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# 2023

## Integrated Resource Plan

ANAHEIM PUBLIC UTILITIES

# TABLE OF CONTENTS

# TABLE OF GRAPHS

# TABLE OF TABLES

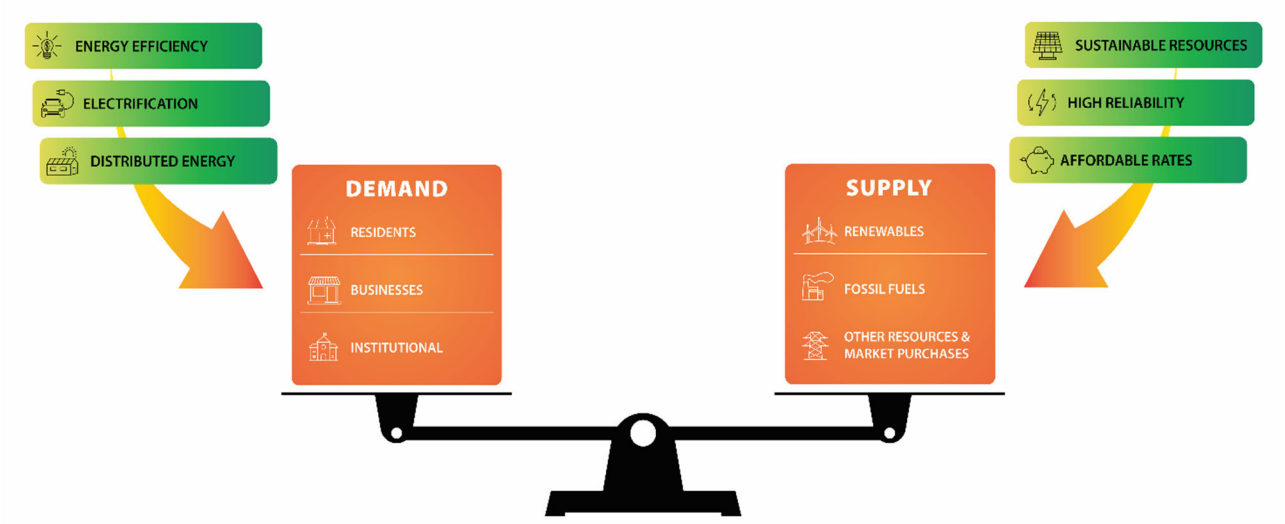
# I. EXECUTIVE SUMMARY

## Introduction

Anaheim Public Utilities (APU) operates a municipally-owned, vertically-integrated electric utility, which has the privilege and obligation to reliably serve electricity and water to the approximately 350,000 residents and 15,000 businesses within its fifty square mile service territory. As the only municipal full-service electric utility in Orange County, APU is responsible for planning adequate power generation resources to reliably meet customer demand for electricity after adjusting for customer energy efficiency savings, added energy demand from electric vehicles (EV) and building electrification, and reductions from customer-owned power generation (e.g., roof-top solar), all while incorporating sustainability policy goals which call for significant reductions in greenhouse gas (GHG) emissions. In addition to reliability and sustainability, APU seeks to mitigate the impact of legislative mandates on resource additions that increase customer rates.

***APU is responsible for planning adequate power generation resources to reliably meet customer demand for electricity after adjusting for customer energy efficiency savings, added energy demand from electric vehicles (EV), and reductions from customer-owned power generation (e.g., roof-top solar), all while considering sustainability policy goals which call for further reductions in greenhouse gas (GHG) emissions.***

The 2023 Integrated Resource Plan (IRP) serves as a long-term comprehensive roadmap to continue APU's long-standing focus on customers by balancing the demand and supply-side factors of the electric utility. The IRP provides a framework showing how APU will transition away from carbon-intensive resources such as coal, to clean renewable resources such as wind, geothermal, biogas, small hydro and solar. This aligns with APU's GHG emission reduction targets and is in accordance with the State's policy goals required by Senate Bills (SB) 350 and SB 100, including the requirement to update the IRP no less than once every five years. The IRP includes the results of data modeling of customer energy demands balanced against reliability, sustainability, and affordability goals to develop an optimum portfolio of resources to meet the needs of Anaheim residents and businesses over the next 20 years. The following graphic shows how APU balances adjustments to customer energy demand and the gradual reduction of carbon-intensive resources to develop its IRP. The power supply mix will change dramatically over time, with a major milestone projected in 2025, when APU will no longer have coal in its power supply portfolio resulting in a significant reduction in GHG emissions.



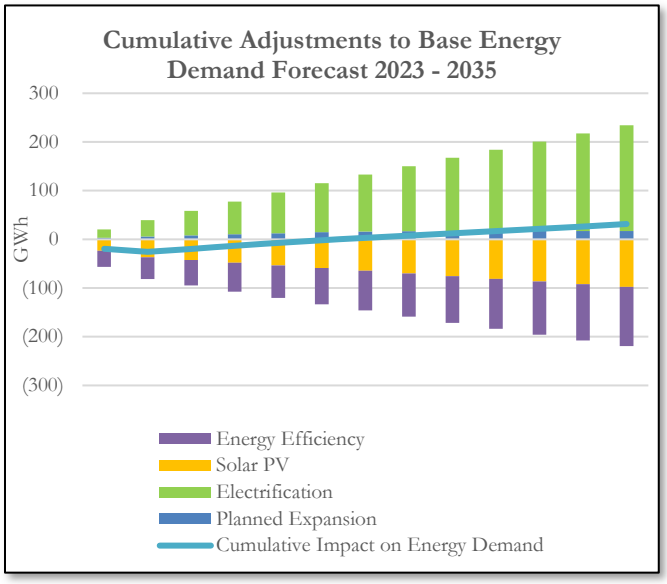
APU's 2023 IRP process commenced in mid-2022 with customer outreach efforts which indicated broad support for APU's responsible transition away from carbon intensive energy resources, strong interest in APU's sustainability initiatives, and support for procurement of renewable energy resources supplemented by cleaner resources.

The California Energy Commission (CEC) has the authority through the passage of SB 350 to implement IRP guidelines for publicly owned utilities and did so in 2018 by requiring the planning horizon for the initial IRP submissions to extend out to the year 2030. The CEC is proposing amendments to their IRP Guidelines which will extend the IRP planning horizon out to the year 2045. As of the writing of the 2023 IRP, the proposed changes to the existing IRP Guidelines are not yet formally adopted by the CEC; nonetheless, for the 2023 IRP cycle APU extended its IRP planning horizon out to 2042. Extending the analyses beyond 2042 presented challenges and abnormal results due to the limits within the long-term capacity expansion database that APU utilized, which provides forecasted additions and retirements only through 2042, or a 20-year planning horizon.

### Assessment of Customer Energy Demand

APU uses a statistical model to forecast long-term baseline customer energy demand, which is adjusted up or down based on planned customer additions, expected transportation and building electrification, estimated customer-owned rooftop solar installations, and expected customer energy efficiency reductions. The results of this same modeling in APU's 2018 IRP projected a cumulative reduction in customer energy demand of 0.86 percent between 2018 and 2030, effectively a zero-growth energy demand forecast. For the 2023 IRP, the adjusted load forecast projects a total load growth of 1.41% between 2024 and 2035, effectively a low-growth energy demand forecast, which indicates that the expected customer expansion and electrification growth is being mostly offset by customer solar installation and energy efficiency reductions, in both retrofit applications and new developments.

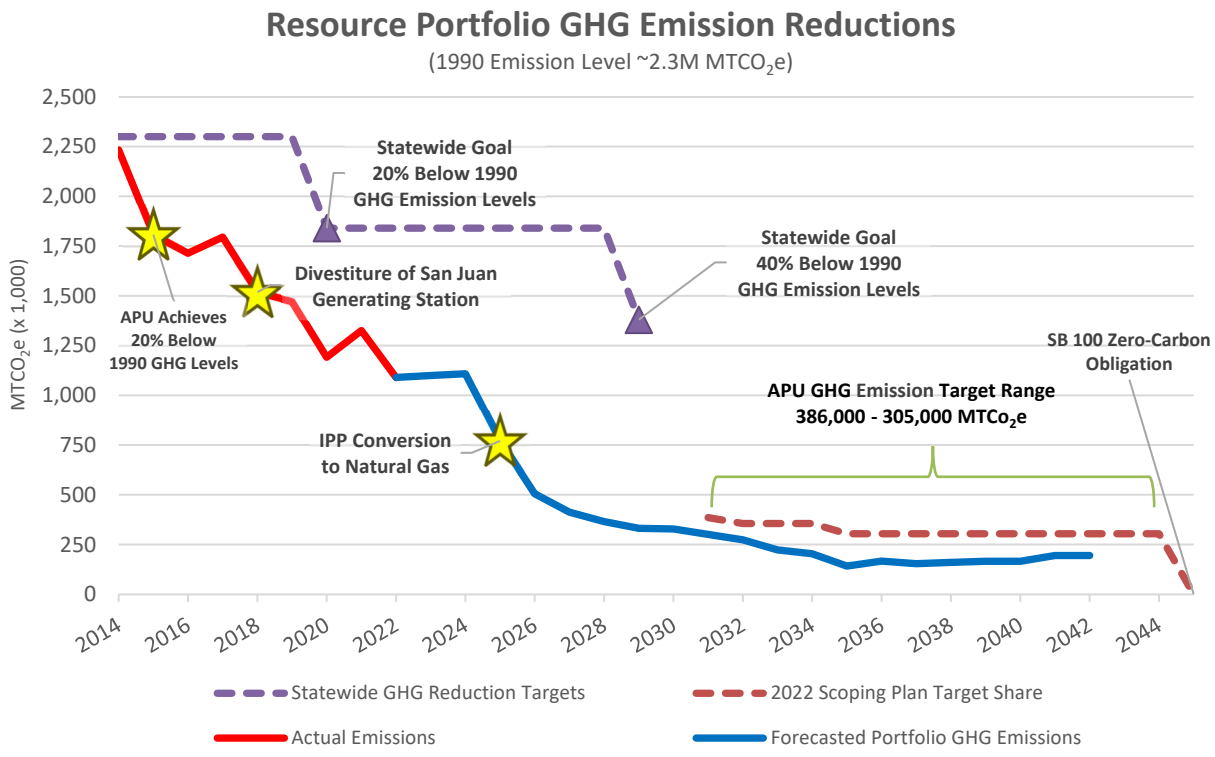
Load forecast beyond 2036 assumes a 0.25% annual load increase. The growth factor is consistent with average load growth between 2027 and 2036 and is applied due to the lack of information in these outer years for all demand variables.

## Transition to Clean Energy Resources

In planning to serve the customer energy demand forecast established above, APU must consider its existing power generation resource mix and plan for the resource changes necessary to meet its reliability and sustainability goals outlined in the IRP. Although APU's current resource mix is adequate to reliably serve the low-growth energy demand forecast, up until 2025 it still includes a significant amount of coal energy. APU recognizes the importance of having reliable, sustainable, and cost-effective electricity supplies to drive the regional economy, support residents, businesses, schools, and visitors, all the while protecting the local environment. Carbon dioxide is the primary GHG associated with electricity generation, and APU has been steadily transforming its electric power supply portfolio since 2003 through increased procurement of renewable resources and accelerating the exit of coal ownership agreements and other contractual obligations. As an example, APU completed divestiture of its ownership share of the San Juan Generation Station, a coal resource in 2017 that demonstrated to customers that APU is responsibly transitioning towards decarbonization.

***The divestiture from coal energy, along with the support for accelerating transportation electrification, will reduce APU's GHG emissions by more than 80% below 1990 emission levels by the year 2030.***



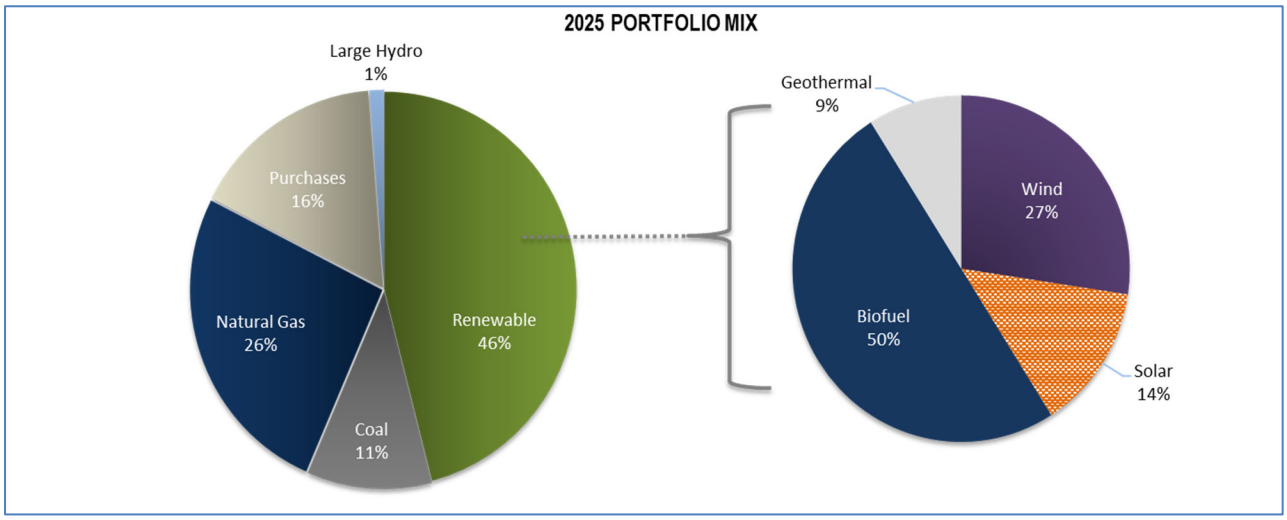

Upon the Intermountain Power Project (IPP) conversion to natural gas, which is scheduled for mid-2025, APU's power supply portfolio will be 100 percent free of coal resources. APU will completely end its contractually obligated participation in IPP in 2027. Transitioning away from coal resources and replacing them with renewable and/or carbon-free energy resources was the optimum resource portfolio identified in the 2018 IRP to meet the State's clean energy and climate goals while maintaining affordability and reliability. The 2023

IRP reaffirms that the optimum pathway to decarbonization requires continuing to divest from coal and invest in new clean energy resources and storage technologies. These clean energy resource additions, along with APU's support for accelerating transportation and building electrification, is expected to reduce APU's GHG emissions by more than 80% below 1990 emission levels by the year 2030, significantly exceeding the State's current overall target of 40% below 1990 emission levels by 2030[1].

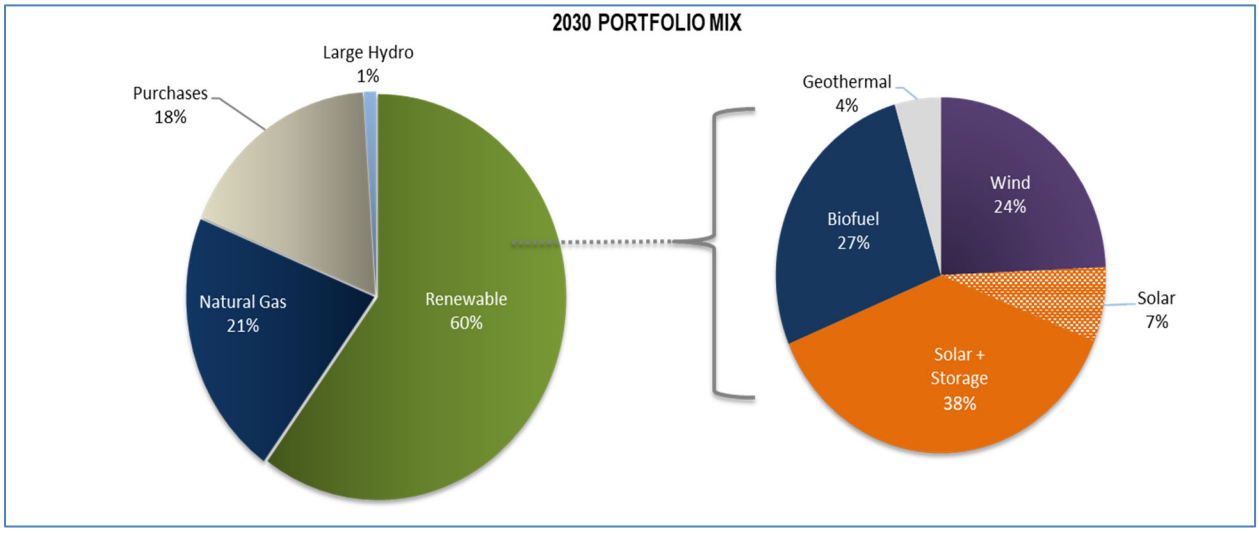
### Renewable Energy Resource Procurement Plan

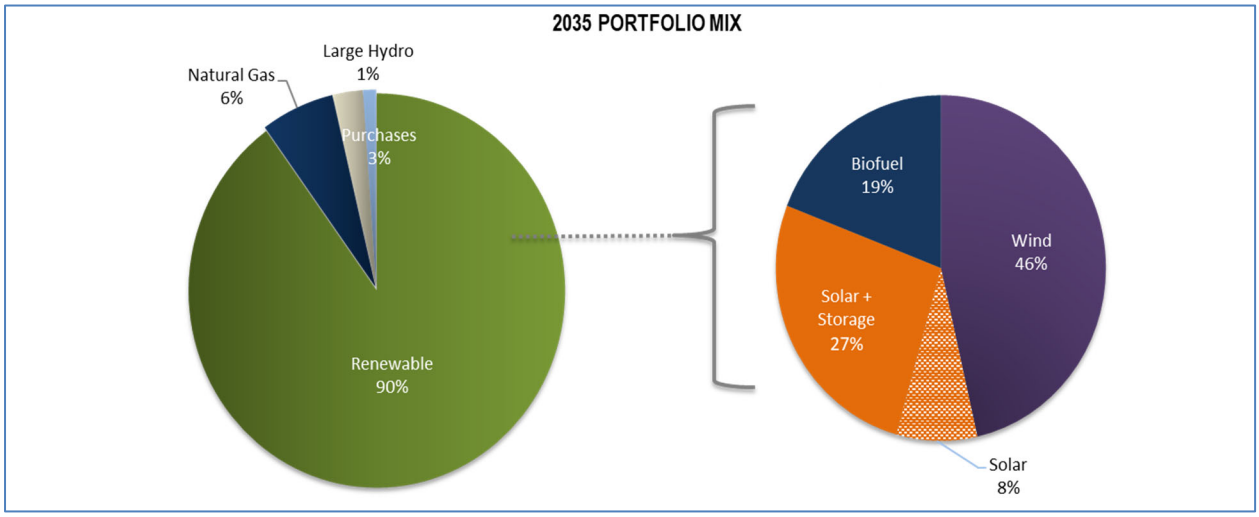
On May 15, 2018, Anaheim's City Council approved APU's 2018 IRP, which expanded the procurement of renewable energy resources to serve Anaheim electric customers from 33% to 50% renewable energy by 2030, consistent with the mandates of SB 350. SB 350 also required that utilities incorporate existing renewable energy resource procurement plans into IRPs going forward. The 2023 IRP includes APU's most recent update to its renewable energy resource procurement plan, which is in accordance with the 60% renewable energy by 2030 target established in late 2018 through the passage of SB 100. SB 100 also established a state policy goal for utilities to serve 100% of customer retail sales from carbon-free resources by 2045.

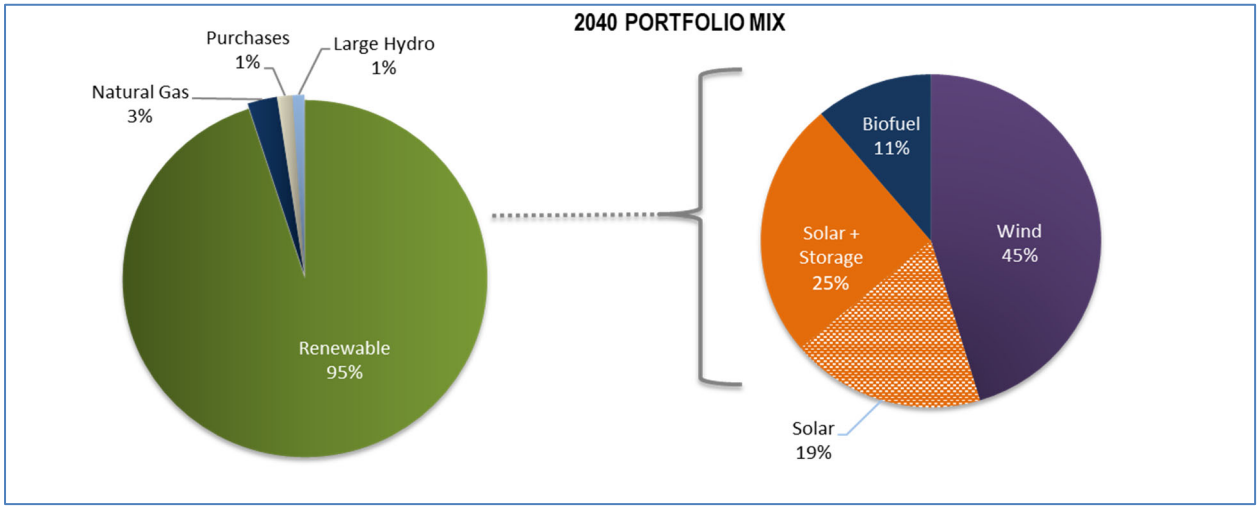
The 2023 IRP evaluated and modeled three power supply procurement plans and the following pie charts display the changing resource mix over time under the optimal Reliability Portfolio. The new resources are recommended by the optimization model runs, which reflect RPS requirements and constraints, planning reserve margin requirements, and seeks to meet environmental goals and reliability requirements, while managing cost pressures. Under the Reliability Portfolio, the renewable percentages continue to increase over the years, consistent with State mandates. As existing contractual obligations end over time and new resources are added to the portfolio, APU plans to add cost-effective resources including utility-scale solar plus battery storage, solar and wind while gradually decreasing fossil-fuel generation to maintain grid reliability.




[1] AB 9 (Muratsuchi) & SB 12 (Stern) introduced this legislative session seek to increase the 2030 goal to 55% below 1990 levels.


2030 PORTFOLIO MIX
Large Hydro 1%
Purchases 18%
Natural Gas 21%
Renewable 60%
Geothermal 4%
Biofuel 27%
Wind 24%
Solar 7%
Solar + Storage 38%


2035 PORTFOLIO MIX
Natural Gas 6%
Large Hydro 1%
Purchases 3%
Renewable 90%
Biofuel 19%
Wind 46%
Solar + Storage 27%
Solar 8%

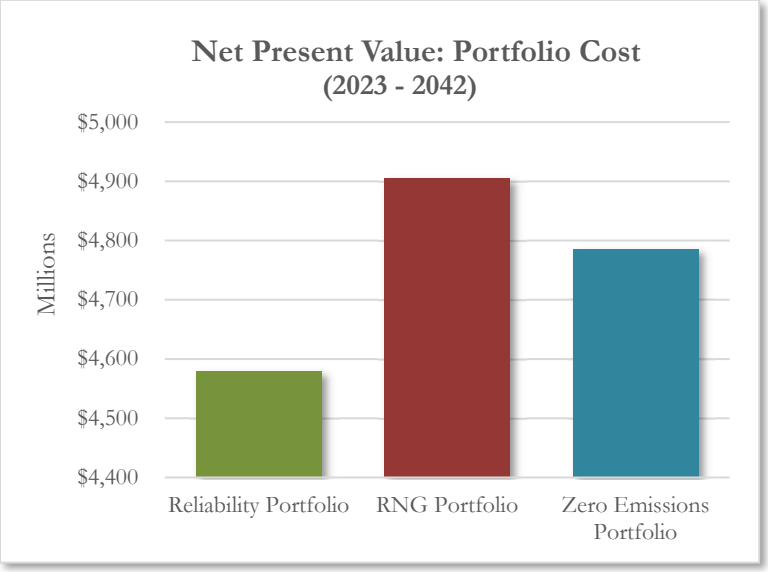

2040 PORTFOLIO MIX
Purchases 1%
Large Hydro 1%
Natural Gas 3%
Renewable 95%
Biofuel 11%
Wind 45%
Solar + Storage 25%
Solar 19%

## Optimum Resource Portfolio

APU's renewable portion of its current overall power resource mix consists mainly of baseload renewables such as geothermal, landfill gas and biofuels. These baseload resources operate continuously around-the-clock and are not dependent on favorable weather conditions unlike intermittent resources such as wind or solar power generation. To supplement these baseload renewables and to cover the capacity and generation from the divestiture of IPP in 2027, APU modeled three power supply portfolios. As shown in the bar chart, the Net Present Value (NPV) identified the Reliability Portfolio as optimal from a cost perspective, and still requires an investment of nearly $4.6 billion over 20 years. The Reliability Portfolio not only is the most affordable, it also maintains high reliability, achieves APU's sustainability goals, and complies with State mandates. Power supply modeling includes the replacement of the divested coal resource and considerations for the gradual decrease of natural gas resources, and includes qualitative performance measures and production cost modeling.

***Under the Reliability Portfolio, APU will achieve a diverse and low-emission resource portfolio that meets RPS and GHG reduction goals, achieves Resource Adequacy and local reliability, and maintains affordable electric rates.***

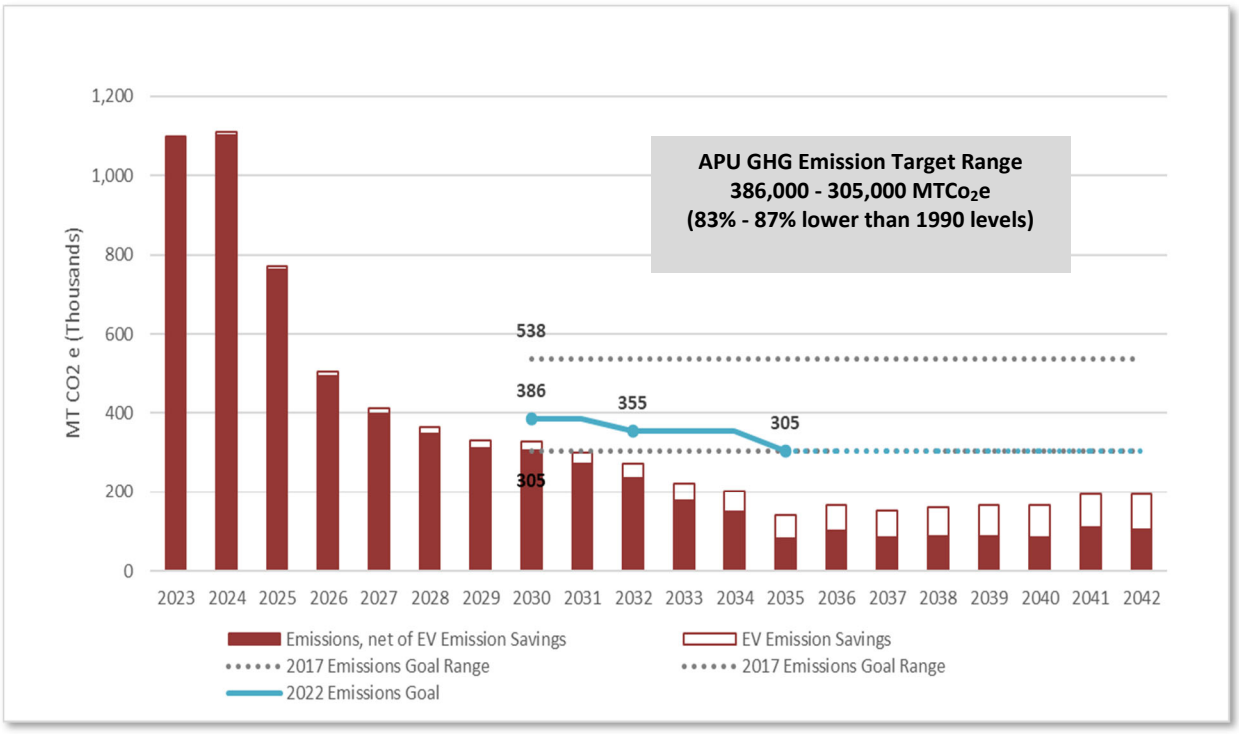
Production cost modeling analysis was used to compare the overall power supply cost of APU's existing resources plus any new resources considered for each portfolio. In addition to the expected cost of each portfolio scenario, the following five factors were also considered in determining the optimum portfolio: Compliance, Regulatory Risk, Resource Adequacy, Portfolio Diversification, and Market Exposure. The Reliability Portfolio outperformed the other portfolios under both expected conditions and stress tested conditions, such as extreme heat, extreme carbon pricing, extreme fuel price volatility, and extreme high or low energy efficiency, behind-the-meter solar penetration, and proliferation of transportation and building electrification.




Under the Reliability Portfolio, APU plans to achieve a diverse and low-emission resource portfolio that meets the RPS and GHG reduction goals, achieves resource adequacy and local reliability, and maintains affordable electric rates. The following graphic shows that the Reliability Portfolio causes the lowest overall increase in power supply costs, compared to the two other scenarios: the Renewable Natural Gas (RNG) Portfolio that considers investments in biofuels to replace natural gas, and the Zero Emissions Portfolio that considers elimination of natural gas resources. The additional costs for these alternatives are $326M and $461M, respectively.

APU's resource portfolio will be coal-free by mid-2025 and, at a minimum, 60% of APU's electricity deliveries will come from renewable energy resources. Based on current law and regulations, APU's optimum resource portfolio under the 2023 IRP will achieve the upper bound of the proposed GHG reduction target range (i.e.,

83% GHG reduction); however, the lower bound of the range (i.e., 87% GHG reduction) will not be achieved without cost impacts. This is not an isolated issue facing APU and is outlined in the Joint Agency SB 100 report[2], published in 2021, which outlined the viability and challenges in serving California demand with 100% zero-carbon resources. This report identified that achieving a 100% zero-carbon by 2045 was achievable but would require significant costs and unprecedented renewable resource build rates. Fulfilling the more stringent 87% GHG reduction target could cause a significant rate impact to APU customers as it would require the shutdown, fuel conversion, or "stranding," of a reliable and efficient baseload natural gas resource Magnolia Power Plant, which has 20-years of unavoidable debt service costs that would still need to be paid by APU customers in addition to replacement renewable resources. The gradual reduction of the reliance of natural gas and the corresponding contractual and bond financing obligations would help maintain reliability and ease the cost burdens on APU customers who will already need to invest heavily in clean energy resources. APU is closely following relevant regulatory proceedings and will work with the California Air Resources Board (CARB) and California Energy Commission (CEC) to recommend methodologies to reduce APU carbon emissions, such as accounting for the effect of electric vehicle (EV) penetration and building electrification on emission reduction, without compromising reliability especially as hot summers require an all-resources approach to meet peak demands.



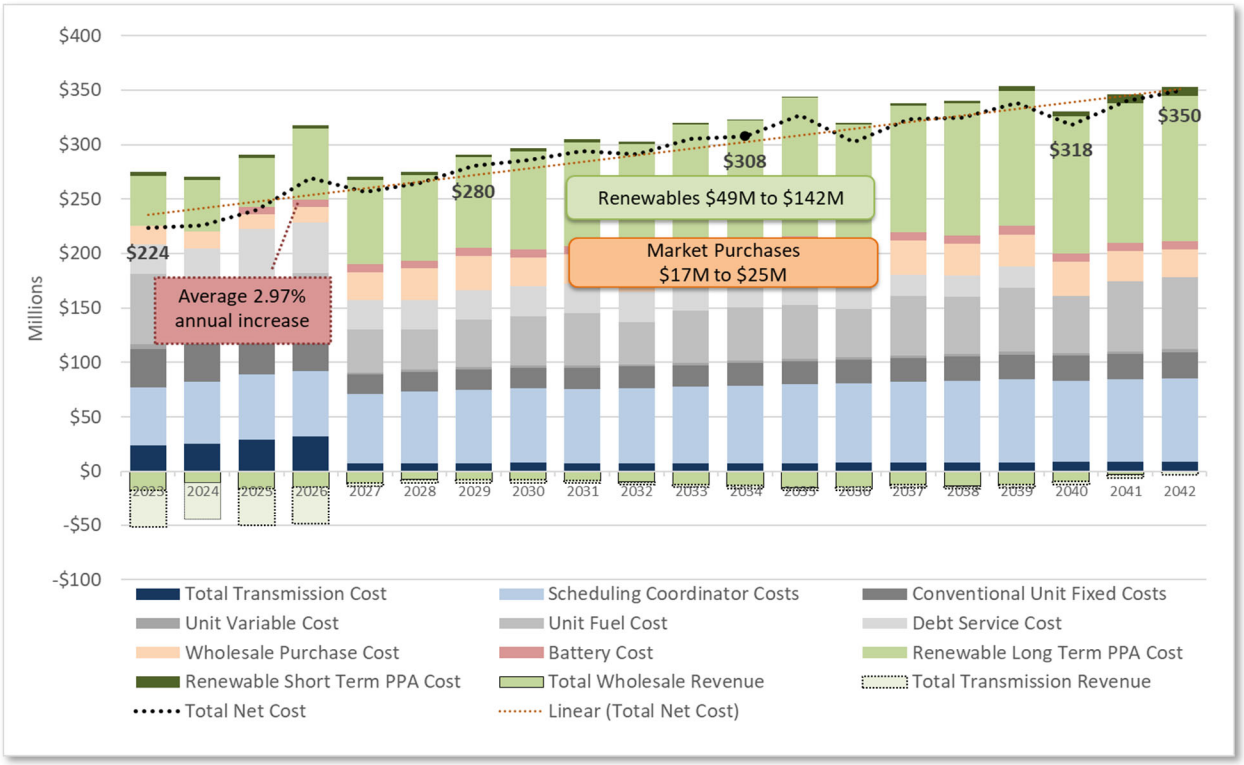

[2] https://www.energy.ca.gov/publications/2021/2021-sb-100-joint-agency-report-achieving-100-percent-clean-electricity

## Projected Impacts on Customer Rates

APU strives to find resources that are cost-effective and minimize rate impacts on customer utility bills, while still meeting its compliance obligations for increased renewables and lower GHG emissions. By responsibly divesting of its coal assets and utilizing its peaking resources to integrate more renewable purchases, APU has been able to maintain affordable electric rates. The following graphic shows the expected net power supply cost forecast from 2023 through 2042 based on the Reliability Portfolio and the expected consumption case. The net cost to supply power, presented in the graphic below, is estimated to be $126 million higher in 2042 compared to 2023, or a 2.97% average annual increase over the next 20 years. The increase is mainly driven by procurement costs for the resources necessary to meet the State's carbon-free energy goals and GHG emissions reductions (carbon neutrality by 2045), as well as an increase in scheduling service fees for participation in the CAISO markets. This analysis does not take into account future legislation or regulatory requirements or other cost pressures such as inflation, supply chain, fleet replacement, and grid modernization that may subject customers to additional rate increases.

***By responsibly divesting of its coal assets and utilizing its peaking resources to integrate more renewable purchases, APU has been able to maintain affordable and competitive electric rates.***

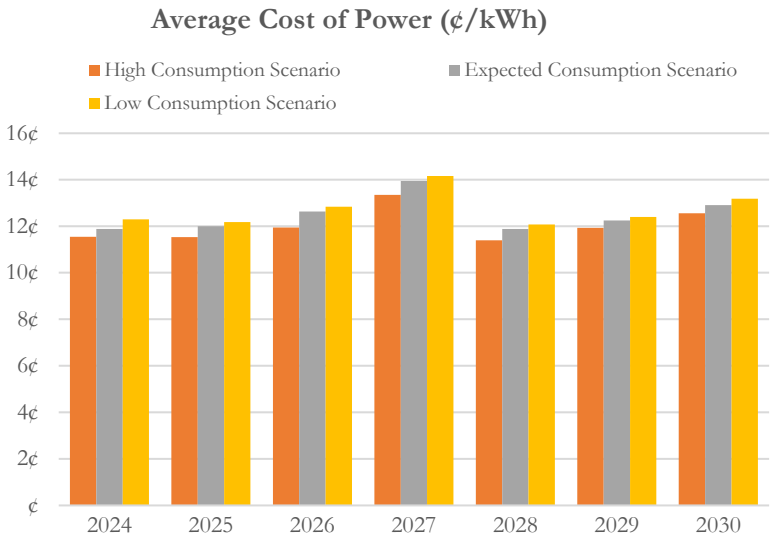
**Power Supply Cost Structure – Reliability Portfolio**




APU performed cost impact analyses under high, medium, and low load growth scenarios to determine the potential cost impact of various changes in regulatory requirements and resulting impacts on power supply costs. The results of this study principally suggest how the projected cost impact to customers is

relatively modest, even under the low consumption scenario where the average cost of power peaks at approximately 14 cents per kWh in FY 2027; under this scenario, the average cost of power increases modestly at a compound annual rate[3] of 2.37% over five years to reach this hypothetical peak. As shown in the chart, the average cost of power is forecast to dip thereafter, as Anaheim will exit from IPP and no longer be subject to the associated cost obligations.

This analysis was based on forward-looking assumptions and is subject to change due to commodity price fluctuations, policy changes, technological developments, and/or changing customer behavior. APU will continue to update its long-term plan as expectations change in order to maintain accurate forecasts. While the model used for the 2023 IRP analysis was based on information available at a single point in time, it is not uncommon for assumptions to change over time as additional information is made available.




## Customer Cost Protections

The acceleration of procurement for renewable and carbon-free resources to replace IPP and meet the State's escalating goals for clean energy resources is one key driver for upward pressure on customer rates going forward. It is important that State programs mandating certain types of procurement from utilities include provisions that protect customers from disproportionate rate impacts. APU's renewable energy resource procurement plan includes a cost limitation methodology that can be used to prevent a disproportionate impact on customer electric rates caused by a significant increase in costs associated with the procurement of renewable energy resources. The State's RPS law permits the local governing board of each publicly owned utility (POU), such as APU, to implement a cost limitation for its RPS activities for the protection of APU customers. As part of the 2023 IRP, APU is updating its cost limitations policy to consider the expanded 60% RPS.


These cost limitation rules are intended to protect APU customers from experiencing

[3] This is calculated using the geometric mean or compound annual growth rate over five years.

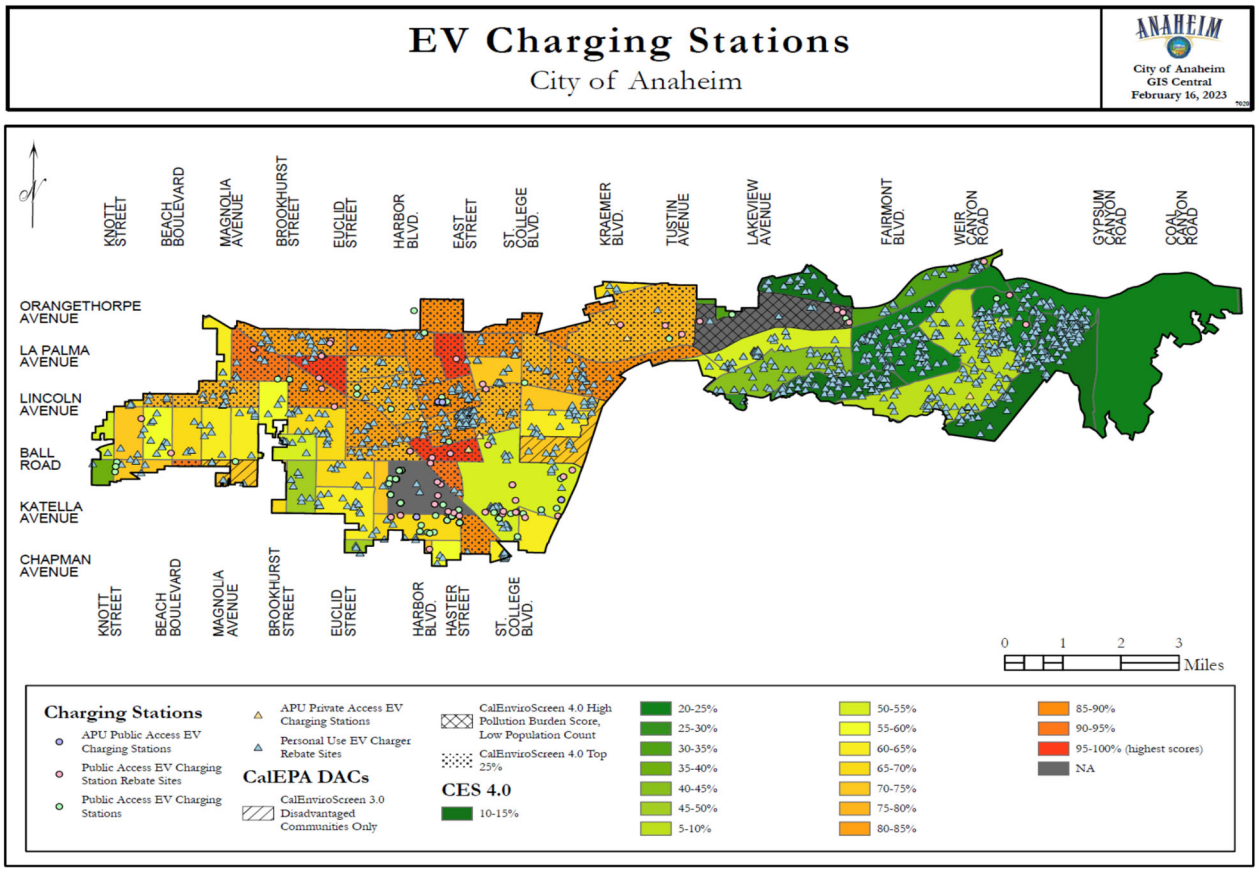
significant and disproportionate rate impacts resulting from procurement expenditures used to comply with RPS procurement requirements. More detailed information can be found in Section V. Renewable Energy Procurement Plan and Enforcement Policy.

### Local Reliability and Air Quality

Of APU's approximate 640 MWs of generation capacity, 200 MWs are located within the City. The Canyon Power Plant provides flexible power generation capability that counts towards resource adequacy capacity near the Anaheim load center, including local black-start capability, which enhances local and statewide reliability. The power plant uses natural gas fuel, including air emission controls to meet stringent air quality permit conditions, has much lower GHG emissions than coal resources, and operates as flexible peaking units to support the morning and evening ramping needs of the power grid and backup fluctuations in solar and wind output due to weather.

According to APU's 2022 residential customer survey, just over 77% of the respondents indicated that they have acceptable to excellent air quality near their home, and approximately 63% of the respondents indicate the air quality has improved or stayed the same over the past few years.

To improve local air quality and support sustainability goals, APU facilitates and promotes transportation electrification through electric vehicle time-of-use rates, rebate incentives for public access and private use charging stations, and the electrification of utilities field services vehicles. APU also supports and facilitates the installation of fast-charging infrastructure to be used by visitors and residents without home charging facilities, which helps to remove fossil fueled vehicles from the road and improves local air quality.



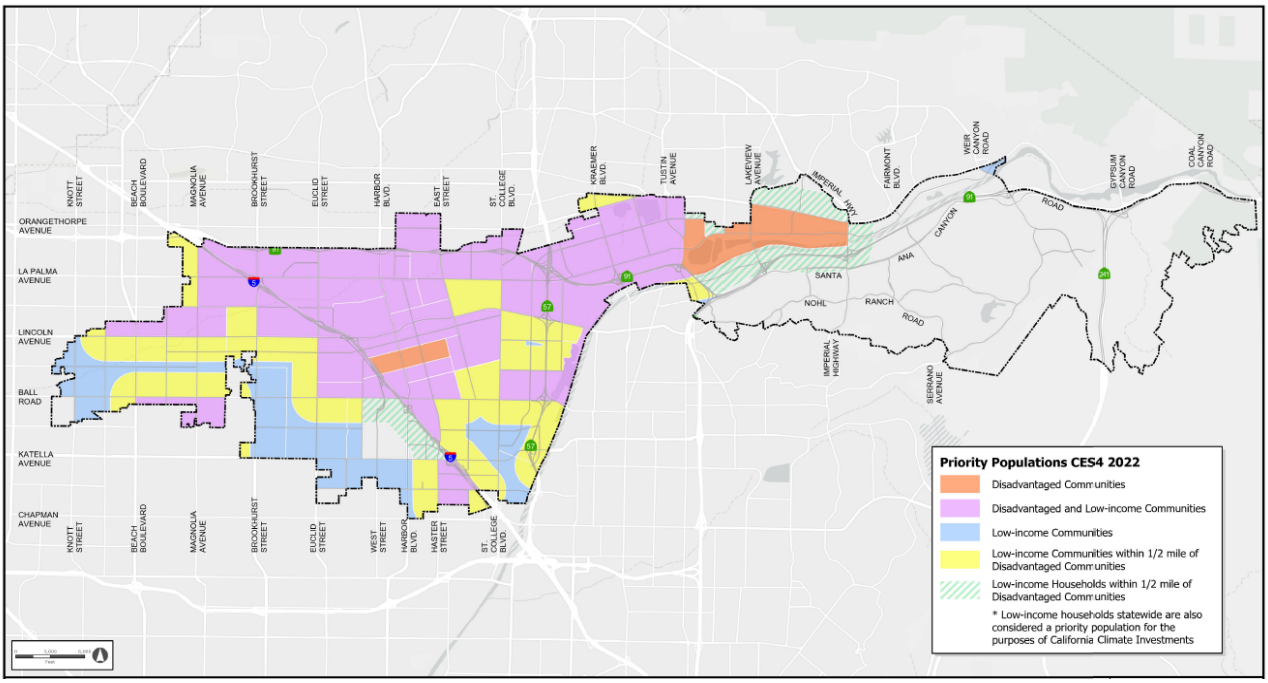
In addition, APU supported customer-owned solar distributed generation by fully implementing the SB 1 solar initiative rebates. Over the past two decades, APU's commercial and residential customers have installed over 47 MW of solar capacity. APU continues to expand clean local distributed generation through utility-owned solar projects. For example, APU installed and maintains 2.4 MW of solar on the roof of the Anaheim Convention Center and 1.5 MW solar carports and lunch shelters at nine public schools throughout Anaheim through its Solar for Schools program.

### Programs for the Low Income and Disadvantaged Communities

APU has a tradition of helping low income customers use energy efficiently to reduce their electric bills, and APU has historically provided rate discounts to income-qualified seniors, military veterans and disabled customers, and directly applies bill credits to qualifying residential customers through the federally-funded Low Income Home Energy Assistance Program (LIHEAP). Additionally, the energy from the Solar for Schools program is administered as a solar discount for income qualified residents who may not be able to procure solar as multi-family development tenants or financial limitations on obtaining solar themselves. APU also offers Home Utility Check-ups that provide indoor and outdoor energy assessments along with LED light bulb replacements and other measures that reduce the customer's energy usage and educate them on making smart energy decisions.

APU has incorporated programs that assist "disadvantaged communities (DAC)," as defined by SB 535 and the most current version of CalEPA's California Communities Environmental Health Screening Tool ("CalEnviroScreen"), which includes low income communities and households known as "priority populations "that are especially vulnerable to the impacts of climate change. The CalEnviroScreen considers area pollution exposure levels in addition to income and unemployment levels to determine which areas are disadvantaged. However, APU programs serve expanded DAC areas, which include low income areas defined by the Department of Housing and Urban Development as Community Development Block Grant (CDBG) areas. The following map illustrates this expanded DAC area served by APU DAC programs:

**City of Anaheim CalEnviroScreen 4.0 Score by Census Tract**



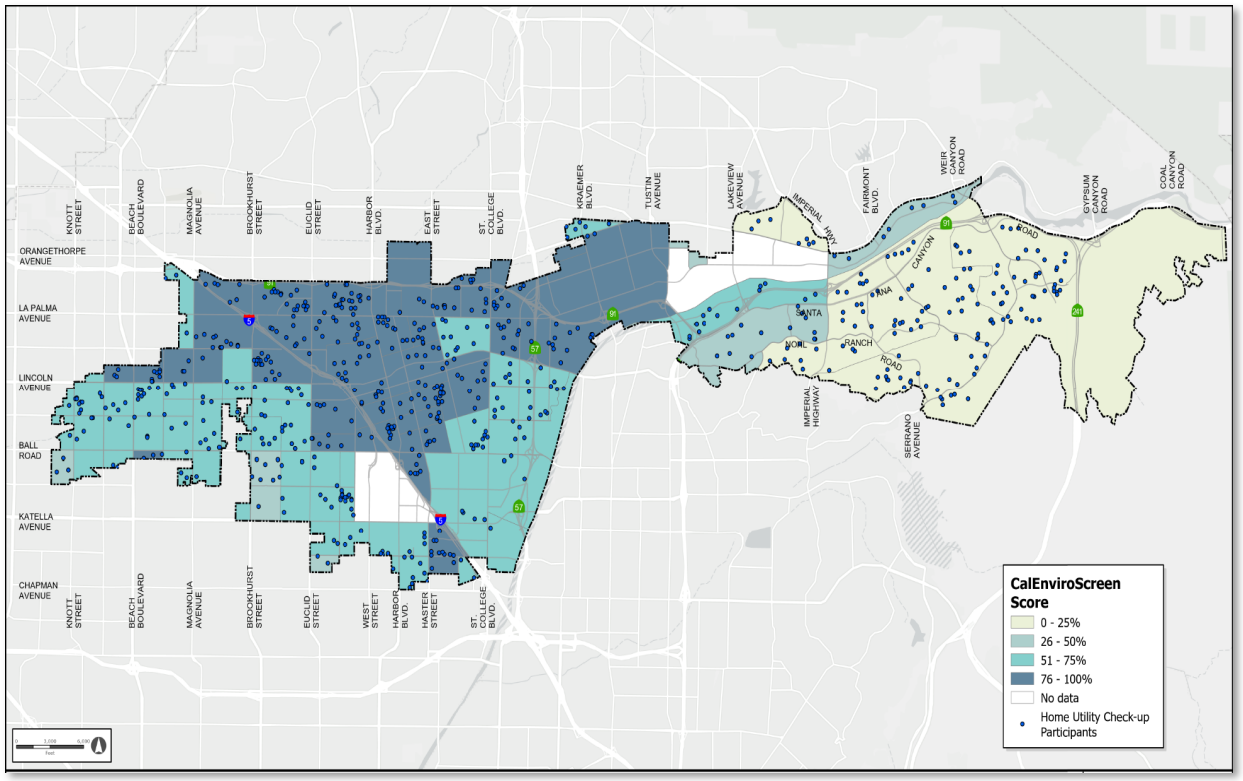

To ensure energy efficiency, transportation electrification and renewable energy is accessible to the low income and disadvantaged communities (LI-DACs), APU offers program incentives and works closely with other City departments including Planning and Building, Public Works, Community Services, and Housing and Community Development to service LI-DAC customers. Below are some examples of interdepartmental collaboration to ensure that investments are made in the City's most vulnerable communities.

- Partnering with other departments to host community outreach events, sustainability fairs, mobile family resource clinics, neighborhood popup meetings, and EV ride and drive events.
- Providing no-interest loans to other City departments to improve efficiency at parks and libraries in LI-DACs.
- Offering rebates for enhanced energy efficiency and publicly accessible EV charging stations located at schools and Affordable Housing Developments. The public access EV rebate program is funded by proceeds from the California Low Carbon Fuel Standard (LCFS) program.
- Actively seeking grant opportunities to support EV charging stations and shade trees for qualifying commercial, industrial, and residential projects, and multi-family developments near freeways and within LI-DACs.

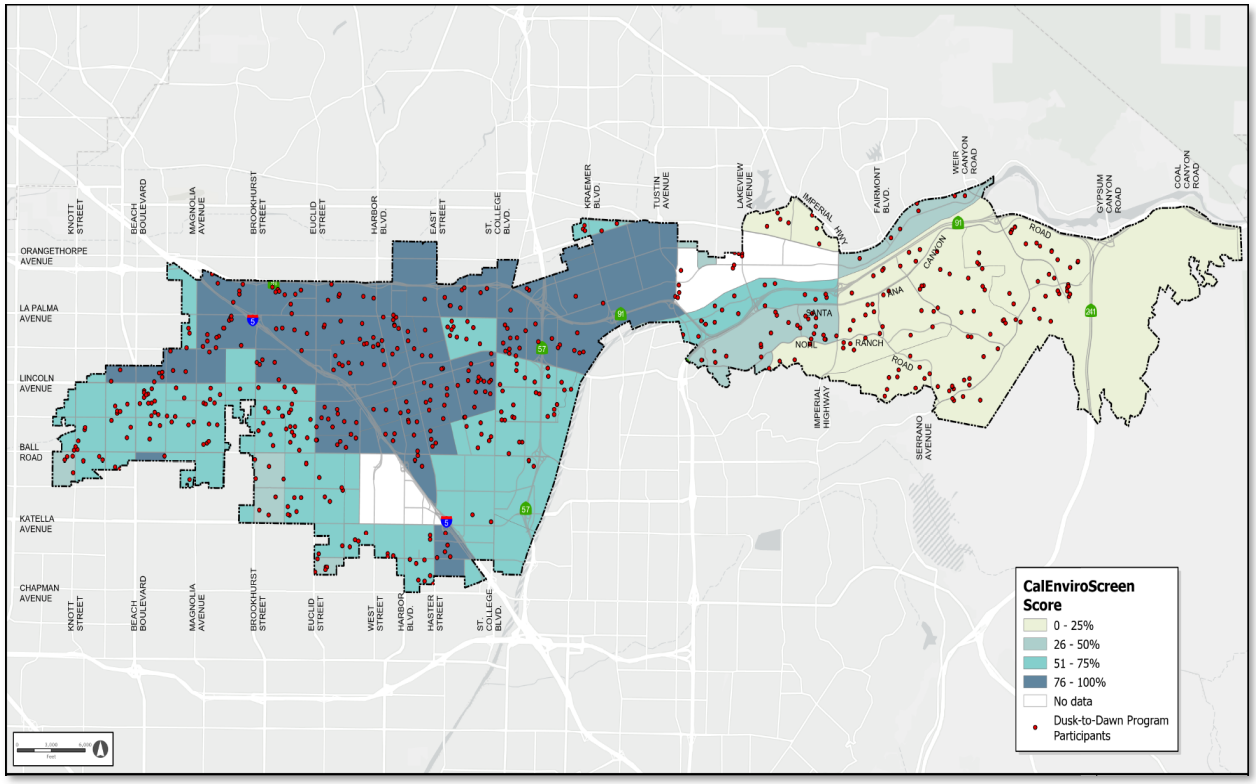
- Transitioning to LED streetlights and partnering with the Southern California Gas Company to offer no-cost weatherization services that are frequently located within LI-DACs.
- Providing EV charging stations at city sites within LI-DACs through grant funding opportunities.
- Offering an EV ride-share program at affordable housing developments to residents for local commuting needs.

Data analytics is used to maximize LI-DAC residents' participation in efficiency programs. As an example, a significant majority of the customers who participate in the Home Utility Checkup Program are within LI-DACs, as illustrated in the following map below. APU's weatherization program is therefore enhanced through the Home Utility Checkup Program. Eligible customers applying for the Home Utility Checkup are also pre-qualified for free weatherization installations. The graph below shows CalEnviroScreen 4.0 layered maps detailing APU's Home Utility Check-Up Program, Dusk-to-Dawn Lighting Program, and income-qualified Weatherization Program participation for Fiscal Year 2021/22, considering CalEnviroScreen census tract data and associated score.

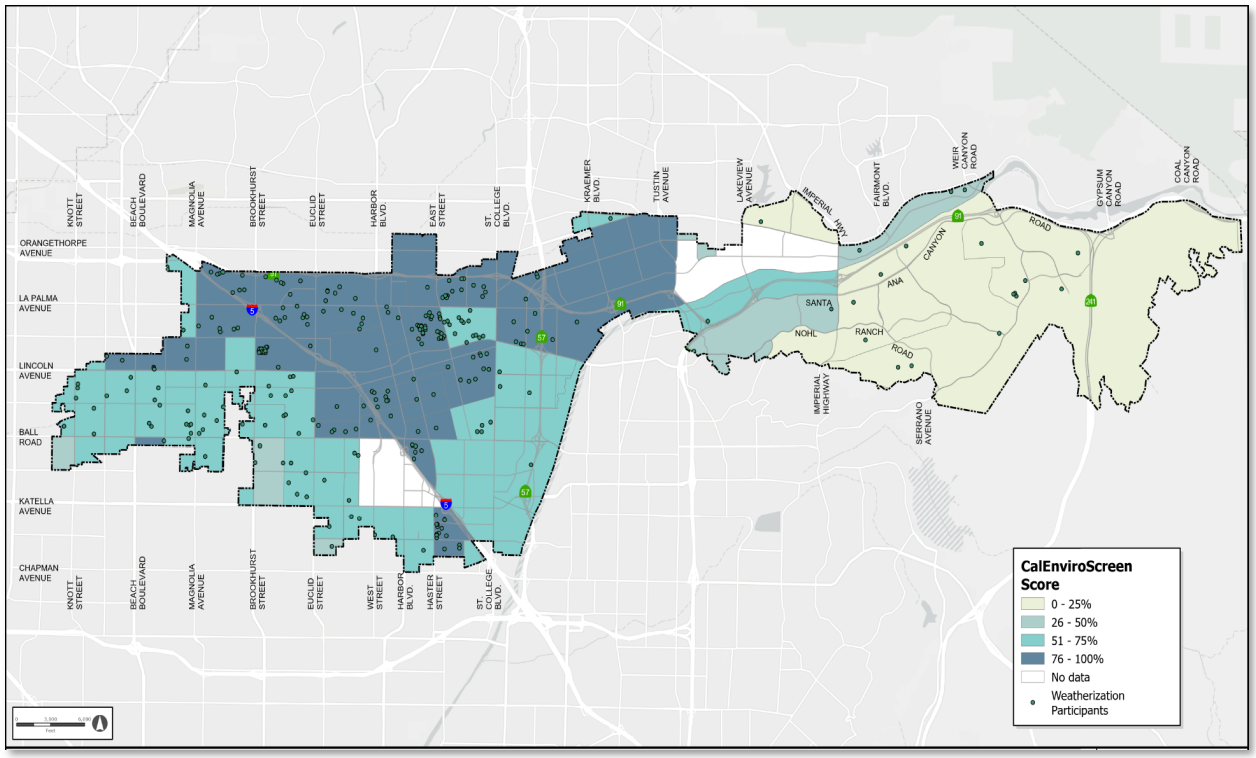
**CalEnviroScreen 4.0 Score and APU's Home Utility Check-Up Program Participation as of December 7, 2022**



**CalEnviroScreen 4.0 Score and APU's Dusk-to-Dawn Program Participation as of December 7, 2022**

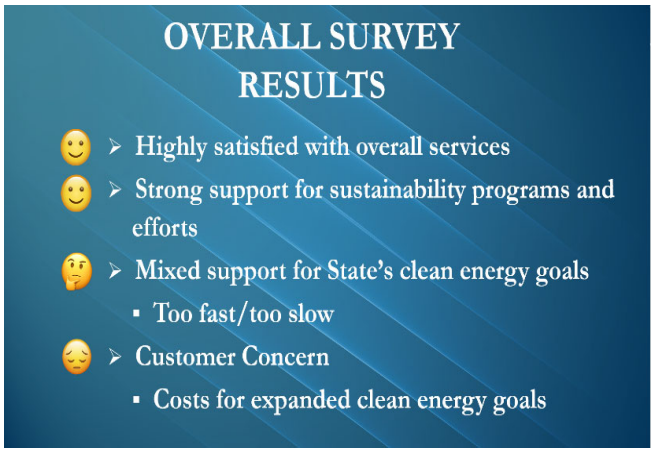



**CalEnviroScreen 4.0 Score and APU's Weatherization Program Participation as of December 7, 2022**



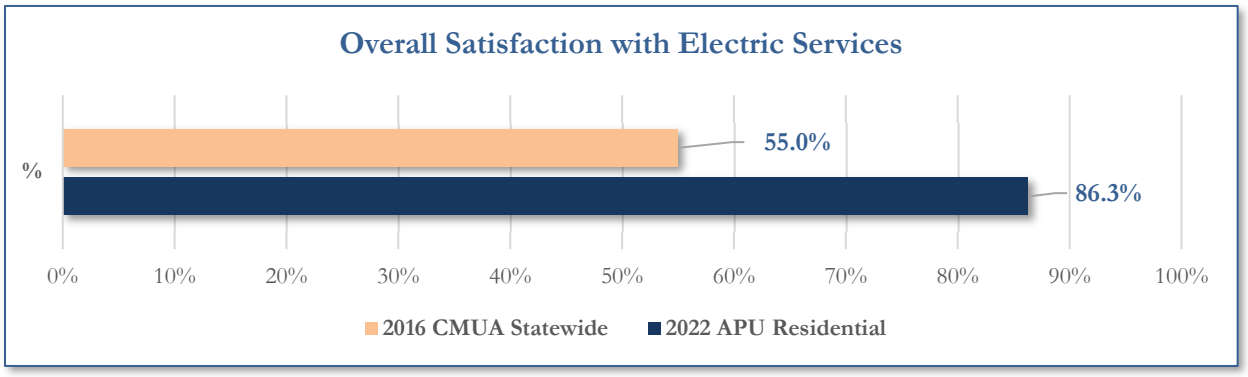
## Customer Satisfaction and Outreach

In 2018, APU actively solicited input from customers and received responses from residents and businesses through online surveys, phone interviews, and outreach events. For the 2023 IRP, APU again commissioned a residential satisfaction survey to compare with, and build upon, the feedback received from the 2018 IRP customer survey. The primary goals of this research study were to assess the effectiveness of APU's ability to serve its customers, identify areas for improvement, and isolate areas that may increase engagement.




The 918 survey results show high satisfaction with the APU's overall services, with high marks for reliability, safety, and value, consistent with the 2018 survey. Customers also expressed support and satisfaction with APU's sustainability programs and initiatives, with mixed support for the State's pace for renewable and carbon-free energy goals. In line with the 2018 IRP customer responses, customers remain concerned with potential cost increases related to increased renewable and carbon-free energy goals.

The California Municipal Utilities Association (CMUA) conducted a statewide customer satisfaction survey in 2016[4] that reached nearly 1,400 residential customers. In comparison to the CMUA municipal customers surveyed, APU customers once again expressed a significantly higher overall customer satisfaction with APU services.



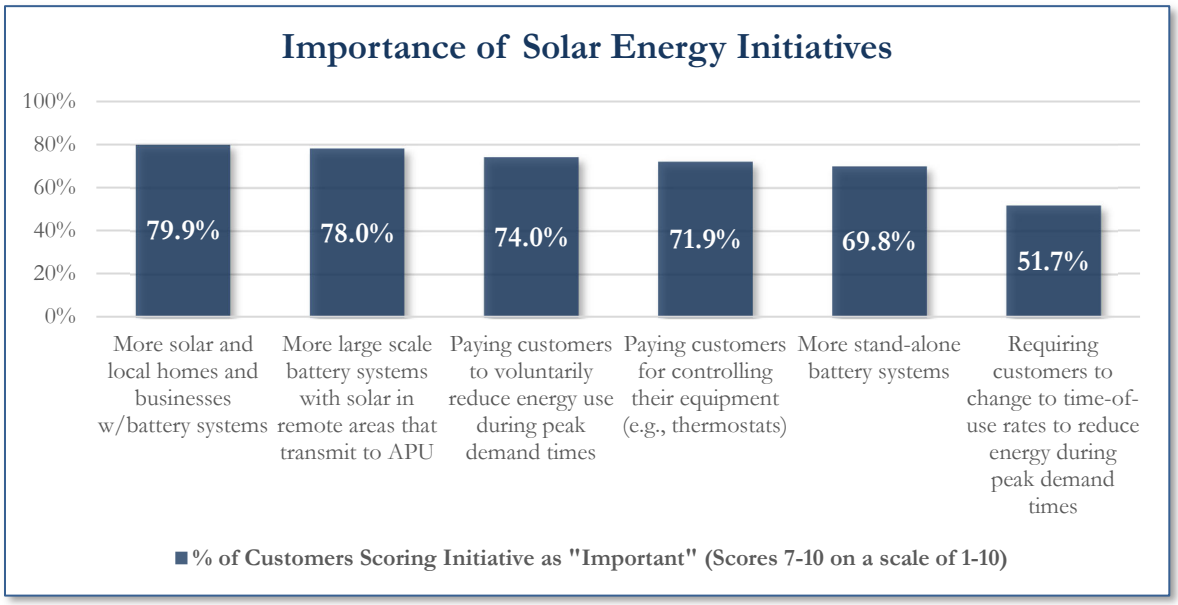

## Importance of Environmental Sustainability Measures

As a utility that provides both water and electric services to its customers, APU solicited input on a series of questions pertaining to water and electricity sustainability initiatives, considering that water and energy systems are interdependent. Over 95% of APU's residential customers indicated that they have taken one or more

[4] The 2016 CMUA customer survey is the latest available as of the writing of the 2023 IRP, another survey is expected within the next 2 years.

measures to reduce indoor water use, and approximately 68% indicated they have taken one or more measures to reduce outdoor water use.

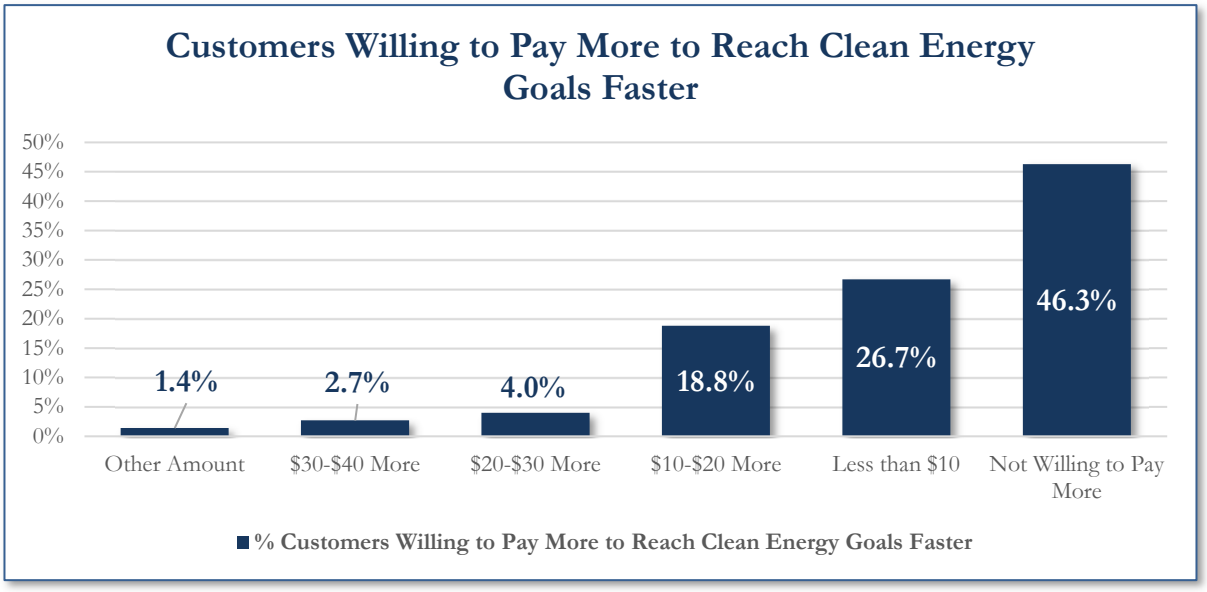
APU customers were also asked about their thoughts on solar energy initiatives and their importance. Nearly four-fifths (79.9%) of customers responded that the "more solar at local homes and businesses with battery systems" initiative is an important sustainability initiative. Similarly, APU customers indicated that "more large-scale solar with batteries in remote areas that transmit into APU" as important. Nearly three-quarters of APU's customers believe that initiatives that provide compensation for customers that voluntarily reduce energy usage during peak times or allow APU to control customer equipment (such as air conditioners) are important to them. Only 51.7% of APU's customers feel that requiring time-of-use rates to reduce energy demand during peak times is an important initiative.




## Expansion of California's Clean Energy Goals

In its 2018 IRP, APU outlined its plans to increase renewable power to 50% by 2030, reduce coal power to zero as contracts expire, and do this over a 10-year period to keep the impact on electric rates to a minimum. Customers were asked to rate how strongly they support or oppose this approach, and approximately 65% of APU's residential customers supported that plan. For the 2023 IRP, customers were asked for their thoughts on the timing of California's 60% RPS and the additional goal to provide 100% carbon-free energy to all retail customers by the year 2045. Customer responses indicate moderate support for the timing of the State's clean energy goals with 42.9% of customers indicating the timing is "just right" while 26.9% indicate they are "too slow".

Since the last APU IRP in 2018, the passage of SB 100 expanded California's RPS to 60% by 2030 and added the carbon-free policy goal by 2045. For the 2023 IRP, APU asked customers if they would be willing to pay more to reach higher clean energy percentages faster than state law requires. Customer responses to this IRP survey are consistent with the customer responses from the 2018 IRP.




The survey results indicate that a noticeable percentage of customers (46.3%) are hesitant or unwilling to incur additional rate increases due to increased or accelerated clean energy goals.

## Executive Oversight and Governing Board Approval

### Executive Oversight

IRP development and subsequent updates are guided by an Executive Oversight group consisting of the following members:

- General Manager
- Assistant General Manager – Administrative & Risk Services
- Assistant General Manager – Electric Services
- Assistant General Manager – Finance and Energy Resources
- Assistant General Manager – Water Services

Staff receives direction and support from the Executive Oversight group on all aspects of the IRP, particularly the cross-departmental efforts such as transportation and building electrification and programs and resources focused on the low income and disadvantaged communities.

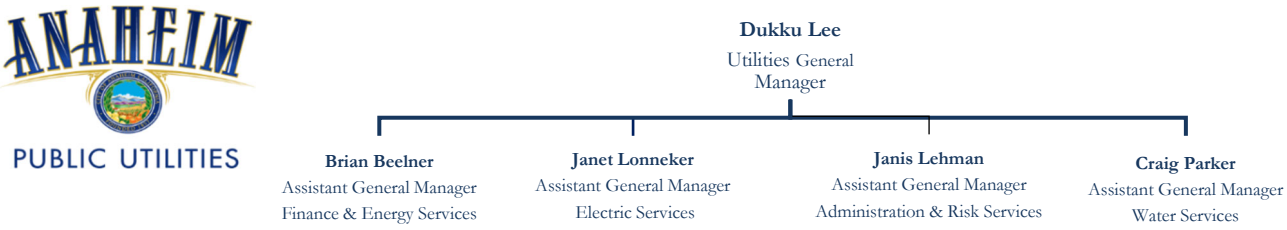
### Board and Council Approval

The 2023 IRP and future updates will be made available to the public for review as part of two meetings; the first opportunity will be at a Public Utilities Board (Board) meeting. The Board is comprised of seven Anaheim residents who are appointed to staggered four-year terms by members of the Anaheim City Council. Their role, as defined in the City Charter, is to make recommendations to the Anaheim City Council on utility matters, including:

- Annual capital and operating budgets
- Water and electric rates, rules and regulations
- Operation of the water and electric utilities
- Financial matters including issuing bonds
- Reliability improvements

Upon the Board's recommendation for approval, the IRP is presented to the Anaheim City Council at a subsequent meeting allowing for public comment. The Anaheim City Council will then consider the 2023 IRP for approval and adoption.

# II. APU FACT SHEET




## Local Ownership & Control

Anaheim Public Utilities is a city-owned, not-for-profit electric and water utility that offers quality electric and water services to residents and businesses in Anaheim at rates among the lowest in California.

Anaheim citizens are more than utilities customers: they are owners of their utilities. They have input to the decision process both directly and through a City Council appointed Public Utilities Board. With final authority vested in Anaheim's elected City Council, decisions are made in the best interest of our citizens, quality of life, and local economy. As a municipal, not-for-profit utilities, our rates are based on our costs of providing water and electricity.

## Electric Services Facts

Anaheim Public Utilities (APU) operates the only municipal electric utility in Orange County, delivering more than 3.7 million megawatt-hours to Anaheim's 350,000 residents and more than 15,000 businesses, including multimillion- dollar tourism, sports, and manufacturing customers.

APU's generates approximately $350 million in retail sales annually, with total assets of $1.7 billion.

## Power Use

Residential customers make up ~85% of APU's total customer meter base; however, nearly 75% of total load is consumed by commercial and industrial customers.

## Resource Adequacy

APU has 640 megawatts (MW) of generation capacity from various types of resources. The record peak customer demand of 593 megawatts was reached on July 14, 2006.

## Power Resources

2 natural gas (in-state[1])
1 coal (out-of-state[2])
1 large hydroelectric (out-of-state)
4 small hydroelectric (in-state)
12 solar photovoltaic (in-state[3])
1 geothermal (out-of-state)
3 wind (1 out-of-state)
2 landfill gas (in-state)

## Distribution Infrastructure

**Transmission, 220kV**
- 1.2 circuit miles

**Sub-Transmission, 69kV**
- 29.3 circuit miles of overhead
- 59.7 circuit miles of underground

**Distribution, 12kV and lower, circuit miles**
- Overhead – 389 primary, 1,153 secondary
- Underground – 769 primary, 979 secondary

**Transformer Capacity, KVA**
- 220kV to 69kV – 1,808,000
- 69kV to 12kV – 1,325,800
- 12kV to customer – 1,911,248

**14 Substations**
**22,305 Streetlights**
**11,866 Distribution Transformers**

[1] One resource within Anaheim Service Area
[2] Conversion to natural gas in 2025
[3] Ten resources within Anaheim Service Area

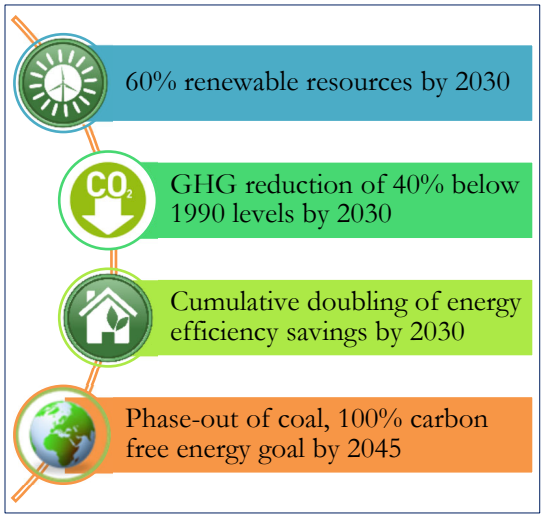
# III. PLANNING GOALS

APU's mission is to be an agile, customer-focused, water and power utility operating in an ever-changing world providing reliable, high quality, environmentally sustainable, and competitively priced water and power and delivering the maximum value to our customer-owners in order to preserve Anaheim's health and prosperity. The 2023 IRP supports this mission by establishing resource planning goals for sustainable resources, high reliability, and affordable rates, including the following sub-goals:

| Sustainable Resources | High Reliability | Affordable Rates |
|---|---|---|
| • RPS Goal<br>• Emmission Reduction Goal<br>• Regulatory Risk | • Resource Adequacy<br>• Portfolio Diversification | • Expected Cost<br>• Market Exposure |

## A. SUSTAINABLE RESOURCES

**Key California Policy Goals**




For more than two decades APU has been a leader in helping its customers use energy wisely and efficiently and transitioning to sustainable power resources such as wind, geothermal, biogas, small hydro, and solar. These efforts, in combination with the transition away from carbon intensive resources will ensure APU is on track to achieve compliance with key California policy goals.

In 2006, Assembly Bill (AB) 32 established a statewide GHG emissions reduction target of 20% below 1990 levels by 2020. This goal was expanded by the passage of SB 32, which established a statewide GHG emissions reduction target of 40% below 1990 levels by 2030. To help achieve the State's GHG reduction goals, Governor Brown signed SB 350 in 2015, which established targets for all California electric utilities, including APU, to increase the use of renewable resources to serve customer load to 50% by 2030. SB 350 also sets a goal to double electricity and natural gas energy efficiency savings statewide by 2030. In 2019, the passage of SB 100 increased the SB 350 renewable energy requirement of 50% by 2030 to 60% by 2030 and established a state policy to serve 100% of all customer load from renewable energy resources and zero-carbon resources by 2045.

The 2023 IRP lays out a plan for APU's resource portfolio to achieve Anaheim's sustainability goals and comply with all of California's legislative and regulatory requirements, including the following:

- Meet or exceed the following Renewables Portfolio Standard (RPS) targets, as a percentage of retail load:
  - 50% by December 31, 2026; and
  - 60% by December 31, 2030, and each year thereafter.
- Meet or exceed the GHG emissions reduction targets established by the California Air Resources Board (CARB) for electric utilities, which contribute toward a statewide GHG emissions reduction goal of 40% below 1990 levels by 2030. The GHG reduction targets established by CARB for POUs are currently 77% to 87% below 1990 levels by 2030. These targets are expected to be revised to align with CARB's 2022 Final Scoping Plan for Achieving Carbon Neutrality resulting in POU emission reduction targets of 83% to 87% below 1990 levels.
- Meet or exceed the energy efficiency targets established by the Anaheim City Council for APU electricity customers, which contribute toward a statewide cumulative doubling of energy efficiency savings in the electricity and natural gas sector final end uses by 2030. The energy efficiency target established for APU by the Anaheim City Council is currently a 1.1% reduction in electricity sales per year.
- Phase-out of all APU coal resources by 2025.

**Sustainable Resources**

***60% RPS*** *is measured by percent of renewable energy delivered to serve retail load.*

***40% GHG Reduction*** *is measured by percent of GHG reduction of the total generation portfolio.*

***Regulatory Risk*** *measures the ability to remain compliant with current and anticipated future legislative or regulatory changes.*

These sustainability goals and reasonable Regulatory Risk were considered in the development of the power supply scenarios evaluated under the 2023 IRP. Regulatory Risk measures the ability to remain compliant with current and anticipated future legislative or regulatory changes. The recommended optimum portfolio is expected to achieve all these goals and be resilient to future regulatory risk.

## B. HIGH RELIABILITY

High overall electric service reliability is a key APU goal considered in the development of the 2023 IRP. Overall electric service reliability is comprised of 1) high power supply reliability and 2) high electric distribution system reliability.

High power supply reliability is measured by two quantitative portfolio performance measures: Resource Adequacy and Portfolio Diversification.

1. Resource Adequacy is measured by the ability to achieve an additional 15% capacity over the forecasted system peak demand, and to meet local and flexible capacity requirements.

2. Portfolio Diversification is measured by the different types of resources, fuel and contract lengths within the portfolio, which increases flexibility, reliability, and operational performance of the overall portfolio.

### High Reliability

**Resource Adequacy** *is measured by the ability to achieve 15 percent above system peak forecast, and to meet forecasted local and flexible capacity requirements.*

**Portfolio Diversification** *is measured by the different types and length of resource investment within the portfolio.*

While the power supply portfolio scenarios evaluated under the 2023 IRP primarily considered power supply reliability (versus distribution system reliability), the addition of customer-owned distributed energy resources (DER), such as rooftop solar, fuel cells, and batteries, the proliferation of electric vehicle charging infrastructure, and increased energy efficiency measures will have an effect on electric distribution system and the need to invest in enhancing reliability; as such, they were also considered and addressed under various sections of the 2023 IRP. The recommended portfolio maintains high power supply reliability through 2030 and beyond, and the expected effect of the aforementioned demand-side factors were determined to have no adverse impact on APU's high electric distribution reliability going forward.

More specifically regarding power supply reliability, APU operates within the balancing area of the California Independent System Operator (CAISO), and the CAISO is within the Western Interconnection of the United States, known as the electric "Grid." The electric Grid interconnects thousands of power generation plants across the 14 western states and parts of Canada and Mexico using a high voltage power transmission system, and all of these generators collectively serve customer electric demands. By participating in this interconnected Grid system, APU operates with extremely high power supply reliability because the loss of any single generator does not affect the delivery of electricity to APU customers, who pay for this level of service through their retail rates. Additionally, APU is able to offer resources to enhance Grid reliability, especially during extreme weather events.

In addition to maintaining Resource Adequacy to maintain adequate power generation capacity beyond that required to serve its own customers and cover any unexpected losses of power generation, the CAISO and the other balancing authorities operating the Grid also adhere to reliability and cyber security standards established and monitored by the North American Reliability Corporation (NERC) under the auspices of the Federal Energy Regulatory Commission (FERC). APU is in full compliance with NERC reliability standards and manages a comprehensive NERC compliance program, which includes annual self-certification, internal audits and formal program reviews.

APU adheres to the CAISO tariffs and Business Process Manuals pertaining to the Grid-level reliability requirements. The reliability requirements and Resource Adequacy programs provide performance and deliverability criteria for generation resources required for each load serving entity. APU's resources fully comply with the system-wide, local, and flexible Resource Adequacy requirements established by the CAISO, and the recommended portfolio is expected to maintain this reliability as APU phases out coal resources and adds renewable resources to achieve a 60% RPS. Also, to improve system resiliency, a diversified and flexible portfolio is considered to minimize risks of unplanned facility outages accompanied with acquisition of resources with complementary generation profiles.

## C. AFFORDABLE RATES

As a municipally-owned utility, maintaining affordable electric rates is a key APU goal considered in the development of the 2023 IRP. APU customers consistently express the need for affordability in their electric rates, given their housing and other cost pressures. APU has consistently maintained electric rates that are lower than adjacent investor-owned utilities, and the recommended portfolio is expected to help maintain affordable rates throughout the planning period.

**Affordable Rates**

***Expected Cost*** *is measured by the total cost to supply power.*

***Market Exposure*** *is measured by the percentage of energy purchased from the wholesale market, and the portfolio's ability to withstand market price volatility.*

Sections 205 and Section 206 of the Federal Power Act stipulate that "all rules and regulations affecting or pertaining to such [public utility] rates or charges shall be just and reasonable." State statute also requires that the integrated resource plan "enable each electrical corporation to fulfill its obligation to serve its customers at just and reasonable rates." In addition, Article XIII C of the California Constitution requires that electric rates do not exceed APU's reasonable cost to provide electricity to its customers. This is also consistent with Section 1221 of the Anaheim City Charter which requires that electric rates be based on the cost-of-service requirements for each customer class.[5]

The Reliability Portfolio consists of a balanced mix of renewable resources and ensures high reliability, meets statutory compliance requirements, while at the same time maintains affordable rates. APU's IRP process includes comprehensive production cost modeling to ensure the resource portfolio serving APU's customer load is met at the lowest possible cost.

The long-term resource planning process introduces many assumptions and each of them may deviate from the original assumptions. A modeling "stress test" is introduced to ensure the optimal portfolio outperforms the alternatives under all scenarios. In addition, the portfolio financial exposure is calculated to evaluate mitigating factors.

Achieving affordable rates is measured by two quantitative portfolio performance measures: **Expected Cost** and **Market Exposure**. Lowest Expected Cost is measured by the total cost to supply power, while Market Exposure is measured by percentage of energy purchased from the wholesale market, and the portfolio's ability to withstand market price volatility.

[5] Anaheim City Charter, https://codelibrary.amlegal.com/codes/anaheim/latest/anaheim_ca/0-0-0-51756

# IV. KEY POLICY DRIVERS AFFECTING THE UTILITY

California is considered a leader in its many efforts to combat the effects of climate change. The overarching goal of the State's climate change strategy is to drastically reduce statewide GHG emissions over the next two decades. To reach this goal, the State has put forward several key legislative actions over the past several years that have a direct effect on how APU plans for and manages its resource portfolio now and into the future. APU is committed to reducing GHG emissions by implementing not only the letter of state laws and regulations, but also their spirit, which supports Anaheim's goal of a more sustainable environment for future generations. In doing so, APU's long-term strategies focus on striking a balance amongst numerous legislative and regulatory issues and challenges while maintaining affordable rates and reliable service for its customers.

At the time of the development of the 2023 IRP, several climate-related bills were introduced and successfully passed through the State's legislative process and were signed by Governor Newsom in September 2022. These newly adopted bills have the potential for significant operational and cost implications for APU that depend on how the responsible state agencies implement the requirements of the legislation. To the extent the requirements of these bills could be assessed and included in the 2023 IRP's resource modeling and associated analyses, they were included. Two of these key bills, SB 1020 (Laird) and AB 1279 (Muratsuchi) are likely to be most impactful because each call for the acceleration of procurement from carbon-free energy resources and deeper GHG emission reductions.

The following table is a summary of the California laws passed since 2006 requiring electric utilities to reduce GHG emissions and increase the proportion of renewable energy in their power supply portfolios:

| Date | Legislation | Description |
|---|---|---|
| September 16, 2022 | Senate Bill 1020 (Laird, Chapter 361, Statutes of 2022) | **Clean Energy, Jobs, and Affordability Act of 2022**<br><br>Builds upon SB 100 (below) and establishes a state policy goal to achieve net zero carbon emissions as soon as possible, but no later than 2045. Also accelerates the goal of reaching 100% carbon-free energy deliveries to all California retail customers by the year 2045. Sets interim policy targets for carbon-free energy deliveries of 90% by 2035 and 95% by 2040, respectively. |
| September 16, 2022 | Assembly Bill 1279 (Muratsuchi, Chapter 337, Statutes of 2022) | **The California Climate Crisis Act**<br><br>Establishes a statewide goal for achieving carbon neutrality no later than 2045, and thereafter. Sets statewide policy goal that ensures that GHG emissions are reduced at least 85% below 1990 levels by 2045. |
| September 10, 2018 | Senate Bill 100 (De Leon, Chapter 312, Statutes of 2018) | **The 100 Percent Clean Energy Act of 2018**<br><br>Accelerates the state's renewable portfolio standard (RPS) to 60% by 2030 and establishes a state policy to ensure 100% of all electricity delivered to retail customers be derived from zero-carbon sources of electricity by 2045. |

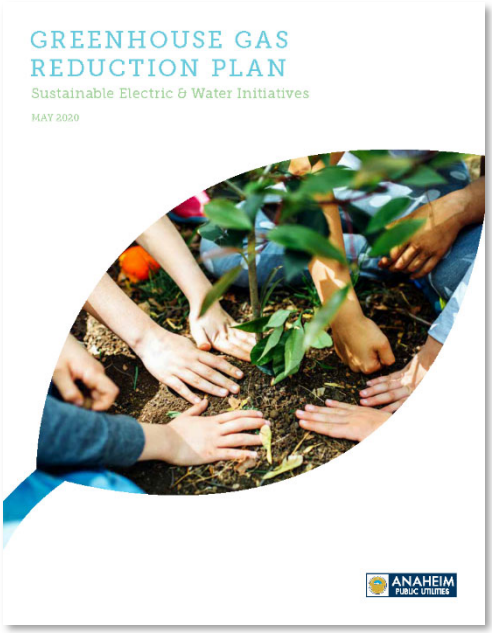
| | | |
|---|---|---|
| September 10, 2018 | State of California. Executive Order B-55-18 | **Achieve Carbon Neutrality**<br><br>An Executive Order signed by Governor Brown in 2018 that directs the California Air Resources Board to work with all relevant state agencies to ensure policies and programs are undertaken to achieve carbon neutrality by the year 2045. |
| July 25, 2017 | Assembly Bill 398 (Garcia, Chapter 135, Statutes of 2017) | **Cap-and-Trade Extension**<br><br>Extends and improves the Cap-and-Trade Program, which will enable the State to meet its 2030 emission reduction goals in the most cost-effective manner. Furthermore, extending the Cap-and-Trade Program will provide billions of dollars in auction proceeds to invest in communities across California. |
| September 8, 2016 | Assembly Bill 197 (Garcia, Chapter 250, Statutes of 2016) | **California Global Warming Solutions Act of 2006 – Direct Emissions**<br><br>Directs the CARB to prioritize direct emission reductions from larg stationary sources and mobile sources when adopting rules an regulations pursuant to the Act. |
| September 8, 2016 | Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) | **California Global Warming Solutions Act of 2006 – 2030 Emissions Limit**<br><br>Establishes a statewide greenhouse gas (GHG) emission reduction target of 40 percent below 1990 levels by 2030. |
| October 7, 2015 | Senate Bill 350 (De León, Chapter 547, Statutes of 2015) | **Clean Energy and Pollution Reduction Act of 2015**<br><br>Establishes targets to increase retail sales of renewable electricity to 50 percent by 2030 and double the energy efficiency savings in electricity and natural gas end uses by 2030. Amended by SB 100 (2018) |
| April 12, 2011 | Senate Bill X1-2 (Simitian, Chapter 1, Statutes of 2011) | **California Renewable Energy Resources Act**<br><br>Governor Edmund G. Brown, Jr. signed Senate Bill X1-2 into law to codify the ambitious 33 percent by 2020 goal. SBX1-2 directs California Public Utilities Commission's Renewable Energy Resources Program to increase the amount of electricity generated from eligible renewable energy resources per year to an amount that equals at least 20% of the total electricity sold to retail customers in California per year by December 31, 2013, 25% by December 31, 2016, and 33% by December 31, 2020. The new RPS goals apply to all electricity retailers in the state including publicly owned utilities (POUs), investor-owned utilities, electricity service providers, and community choice aggregators. This new RPS preempts the California |

| | | |
|---|---|---|
| | | Air Resources Board's 33 percent Renewable Electricity Standard. Amended by SB 350 (2015). |
| September 27, 2006 | Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006) | **California Global Warming Solutions Act of 2006**<br><br>This bill requires Air Resources Board (ARB) to adopt a statewide greenhouse gas emissions limit equivalent to the statewide greenhouse gas emissions levels in 1990 to be achieved by 2020. ARB shall adopt regulations to require the reporting and verification of statewide greenhouse gas emissions and to monitor and enforce compliance with this program. AB 32 directs Climate Action Team established by the Governor to coordinate the efforts set forth under Executive Order S-3-05 to continue its role in coordinating overall climate policy. See more information on AB 32 at ARB. |

Source: leginfo.legislature.ca.gov and gov.ca.gov

## A. REDUCING GREENHOUSE GAS (GHG) EMISSIONS

To meet the AB 32 and SB 32 goals, APU began reducing its reliance on generation resources that produce GHG emissions by transitioning from fossil fuel-fired generating resources to renewable resources. The most significant contribution that APU can make in reducing GHG is the reduction of energy resources that produce GHG emissions from its power supply. In addition to GHG emission reductions from APU's power supply, further GHG reductions will come from complementary efforts including continued energy efficiency measures, local solar, energy storage, electrification of homes from natural gas, and electrification of the transportation sector.



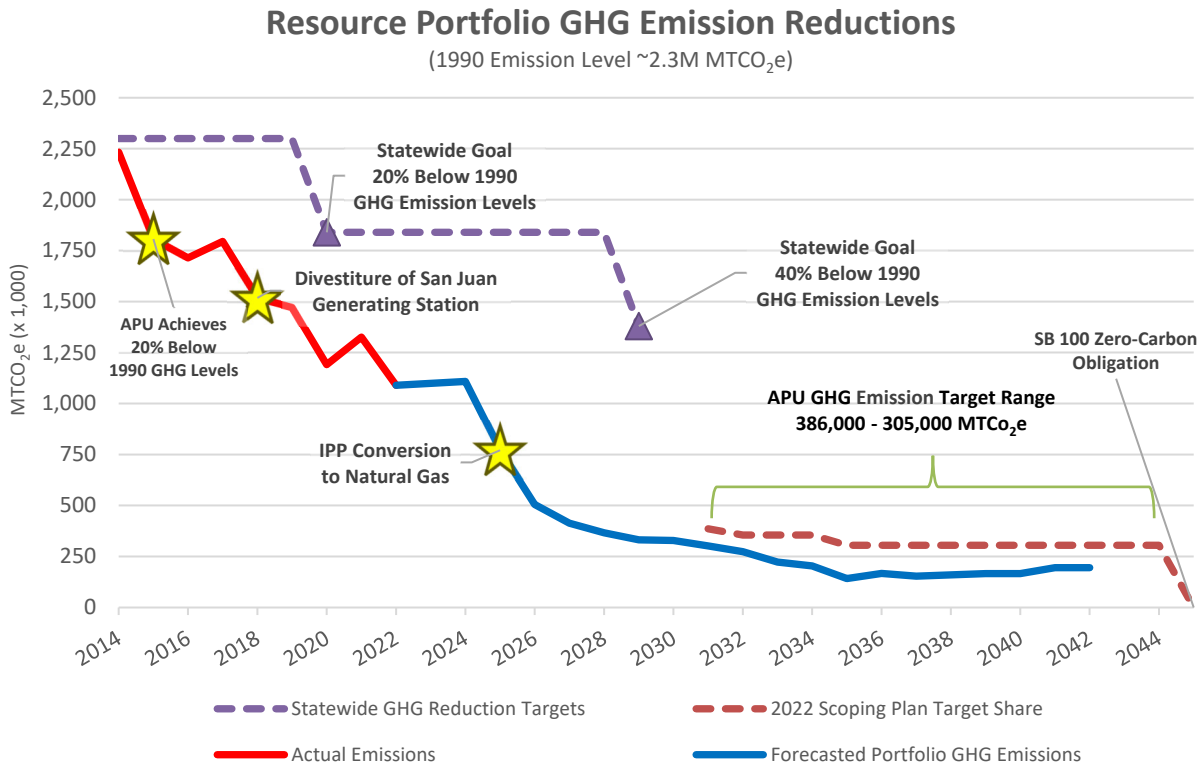

In May 2020, APU published its follow-up utility-specific Greenhouse Gas Reduction Plan[6] with the purpose of continuing its commitment to a clear and comprehensive long-term strategic framework to reduce GHG emissions. The Plan reviews how it doubled its 2020 goal to reduce GHG emissions by 20% below 1990 levels by 2020, as well as identifying goals for a minimum of 40% below 1990 levels by 2030 and zero-carbon by 2045. It is important to note that the 40% reduction below 1990 levels is a statewide goal; however, California utilities will likely be called upon to do more. This includes serving all retail load with zero-carbon resources by 2045 as prescribed in SB 100 passed in 2018.

APU doubled its goal of 20% below 1990 levels through the increased renewable generation from 11% in 2010 to 32.3% of overall sales in calendar year 2020. Further GHG emissions reductions were realized in 2018 due

[6] https://www.anaheim.net/5507/Greenhouse-Gas-Reduction

to the divesture of the San Juan Generating Station in 2017. Upon the conversion of the Intermountain Power Project to natural gas in 2025, APU's overall GHG emissions from its power supply portfolio are expected to decrease to at least 70% below its 1990 emissions. In order to continue a downward emissions trajectory to meet increased GHG reduction targets beyond 2025, APU will need to procure additional renewable energy to account for forecasted growth of transportation and building electrification demand. Procurement and/or development of bulk energy storage systems is another method that APU is actively pursuing to shift renewable over-generation from mid-day hours to evening demand periods where the CASIO grid managers currently depend on natural gas, and other high emitting resources, to meet peak demand. This has a direct impact on reducing system wide emissions but may not necessarily reduce APU's natural gas baseload or Canyon Power Plant Project[7] resources. Significant emission reductions are observed in each of the portfolio scenarios analyzed and discussed in Section VII. Resource Portfolio Evaluation.

**Graph 1: APU GHG Reduction Targets**




## B. INCREASING PROCUREMENT FROM RENEWABLE RESOURCES

APU has steadily been increasing the renewable energy component of its resource portfolio since 2003. In response to SB 1078, the Anaheim City Council adopted a renewable portfolio objective in July 2003 requiring APU to provide 15% of retail energy requirements with energy from renewable resources by 2017. That objective was revised by Council Resolution No. 2006-187 in August 2006 to achieve a target of 20% by 2015 as a result of Assembly Bill 1362, which accelerated the statewide target to 20% by 2010. The passage of SB X1-2 in 2011 increased the State's renewables target to 33% by 2020 and was further expanded to 50% by 2030

[7] https://www.anaheim.net/DocumentCenter/View/21469/Canyon-Power-Project

in late 2015 through the passage of SB 350. Shortly afterward, the passage of SB 100 in 2018 expanded the RPS target to 60% by 2030 and established a state policy to ensure 100% of retail energy sales to customers are derived from carbon-free energy resources by the year 2045.

In late 2022, two additional legislative bills passed through California's legislature that intensify and escalate the state's environmental policy goals. The requirements of these bills will be established by California energy agencies through new regulations, or amendments to existing regulations. SB 1020 builds upon SB 100 and establishes a statewide policy goal to achieve net zero carbon emissions as soon as possible, but no later than 2045. The bill also accelerates the goal of reaching 100% carbon-free energy deliveries to all California retail customers by the year 2045 and sets interim policy targets for carbon-free retail energy deliveries of 90% by 2035 and 95% by 2040, respectively. AB 1279 establishes a statewide goal for achieving carbon neutrality no later than 2045, and each year thereafter. Additionally, it establishes a statewide policy goal that ensures that GHG emissions are reduced to at least 85% below 1990 levels by 2045.

The Renewable Portfolio Standard (RPS) is a key element of California's strategy to reduce statewide GHG emissions. By the end of 2023, APU will be delivering nearly 40% of its retail electricity sales to customers from renewable resources. APU is a fully resourced utility, meaning APU's resource portfolio has sufficient generation capacity to serve customer energy demand and meet Resource Adequacy capacity requirements. The State's increasing renewable energy procurement requirements and carbon-free energy policies create a challenge in balancing the costs associated with the current resource portfolio with the added costs of further increasing the renewable energy/carbon-free components of the overall resource mix. Section VII further discusses the effect of an accelerated RPS, along with APU's strategies to minimize costs, risk and maintain affordable rates for the customers.

## C. TRANSFORMATION OF THE REGIONAL GRID

APU is a market participant within the CAISO, which manages approximately 80 percent of California's electric grid and operates a competitive wholesale market. The CAISO is also responsible for Grid reliability and efficiency. While California's RPS is one of the more effective ways of lowering emissions of GHGs, integrating a significant amount of variable renewable energy resources, such as wind and solar, into the physical electric power grid presents various challenges for Grid reliability and the stability of energy markets. As the State's share of variable renewable energy generation increases, the need for resources to respond to intermittent generation becomes critical for grid operators especially when this is occurring on a minute-by-minute basis, with changes in hourly, daily, and seasonal patterns of variable generation.

As a consequence of the State's RPS, including solar generation installed by residents and businesses, the CAISO is dealing with an over-supply of daytime electricity produced by solar generation. When there is less demand for electricity than there is supply, the result is a drop in wholesale electricity prices, which in turn forces generation to shut down (or curtail) until the demand for electricity increases later in the day. During times of extreme energy oversupply, the CAISO may need to send market signals through negative energy pricing, resulting in generators paying other entities to take the energy. This will lead to additional costs if market participants own generation that cannot be ramped down due to technology constraints such as non-dispatchable renewables or a minimum capacity requirement.

# V. RENEWABLE ENERGY PROCUREMENT PLAN AND ENFORCEMENT PROGRAM

## A. ELEMENTS OF THE RPS PROGRAM

### A.1. PROCUREMENT TARGETS

Public Utilities Code Section 399.30(n), as amended from time to time, directs the CEC to establish POU enforcement rules and procedures for the RPS. Unless otherwise provided herein, all section references will refer to the California Code of Regulations, Title 20, Division 2, Chapter 13, Sections 3200-3208 (Regulation). Section 3204 of the Regulation requires APU to procure specific quantities of electricity products from eligible renewable energy resources for each Compliance Period (CP), including Renewable Energy Credits (RECs). The CEC, through formal rulemaking processes, adopted multi-year Compliance Periods and procurement targets for each calendar year (CY) through the year 2030. Compliance Periods beginning on and after January 1, 2031, shall be three years in length starting on January 1 and ending on December 31, and must meet an average of 60% over each three-year compliance period. The current Compliance Periods and procurement targets are outlined below:

| Compliance Period | Procurement Targets |
|---|---|
| CP 3<br>(CY 2017-CY 2020) | Total renewable procurement of CP 3 must be equal to or greater than the sum of: [(27% of 2017 retail sales)+(29% of 2018 retail sales)+(31% of 2019 retail sales)+(33% of 2020 retail sales)]. |
| CP 4<br>(CY 2021-CY 2024) | Total renewable procurement of CP 4 must be equal to or greater than the sum of: [(35.75% of 2021 retail sales)+(38.50% of 2022 retail sales)+(41.25% of 2023 retail sales)+(44% of 2024 retail sales)]. |
| CP 5<br>(CY 2025-CY 2027) | Total renewable procurement of CP 5 must be equal to or greater than the sum of: [(46.00% of 2025 retail sales)+(50.0% of 2026 retail sales)+(52% of 2027 retail sales)]. |
| CP 6<br>(CY 2028-CY 2030) | Total renewable procurement of CP 6 must be equal to or greater than the sum of: [(54.67% of 2028 retail sales)+(57.33% of 2029 retail sales)+(60% of 2030 retail sales)]. |
| Post-2030 | Compliance periods beginning on and after January 1, 2031, shall be three (3) years in length. Total renewable procurement in each three-year compliance period must meet an average of 60% over each compliance period. |

The passage of SB 350 established a long-term procurement requirement (LTR) beginning January 1, 2021. This provision requires that at least 65 percent of the procurement APU counts toward the RPS requirement of each Compliance Period must be from its contracts of 10 years or more in duration, or in its ownership or ownership agreements for eligible renewable energy resources.

## A.2. PORTFOLIO CONTENT CATEGORY REQUIREMENTS

Per Section 3203, any renewable contracts executed after June 1, 2010, will be categorized into one of three Portfolio Content Categories (PCCs). The table below describes the types of resources that are subject to the PCC limitations, and the minimums and maximums allowed for each Compliance Period. Any renewable contracts executed prior to June 1, 2010, are not subject to the following PCC limitations:

| Portfolio Content Categories (PCCs) | Percentage Requirements (Post-June 1, 2010 Procurement) |
|---|---|
| **PCC 1**:<br>Energy or RECs from eligible resources interconnected to a transmission network within the Western Electricity Coordinating Council (WECC) that:<br>1. Has its first point of interconnection within the metered boundaries of a California (CA) balancing authority area; or<br>2. Has its first point of interconnection to an electricity distribution system used to serve end users within the metered boundaries of a CA balancing authority area; or<br>3. Is scheduled into a CA balancing authority without substituting electricity from another source. If another source provides real-time ancillary services to maintain an hourly import schedule into CA, only the fraction of the schedule actually generated by the renewable resource will count; or<br>4. Has an agreement to dynamically transfer electricity to a CA balancing authority area. | Compliance Period 3 (CP 3), and thereafter: Minimum of 75% |
| **PCC 2**:<br>Energy or RECs from eligible resources interconnected to a transmission network within the WECC that must be matched with incremental energy that is scheduled into a CA balancing authority area. | CP 3, and thereafter: Maximum of 25% |
| **PCC 3**:<br>Energy or RECs from eligible resources that do not meet the requirements of PCC 1 or PCC 2, including unbundled RECs. | CP 3, and thereafter: Maximum of 10% |

# B. PLANNING AND PROCUREMENT

## B.1. PLANNING ACTIVITIES

APU's Integrated Resources (IR) division is responsible for managing APU's energy resource portfolio (both conventional and renewable). To effectively manage the overall resource portfolio, IR develops a Power Supply Forecast on an annual basis. When developing this forecast, IR considers several factors including, but not limited to, an assessment of the resource supply portfolio and a projection of customer energy and peak demand requirements. This annual review results in a twenty (20) year projection that includes all contracted projects, potential projects, and other viable technologies to fill resource needs that are required to meet California Independent System Operator (CAISO) reliability requirements, as well as legislative mandates. IR determines its expected renewable procurement needs by comparing its forecasted RPS procurement quantity targets to its forecasted energy deliveries from its renewable energy resource portfolio, all of which are key components of the Power Supply Forecast.

IR takes the RPS program's regulatory framework into account when planning for renewable procurement and meets to discuss its RPS requirements and progress on a regular basis. This process includes a thorough analysis of project performance, as well as short-term and long-term RPS needs. Other factors taken into consideration while conducting this analysis include, but are not limited to: renewable integration costs, the risk of delay or failure associated with renewable resources contracted or under consideration, transmission availability, developer experience, financial considerations (including the ability of the developer to secure funding), technology (i.e., new technology versus proven technology), and any other factors that can potentially delay or indefinitely postpone a project. APU also offers a voluntary Green Power Program (GPP) that allows residents and businesses to support more renewable energy above APU's state-mandated target to meet clean energy goals. Under this program APU purchases additional clean green power on behalf of GPP customers up to 60% or 100% of electric usage. This program is considered during overall procurement to ensure APU procures enough incremental renewable purchases for a successful program while ensuring APU's compliance with the RPS Program.

IR's objective is to competitively procure renewable projects that are viable and cost-effective, enhance APU's resource portfolio, and optimize each PCC to minimize overall costs. In doing so, APU determines whether resources are procured jointly, are financed, are owned or purchased, and these determinations are made in the best interests of APU customers. However, long-term investments to manage expenses result in financial obligations that may conflict with aggressive State policies.

State law requires APU to develop an Integrated Resources Plan (IRP) no less than once every five years. This comprehensive plan outlines APU's activities to meet a 60% RPS by 2030 and greenhouse gas (GHG) emission reduction targets. It also addresses impacts on customer rates, energy efficiency, system reliability and the integration of various distributed energy resources within the APU service area. The IRP describes APU's strategy for effectively managing its overall energy resource portfolio into the future.

## B.2 PROCUREMENT (ORIGINATION)

APU intends to demonstrate its progress in reaching its RPS targets in compliance with the State's established RPS goals; however, it is important to note that APU is fully resourced and additional resources will exceed the retail sales needs. Per PUC §399.15(a) "… in order to fulfill *unmet* long-term resource needs, the commission shall establish a renewable portfolio standard…" (emphasis added). APU has sufficient long-term resources to

meet anticipated customer demand. Future resource procurement plans will be based upon load forecasts, any new power supplies required, if any, to cover unmet needs, and divestiture of existing coal resources. Additionally, as a member of the CAISO, APU is required to procure resources to meet 115 percent (115%) of its forecasted peak demand for each month to ensure that more than sufficient resources are available to meet customer loads per the FERC-approved CAISO tariff.

In the third Compliance Period, IR executed eight (8) renewable energy contracts, which included a long-term contract for 36 MW of solar energy sourced within California and one SB 859 compliant biomass contract. To date, APU has executed four (4) short-term contracts in Compliance Period four (CP 4) and is actively negotiating a term extension to an existing long-term contract. APU's procurement strategy incorporates both near and long-term renewable power purchase agreements to meet the complex requirements of the RPS Regulation.

APU routinely reviews its procurement strategy each month, not only for meeting its RPS goals, but to also ensure the reliability of its distribution system. In addition, APU evaluates the viability of energy storage, demand response, and distributed generation resources to maintain grid reliability and meet the State's overall energy policy goals.

## C. STATUS OF APU'S RPS PORTFOLIO

### C.1. PROGRESS TOWARD MEETING TARGETS

APU has successfully met all the RPS requirements for Compliance Periods 1 and 2. At the time of the writing of the 2023 IRP, APU is awaiting the final verification from the CEC of its Compliance Period 3 compliance filing. Planning activities undertaken in 2021-2022 while developing the IRP incorporated a variety of renewable resources as a way to ensure continued diversification of the portfolio while progressing toward an aggressive goal of 60% renewables by 2030.

### C.2. RENEWABLE RESOURCE PROCUREMENT PLAN

Appendix A – Renewable Procurement Plan provides a detailed summary of APU's Renewable Resource Energy Procurement Plan. The table includes all grandfathered and contracted resources, as well as any contracts being actively negotiated. This chart also provides expected RPS compliance percentages and expenditures. The data is based on actual data for past years and forecasted data for all future years. Appendix A may be revised, with the approval of the General Manager, without further approval by the Anaheim City Council to reflect updated Renewable Resource Procurement Plan information or data.

### C.3. BANKING OF EXCESS PROCUREMENT

Due to the inconsistent nature of renewables development and energy production, there may be years when the APU exceeds its projected RPS targets. To preserve the investment our customers have made, and will continue to make, in the development of these resources, the legislature and State agencies recognized that the ability to use any excess procurement for future compliance is essential. Pursuant to Section 3206, the City Council may permit APU to accumulate excess procurement of eligible renewable resources in one Compliance

Period to be applied to any subsequent Compliance Period. APU intends to continue banking any excess procurement, as appropriate, and will use any surplus to help satisfy its future RPS compliance targets in the most cost-effective manner.

### C.4. REPORTING REQUIREMENTS

APU is required to provide the CEC with documentation and reports, pursuant to Section 3207. Compliance reports are due by July 1 after every Compliance Period; however, similar reports are required annually for the CEC to track each publicly owned utility's progress toward meeting RPS targets. APU has demonstrated full compliance for the years 2011-2017 in its compliance filings to the CEC. The third Compliance Period filing covering the years 2017-2020 was filed ahead of the July 1, 2017 deadline, and is awaiting final verification from the CEC.

## D. POTENTIAL COMPLIANCE DELAYS

### D.1 COMPLIANCE PERIOD EVENTS

As discussed in Section B.1. above, in planning its renewable procurement position and needs, APU accounts for and attempts to anticipate potential issues that could delay RPS compliance in future Compliance Periods. As global supply chains and economies adjust to post-COVID conditions, circumstances may be encountered that have the potential to encumber APU's ability to comply with RPS requirements. Achieving renewable energy goals is dependent on a multitude of factors successfully occurring at relatively the same time. Some of these necessary factors include, but are not limited to, the availability of critical components, dependence on developers to achieve commercial operation, and influences from continually changing regulatory requirements. For example, it is recognized that worldwide supply chain issues have resulted in a significant shortage of microchips, transformers, and other components vital to any electrical system which can result in significant delays to the development and deployment of renewable facilities and the transmission necessary for energy delivery to the bulk electric system. Completing construction milestones, achieving commercial operation, and completing CEC RPS Certification in a timely manner are all contractual requirements for renewable developers, and the supply chain issues are additional factors affecting the performance of renewable developers in meeting contractual obligations.

APU has experienced delays associated with two renewable resource contracts that were previously mentioned in APU's 2018 IRP. One contract delay was caused by the developer's inability to secure contract compliant fuel, which subsequently forced the developer into Chapter 7 Bankruptcy. The second contract delay was similarly the result of the developer's inability to secure organic waste feedstock needed to produce RPS eligible renewable biomethane. The continued delay resulted in the failure of this project, but APU considered this potential in its renewable planning processes. These delays and/or project failure are not expected to affect APU's compliance moving forward.

Finally, APU actively monitors and participates in potential legislative and regulatory changes that influence renewable procurement. These changes impact APU's planning process by potentially increasing the quantity of renewables that are required to be procured (i.e., SB 350 and, subsequently, SB 100) and/or result in market changes that make renewable energy supply scarcer and thus procurement incrementally more challenging.

Going forward into the next Compliance Periods, APU will continue to consider all factors in the planning process that may have an effect on its renewables portfolio and potentially delay timely compliance with the RPS.

# E. COST LIMITATION

## E.1. BACKGROUND

California Energy Commission (CEC) RPS Regulations permits the local governing board of each POU to implement, at its sole discretion, rules for a cost limitation on the procurement expenditures used to comply with its RPS requirements. Through the approval and adoption of the 2023 IRP, the Anaheim City Council is implementing a cost limitation. Pursuant to Section 3206(a)(3) of the Regulation, the City Council, in the manner set forth in this and previous versions of the IRP, has adopted rules for a cost limitation for the protection of its customers and continues to review its methodology in coordination with updates to the IRP.

The 2018 IRP included rules for a cost limitation based on a goal of 50% renewables by 2030. APU is revising the cost limitation methodology to account for costs related to the increased State goal of a 60% RPS by the year 2030.

## E.2. RULES ON COST LIMITATIONS

The following cost limitation rules are intended to protect APU customers from experiencing significant and disproportionate rate impacts resulting from procurement expenditures used to comply with RPS procurement requirements.

1. APU may not make any major financial commitment to procure eligible renewable energy resources prior to evaluating any potential rate impact it may have on customers. Such an evaluation should account for local and regional economic conditions indicative of an average residential customer's ability to afford produced or procured energy products. The evaluation should also account for any resulting rate disparities where comparable, neighboring utilities gain a rate advantage (lower average system rate) over APU.
2. The costs of all procurement credited toward achieving the state mandated RPS requirement shall be considered as part of the rate impact on customers.
3. Procurement expenditures will not include any indirect expenses such as, but not limited to, imbalance energy charges, sale of excess energy, decreased generation from existing resources and costs to upgrade transmission facilities.

## E.3. IMPLEMENTATION OF RULES

The Anaheim City Council has the authority to implement a cost limitation which may result in the temporary suspension of RPS compliance activities. Through the approval and adoption of the 2023 IRP, the Anaheim City Council is implementing rules for cost limitation that relies on the following:

- The most recent RPS Procurement Plan (which is contained herein); and

- Procurement expenditures that approximate the expected cost of building, owning or operating eligible renewable resources, which does not include indirect expenses as described in Section 3206(a)(3)(A-D); and
- The potential that some planned resource additions may be delayed or cancelled.

APU continuously monitors its expenditure levels and will advise the Public Utilities Board and City Council of its RPS activities, including its procurement expenditures. If the cost limitation, as determined by City Council, is insufficient to support the projected costs of meeting the renewables portfolio standard procurement requirements, APU may refrain from entering into new contracts or constructing facilities beyond the quantity that can be procured within the limitation, unless eligible renewable energy resources can be procured in a manner consistent with the 2023 IRP.

## F. ENFORCEMENT PROGRAM

### WAIVER FOR NONCOMPLIANCE

APU monitors its progress in reaching its RPS targets on a monthly basis, as well as through the APU's annual budgeting process, subject to the approval of budgeted expenditures by the City Council as recommended by the Public Utilities Board. The City Council is responsible for enforcing the RPS Policy through the Enforcement Program and will consider any recommendation by the Public Utilities Board.

Current law authorizes the City Council to waive APU's compliance requirements, consistent with PUC §399.15(b)(5) and Section 3206(a)(2) of the Regulation, if APU can demonstrate any of the following conditions are beyond the control of the utility and will prevent timely compliance. The conditions for waiver or delaying compliance include, but are not limited to the following (which may delay or indefinitely postpone a project):

1. Inadequate transmission capacity: [Section 3206(a)(2)(A)(1)]. There is inadequate transmission capacity to allow for sufficient electricity to be delivered from proposed eligible renewable energy resource projects using the current operational protocols of the California Independent System Operator (CAISO). City Council interprets this to mean the inability to bring eligible renewable resources into the CAISO due to transmission limitations. This includes instances where transmission outages may prevent renewable energy from entering the CAISO market. This may cause APU to be out of compliance for a Compliance Period. The City Council has the authority to waive APU's compliance for this instance.

2. Permitting, interconnection, or other circumstances that delay procured renewable energy resource projects or insufficient supply of eligible renewable energy resources: [Section 3206(a)(2)(A)(2)]. Examples include, but are not limited to, the following:
    - Development (i.e., permitting, financing, etc.): City Council interprets this to include a renewable resource developer's inability to obtain financing, permits, interconnection, or the rights to build the project. This may cause APU to be short of compliance for a Compliance Period. The City Council has the authority to waive APU's compliance for this instance.

- Operation (i.e., fires, accidents, outages, etc.): City Council interprets this to include any unforeseen circumstances preventing the renewable resource from being developed or delaying its output. This includes outages at the renewable energy facility. For example, if there is a wildfire, transmission outage, or facility outage that prevents resources from delivering energy into the CAISO may cause APU to be short of compliance for a Compliance Period. The City Council has the authority to waive APU's compliance for this instance.

- Regulatory Delays: City Council interprets this to include instances where State agencies delay timely requests by APU for registering renewable resources, certifying renewable resources, and accepting renewable resources into its renewable portfolio. In addition, these also include changes to State mandates, which may lead to a delay in compliance. The City Council has the authority to waive APU's compliance for this instance.

3. Unanticipated curtailment to address needs of a balancing authority: [Section 3206(a)(2)(A)(3)]. City Council interprets this section to include the CAISO directing a renewable resource to modify their energy obligations, due to the needs of the balancing authority. This may cause APU to be short of compliance for a Compliance Period. The City Council has the authority to waive APU's compliance for this instance.

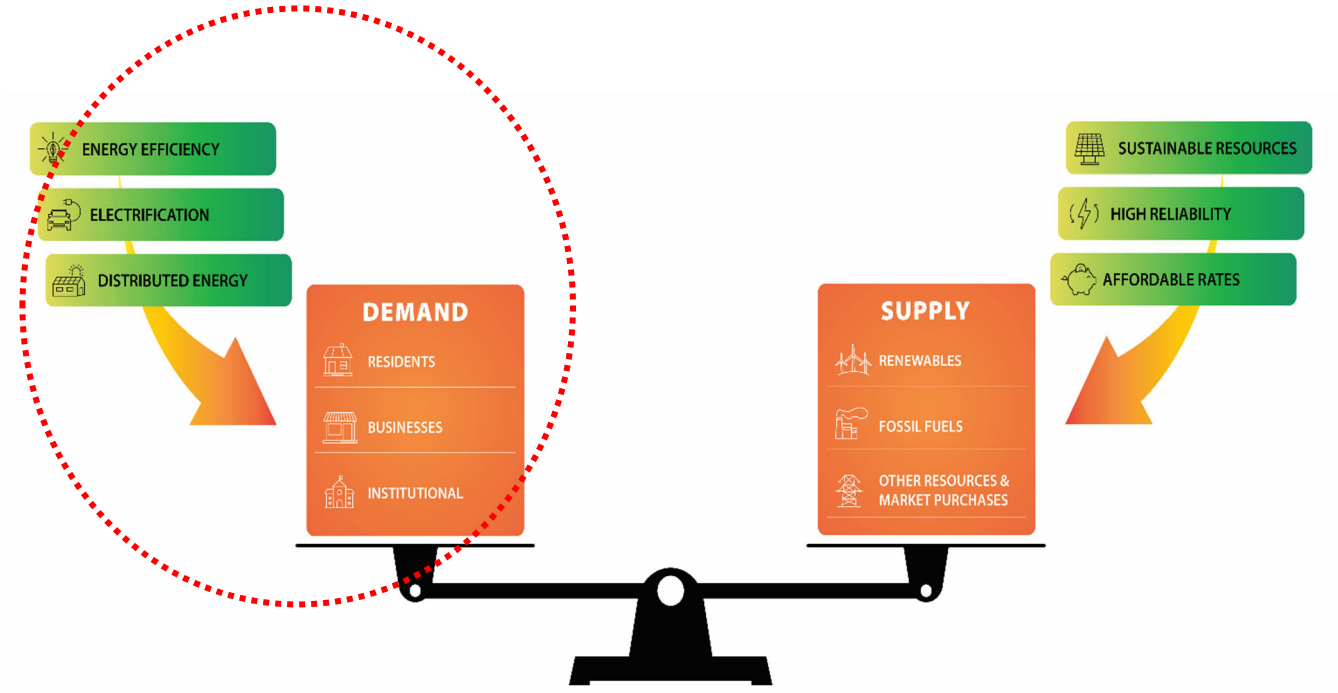
To date, APU has not sought a waiver of compliance. APU will monitor its progress in reaching its RPS targets; however, as listed above, there may be circumstances that prevent APU from procuring renewable resources to meet its RPS targets. In such an instance, APU will request City Council authority to approve a waiver of compliance, consistent with Section 3206(a)(2).

# VI. ENERGY DEMAND AND PEAK FORECASTS

Integrated resource planning is the process in which APU evaluates a multitude of supply-side and demand-side resources to meet customer energy needs in an efficient, cost effective, and reliable manner. Traditionally this integrated resource planning activity was primarily to ensure that all cost-effective demand side resources were deployed prior to commitment to new supply-side resources such as power plants. Supply-side resources usually involved long lead times to develop, and increased the use of fossil fuel causing the depletion of a limited resource and adverse effects on the environment. The passage of SB 350 requires integrated resource planning to consider and address the following elements in addition to traditional demand-side and supply-side resources:

- Actively involve stakeholders. APU proactively solicited additional feedback from residential customers to build upon information obtained through the 2018 IRP Customer Survey process.
- Include energy efficiency and demand side management activities.
- Incorporate more robust analysis of more aspects of utility activities.
- Explicitly account for commodity price volatility and other risks to quantify the risk/reward tradeoff.
- Reflect a set of goals that are broader than just meeting energy demand, such as meeting RPS goals and GHG goals.
- Accommodate the load increases and decreases caused by transportation electrification and distributed energy resources such as rooftop solar.

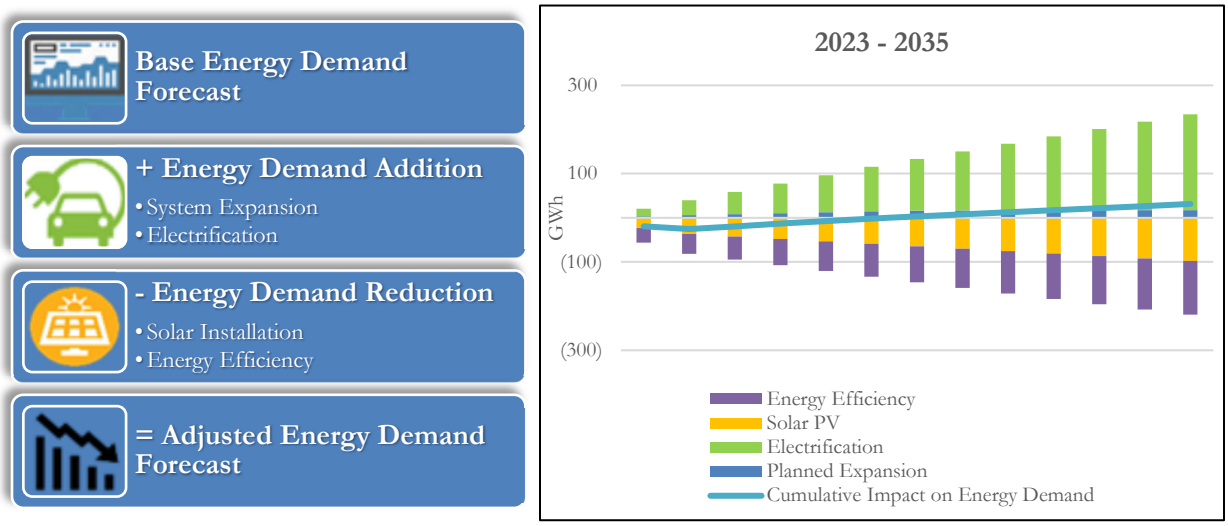
The energy demand forecast, and peak forecast are both developed as a first step to evaluate APU's future energy needs. APU's forecasting methodology and different components of the forecasts are detailed below.




Pursuant to the 2023 IRP, APU performed a long-term statistical forecast of its expected load growth and then adjusted this base load forecast for the factors described above. This adjusted load forecast projects a total load growth of 1.41% between 2024 and 2035, effectively a low growth energy demand forecast, which indicates

that the expected customer expansion and EV growth is being offset by customer solar installation and energy efficiency reductions. Load forecast beyond 2036 assumes a 0.25% annual load increase. The growth factor is consistent with average load growth between 2027 and 2036 and is applied due to the lack of information on all demand variables.

**Graph 2: Cumulative Adjustments to Base Energy Demand Forecast**




In determining APU's energy demand forecast, staff considered historical energy demand and customer growth trends as the basis for statistical modeling and econometric forecasting techniques to develop a "**base energy demand forecast."** Once developed, the base forecast was further adjusted (referred to as the **adjusted energy demand forecast**) by planned system expansion, expected EV energy demand, estimated customer-side solar installations, and the effect of demand side management and energy efficiency. While system expansion and EV growth increase the energy demand, solar installation and energy efficiency programs reduce the energy demand.

The **adjusted energy demand forecast** was then used as the basis for the development of power supply expansion portfolio scenarios, which were analyzed to determine the recommended supply (resource) portfolio.

## A. ENERGY DEMAND FORECAST - METHODOLOGY & ASSUMPTIONS

The energy demand forecast is determined in two steps:

The first step **establishes the base energy demand** forecast. It relies on traditional econometric forecasting techniques to develop relational equations that reflect historic consumption trends. The base forecast for energy demand is developed using a 5-year running average of historical temperature.

The second step **adjusts the base energy demand forecast** by taking into consideration residential and commercial projects within the City of Anaheim (City) that may affect energy demand. Information related to these projects is collected through collaboration with the City's Planning Department, APU Electric System Planning, and Community & Sustainability Programs. Examples of such projects include City-wide development and expansion plans, customer-specific capacity additions and/or energy reduction plans, and the

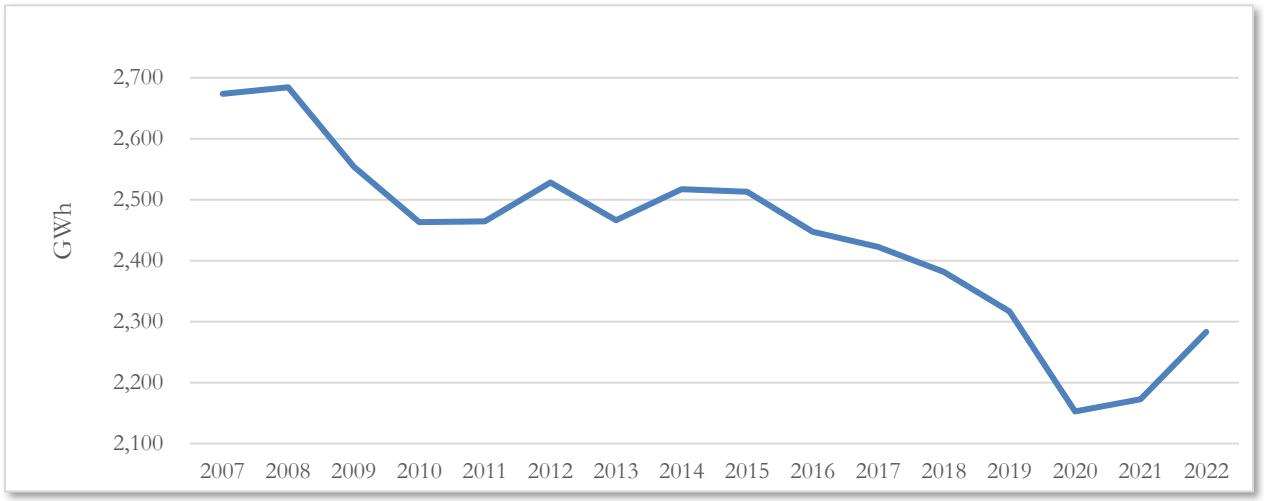
installation of commercial-scale solar installations and other behind-the-meter distributed generation resources. Project timelines are evaluated and incorporated into adjustments that either increase or decrease the "base" forecast.

## A.1. BASE ENERGY DEMAND FORECAST


### HISTORICAL ENERGY DEMAND

Prior to the economic recession in 2008, APU's average energy demand was between 2,500 and 2,700 GWh. From 2008 to 2011, a decline in energy demand growth was observed due to economic conditions impacting demand. The economy began to stabilize in 2011 and continued to improve through 2015. However, the corresponding demand growth was offset by behind-the-meter distributed generation, such as fuel cell and solar installations, as well as by energy efficiency in both the commercial and residential sectors. From 2017 to 2019, energy efficiency and solar penetration continued to reduce system demand. The COVID pandemic lowered system demand in 2020 through 2021. By 2022, a slight bounce back in energy demand occurred after statewide reopening.

**Graph 3: Anaheim Actual Energy Demand 2007 - 2022**




### ECONOMETRIC MODELING

Econometric modeling is the application of mathematical and statistical methods to forecast future values and understand the relationship between variables. APU develops its forecast of total system energy consumption using econometric modeling. Hourly energy demand is estimated using least squares estimation and variables for expected temperature, calendar (weekday versus holiday), season and time effects (which capture specific hours as well as the cumulative impact of prolonged heat waves). Five years of historical hourly data are used to estimate the following econometric equation:

$$Total\ Energy_t = \alpha + \beta_1\ Temperature_t + D_1\ Holiday_t + V_t + M_t + \varepsilon_t$$

Where:

$Temperature_t$ = Temperature at hour t

$Holiday_t$ = Dummy variable to identify weekend and NERC holidays

$V_t$ = Vector of dummy variables for the hours

$M_t$ = Vector of dummy variables for the months

$\varepsilon_t$ = Error term

## VARIABLES INCLUDED: TEMPERATURE FORECAST

APU owns calibrated equipment at the Linda-Vista Reservoir that records hourly temperature in the Supervisory Control and Data Acquisition (SCADA) system. The IRP energy demand forecast assumes normal weather conditions and uses average hourly temperatures from the past five years (summer 2017 – summer 2022). The forecasted monthly temperatures in degrees Fahrenheit are summarized below in Table 1. Compared to data from the 2018 IRP, the total average and maximum temperature did not change; however, the minimum temperature increased by 13%. The monthly average temperature was higher in June – August and October – December, and lower in February, March, and September. The monthly minimum was higher in 10 out of 12 months of the year.

**Table 1: Temperature Summary**

| Month | Average | Minimum | Maximum |
|---|---|---|---|
| January | 60 | 38 | 92 |
| February | 59 | 36 | 93 |
| March | 61 | 42 | 94 |
| April | 65 | 48 | 104 |
| May | 67 | 51 | 96 |
| June | 72 | 56 | 100 |
| July | 76 | 61 | 105 |
| August | 77 | 60 | 105 |
| September | 75 | 55 | 105 |
| October | 71 | 52 | 105 |
| November | 65 | 41 | 99 |
| December | 59 | 40 | 86 |

## VARIABLES EXCLUDED: ECONOMIC AND DEMOGRAPHIC FORECAST

Anaheim is a fully developed Orange County city with historically consistent growth and median income level and employment rate. A series of modeling tests determined that the inclusion of economic and demographic variables leads to increased variability, and results in overly optimistic demand growth. The hourly demand estimation excluding these variables proved to be more accurate.

Although economic and demographic variables are excluded from the base model, planned expansions and energy reductions are included as adjustments after the econometric regression modeling is complete.

## MODEL VALIDATION

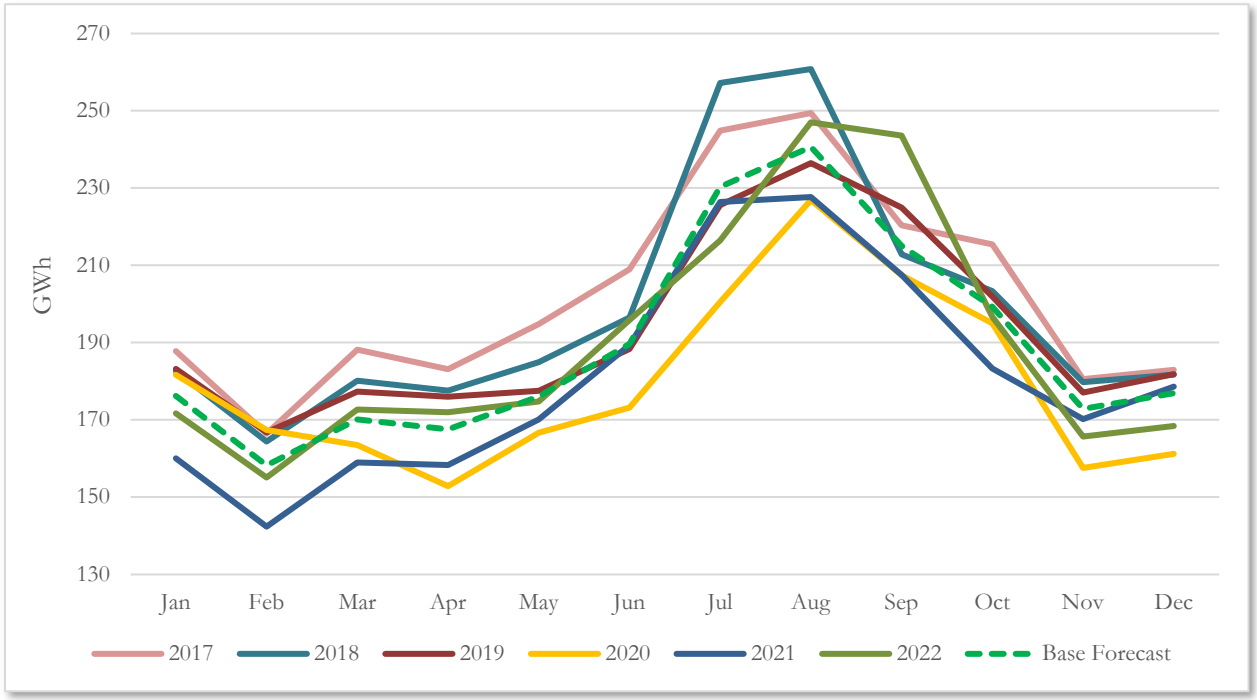
The base econometric model is validated by comparing modeling results to historical energy demand data. Essentially, the model is used to develop energy demand forecasts for 5 historical years (summer 2017 through summer 2022). The forecast results are compared to historical actual values and analyzed for reasonableness. The base model was proven to produce efficient estimation results averaging 0.28% variance from the testing period. Had the model been proven inefficient, alternative variables would have been introduced and a new model established to go through the validation process again.

Note that backcasts for selected historical months showed greater variance due to the pandemic impact. Therefore, two other models were introduced to remove the pandemic impact. However, upon review and comparison, the 5-year historical data regression model still yielded the most reasonable overall forecast. The regression model is accepted as the base forecast model. In addition, the energy demand forecast is subject to stress testing of a wide range of high and low demand forecasts to capture any deviations from the base forecast.

## FORECAST RESULTS

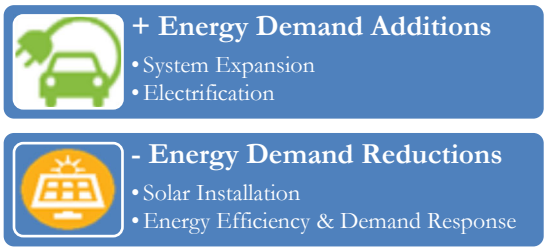
After validating the model, the base forecast for future years is generated and compared to historical energy demand. As seen in Graph 4, the energy demand forecast profile is comparable to historical energy demand. Overall, annual energy demand shape remains fairly constant, while peak demand appears to be lower than that of recent years. This is mostly due to the assumption of normal weather conditions rather than the incorporation of heat shocks in the base model.

**Graph 4: Historical and Base Energy Demand Forecast by Month**



## A.2. ADJUSTMENTS

Planned energy growth and reductions are included as adjustments to the base economic model. Adjustments include planned new development, electric vehicle growth, behind-the-meter distributed generation, and energy efficiency targets.




This section focuses on the energy demand impact. The design, funding and details of these programs can be found in the following sections:

X. Transportation Electrification

XI. Solar and Other Distributed Generation

XII. Energy Efficiency and Demand Response Programs

XIII. Programs for the Low Income and Disadvantaged Communities

### SYSTEM EXPANSION

Most of the buildable open land in Anaheim is fully developed. While new building developments may contribute to energy demand increase, a corresponding decrease also incurs from the demolition of existing buildings and infrastructure. As such, it is not appropriate to apply a growth rate based on historical trends. Rather, new development data is gathered from City permits and from APU's Electric System Planning, and these net impacts to energy demand are applied to the base model.

Anaheim's most recent development projects are expected to cumulatively contribute an additional 34 MW capacity to Anaheim's distribution infrastructure through 2035. When estimating the impact to load, staff took into consideration both the distribution system expansion and the varying levels of capacity factors for each customer sector.

System expansions related to transportation electrification is accounted for separately under the section below.

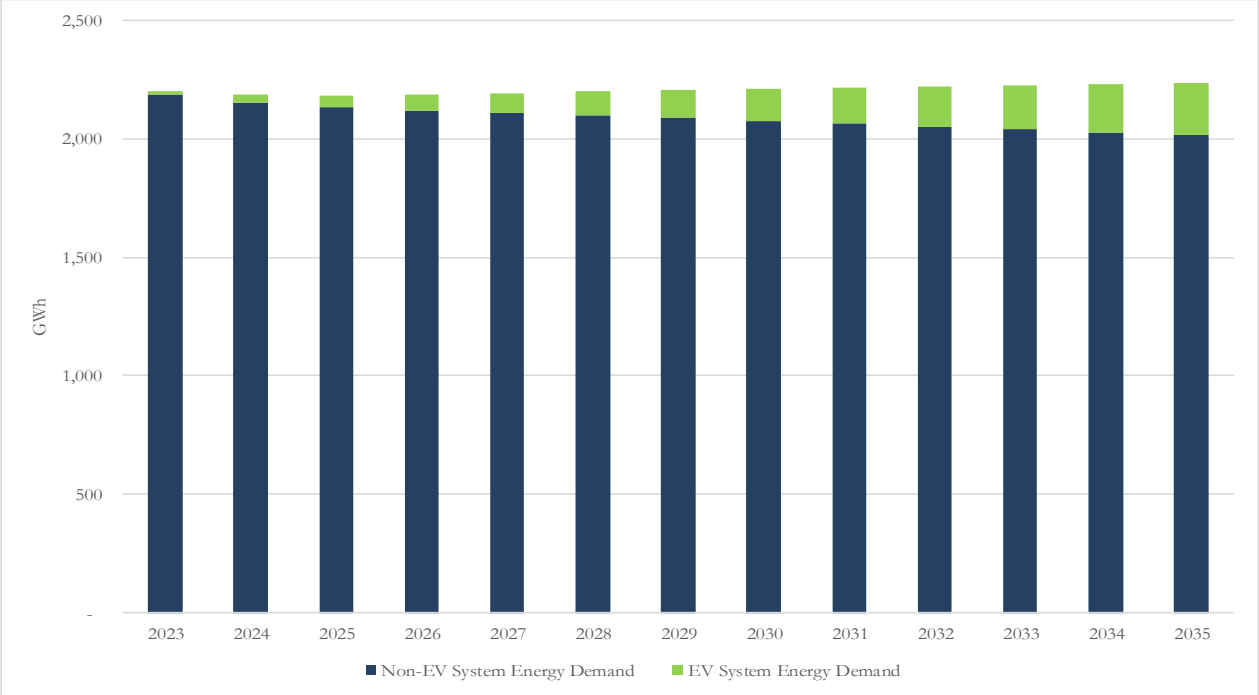
### EV PENETRATION & TRANSPORTATION ELECTRIFICATION

APU's incremental EV load is expected to average 17 GWh annually, from 2023 to 2035. This results in a cumulative EV load of 134 GWh in 2030, which is more than double the 2018 IRP forecast of 63 GWh in 2030. By 2035, the estimated cumulative EV load reaches 217 GWh, or 9.7% of the total system load. The CEC no longer provides the "Transportation Electrification Common Assumptions" workbook[8] made available during the 2018 IRP process. The forecast is derived from the CPUC 2022 Unified RA and IRP Modeling

[8] APU relied on the "Transportation Electrification Common Assumptions 3.0" workbook for the 2018 IRP EV Energy Demand forecast. It included utility-specific forecast on EV growth, energy demand increase per EV, and GHG emission savings per EV.

Datasets[9] with data comparison again the CEC IEPR Demand Forecast[10]. Note that the statewide CPUC's 38 MMT Portfolio is used to approximate EV energy demand in APU territory. This is consistent with the California Air Resources Board (CARB) 2022 Scoping Plan[11] approach for the electricity sector.

**Graph 5: Estimated Electric Vehicle Energy Demand Growth**




## FUEL SUBSTITUTION (BUILDING ELECTRIFICATION)

Additional achievable fuel substitution (AAFS) was introduced as a new load modifier in the CEC's 2021 IEPR. As explained in the 2021 IEPR, "Fuel substitution refers to substitution of one end use fuel type for another, such as changing out gas appliances in buildings for cleaner more efficient electric end uses."[12]

AAFS is also a component of the CPUC's IRP demand forecast. APU's AAFS may be derived from the CPUC's IRP demand forecast, as a percentage of the Southern California Edison region's overall AAFS energy demand. This method captured a minimal cumulative energy demand increase of 2% by 2035. However, Anaheim is a

[9] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/unified-ra-and-irp-modeling-datasets-2022 "study_10_2023_Renewables_Output_Profiles", "study_10_2024_Renewables_Output_Profiles", "study_10_2026_Renewables_Output_Profiles", "study_10_2030_Renewables_Output_Profiles" and "study_10_2035_Renewables_Output_Profiles"

[10] https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report/2021-1 "TN241221_20220119T103905_CED 2021 Baseline Forecast - SCE Mid Demand Case"

[11] Pg. 201 of the 2022 Scoping Plan Update: https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf

[12] Page 3, https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report and https://efiling.energy.ca.gov/GetDocument.aspx?tn=241581

fully developed Orange County city, with half of the utilities service area within low income and disadvantaged communities. APU's AAFS impact may be at a rate that is different from the overall SCE region.

Due to the lack of internal data for AAFS analysis and the minimal impact derived from the CPUC dataset, AAFS is not introduced as a separate demand adjustor into the 2023 IRP demand forecast. However, APU's adjusted base energy demand forecast is compared with the CEC's demand forecast inclusive of the AAFS considerations, to ensure APU's forecast is comparable to the CEC's forecast.

As more information becomes available, APU may include AAFS as a separate demand adjustor.

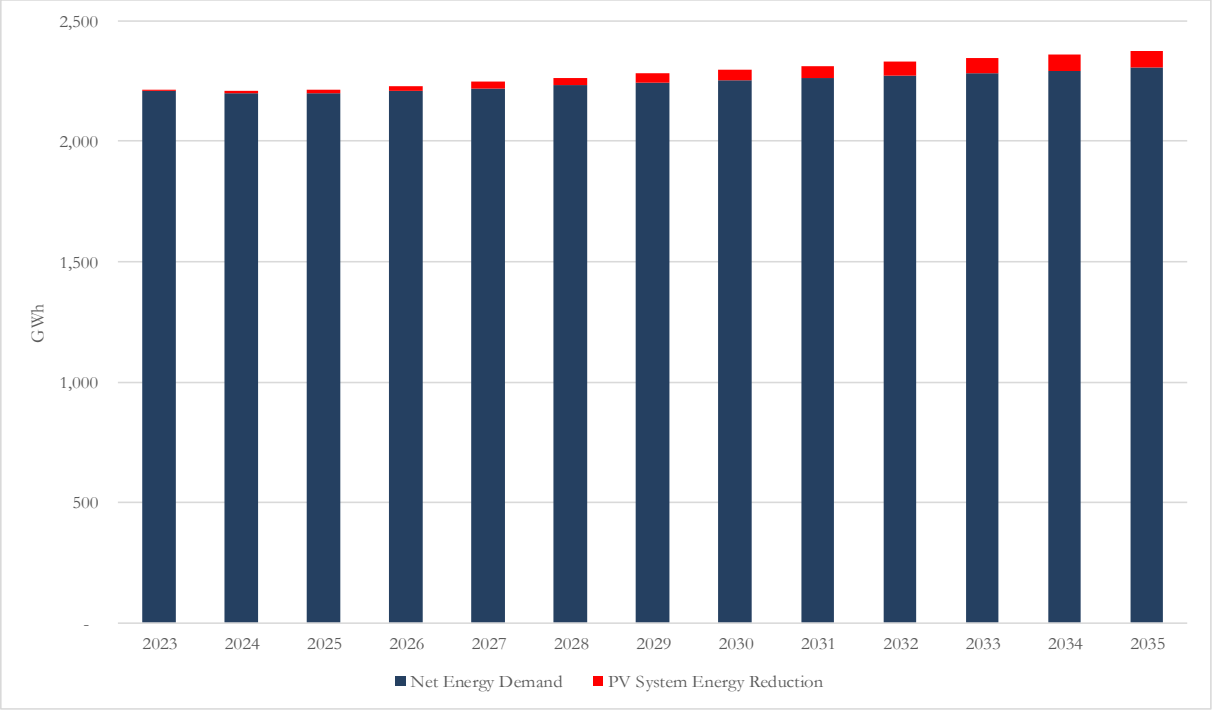
## SOLAR INSTALLATION & OTHER DISTRIBUTED GENERATION

Behind-the-meter distributed generation information is obtained from SB 1 and City permit applications. This includes micro turbine, fuel cell, solar and battery storage installations.

The Inflation Reduction Act of 2022 extended the 30% tax credit for solar installations through 2032. Behind-the-meter solar installation is estimated with recent year annual installation totals, and with specific project plans from commercial customers. APU estimates to have 51.5 MW of new solar installations within the next decade, including solar plus battery storage projects. To estimate solar generation, a proxy capacity factor of 18% is applied to the solar capacity forecast. Detailed solar capacity calculation and peak impact analysis may be found in the "Peak Shift Analysis" section.

In 2022, behind-the-meter solar distributed generation is estimated to account for 3.4% of APU's total energy demand and is expected to grow by 0.25% or greater annually, depending on when larger planned commercial installations take place. Graph 6 shows the estimated annual impact of behind-the-meter solar installation growth.

**Graph 6: Estimated Behind-the-Meter Solar Impact to Energy Demand**



Planned distributed generation projects other than solar are forecasted only in the short term, with system size estimates obtained from Electric System Planning.

## ENERGY EFFICIENCY

In accordance with AB 2021, APU is required to establish specific annual energy saving goals as a percentage of total annual retail electric consumption. SB 350 also mandated that the CEC develop utility-specific energy efficiency saving targets to help achieve doubling statewide energy efficiency savings in electricity and natural gas end uses by 2030.

APU, in conjunction with other members within CMUA, contracted with GDS Associates, Inc. to identify all potentially achievable cost-effective electricity efficiency savings and establish annual targets for energy efficiency savings for 2022-2031. The final report "Energy Efficiency in California's Public Power Sector"[13] was published and submitted to the CEC in 2021.

APU's energy saving goal, along with its impact to Energy Demand, are summarized in Table 2.

**Table 2: APU Energy Efficiency Targets including Codes & Standards (GDS Associates, Inc.)**

| 10 Year Energy Goals (Incremental Gross MWh) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **ALL Sectors (MWh)** | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** |
| **Total Market Potential** | 17,825 | 17,277 | 15,621 | 11,732 | 7,636 | 7,346 | 7,363 | 7,435 | 7,222 | 7,264 |
| **Res Market Potential** | 3,710 | 3,340 | 2,603 | 2,506 | 2,582 | 2,721 | 2,792 | 2,991 | 3,226 | 3,411 |
| **Non-Res Market Potential** | 14,115 | 13,936 | 13,018 | 9,226 | 5,054 | 4,624 | 4,571 | 4,445 | 3,996 | 3,853 |
| **Total Potential as a % of Total Sales** | 0.82% | 0.79% | 0.72% | 0.54% | 0.36% | 0.34% | 0.34% | 0.35% | 0.33% | 0.34% |
| **Res Potential as a % of Res Sales** | 0.62% | 0.56% | 0.44% | 0.43% | 0.44% | 0.47% | 0.48% | 0.51% | 0.55% | 0.58% |
| **Non-Res Potential as a % of Non-Res Sales** | 0.90% | 0.87% | 0.82% | 0.59% | 0.32% | 0.30% | 0.29% | 0.28% | 0.25% | 0.24% |

[13] https://www.anaheim.net/DocumentCenter/View/11240

| 10 Year Energy Goals (Incremental Gross MWh) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ALL Sectors (MWh) | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
| Base Market Potential | 17,825 | 17,277 | 15,621 | 11,732 | 7,636 | 7,346 | 7,363 | 7,435 | 7,222 | 7,264 |
| Codes & Standards Advocacy | 18,026 | 18,589 | 17,879 | 17,374 | 16,350 | 15,347 | 13,929 | 12,092 | 10,349 | 8,901 |

APU's voluntary demand response programs are only called upon under extreme conditions, and therefore is not included in the energy demand adjustments under normal weather conditions. In summer 2022, the residential demand response program generated 6 MWh savings, while the commercial voluntary load reduction program reduced 120 MWh. Currently, only voluntary demand response programs are in place. Estimated adjustments for demand response reductions will be considered for extreme weather conditions when dispatchable demand response programs are in place.

APU is planning to launch several dispatchable demand response programs in the upcoming years. By summer 2023, APU will implement an electric vehicle charging station and demand response program, titled "Drive Green Anaheim". The program aims to increase the proliferation of EVs in underserved locations by installing, operating, and maintaining charging stations and providing no-cost charging to local users. Through the program, commercial properties and multifamily dwellings in low income and disadvantaged communities will have the opportunity to become a public EV charger station host site and receive a turn-key EV charger program inclusive of design, procurement, installation, operation and maintenance. With growing EV demands on the local grid, EV charging stations will be equipped with demand response capabilities to be able to curtail EV charging during peak hours (between 4-9 PM) or during grid emergencies.

In 2024, APU will launch an expanded demand response program that provides customers with energy saving tools, incentives, and a user-friendly notification system that prompts participating customers to curtail usage during times of high demand, or when APU calls for a load curtailment event. As part of the expanded demand response program, new software management technology will be implemented that provides a one-stop-shop of services including customer enrollment tracking, customer participation in curtailing load, device registration, load impact, dispatch notifications, optimization with CAISO alerts, incentive processing, and behavioral analysis. A variety of energy saving tools and incentives will be available to customers, including smart thermostats, heat pumps, HVAC, pool pumps, small business equipment, commercial equipment, industrial equipment, energy management systems, electric vehicle supply equipment, electric school buses, and batteries for storing energy.

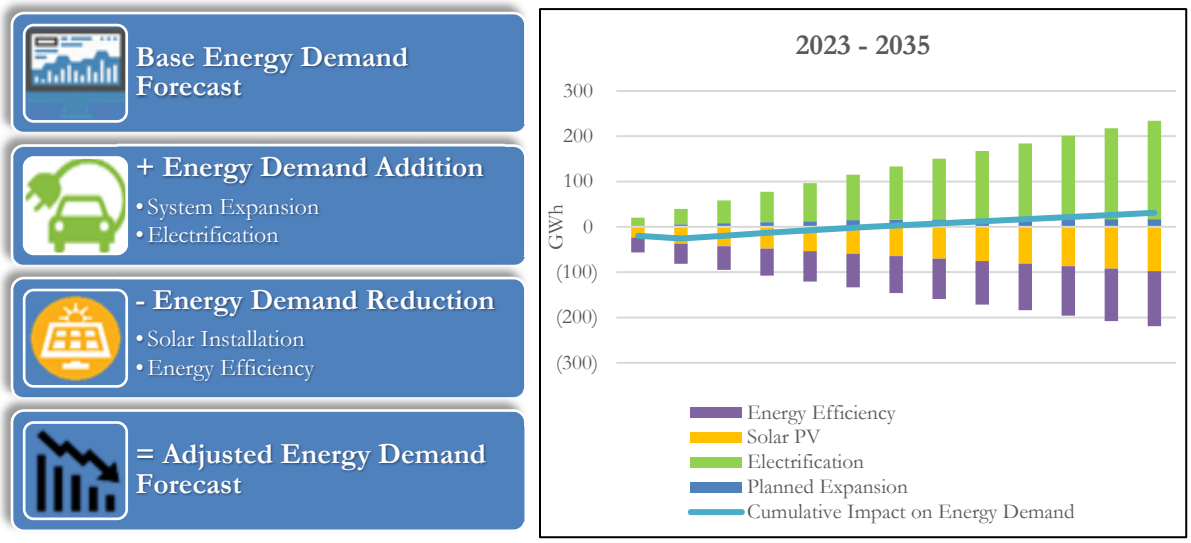
## A.3. ADJUSTED BASE ENERGY DEMAND FORECAST

In total, APU expects a 1.41% net energy demand growth between 2023 and 2035, which is essentially a low growth forecast. Load forecast beyond 2036 assumes a 0.25% annual load increase. The growth factor is consistent with average load growth between 2026 and 2035 and is applied due to the lack of information on

all demand variables. The net energy demand forecast is used in Section VII. Resource Portfolio Evaluation to determine the recommended resource portfolio to meet APU's future energy needs.

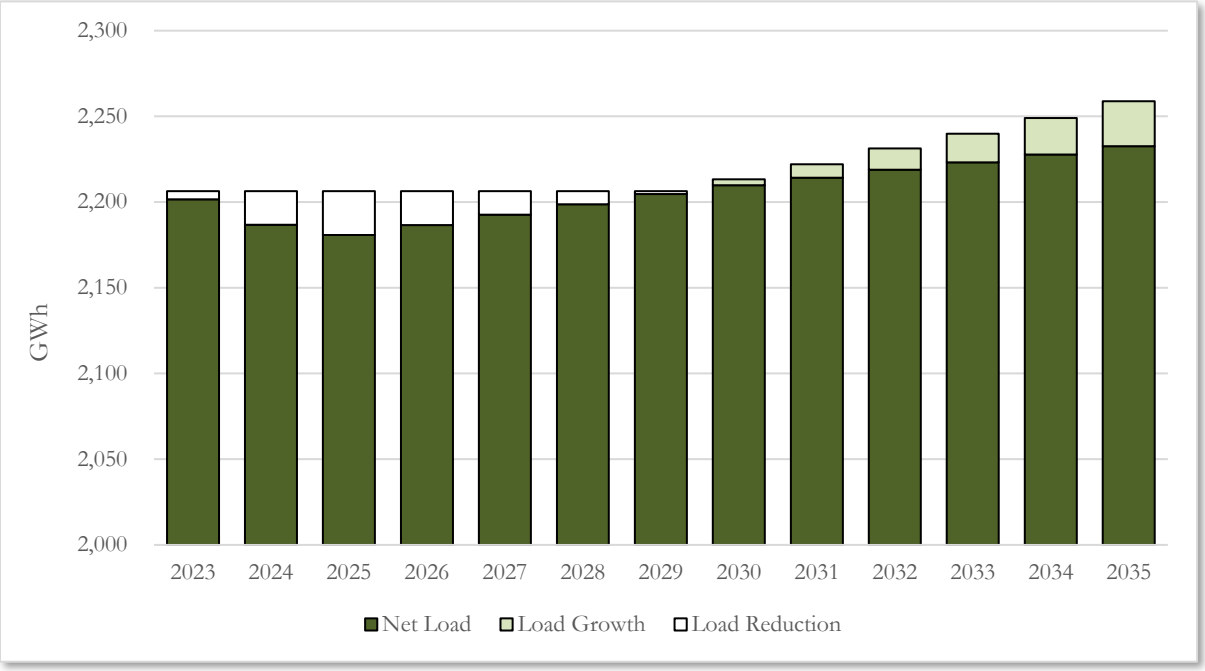
Graph 2 displays the estimated cumulative impacts to the Base Energy Demand Forecast. The energy demand additions are estimated to increase by 234 GWh cumulatively due to planned expansion projects and electric vehicle growth. During the same period, solar PV and energy efficiency are estimated to reduce the energy demand by approximately 208 GWh cumulatively. The overall cumulative net energy demand growth is estimated to be approximately 26 GWh as indicated by the blue line in the graph below.

**Cumulative Adjustments to Base Energy Demand Forecast**




Graph 7 below depicts the Adjusted Energy Demand Forecast. The sum of all three bars is the anticipated Base Energy Demand Forecast, assuming no growth or reduction. Additions such as planned expansion projects and electric vehicles are displayed by the light green bar. The total reductions are displayed by the white bars. The Adjusted Energy Demand is the sum of the dark green and light green bars. The remaining white bar is the estimated net energy demand reduction per year. Load reduction in earlier years is mainly due to planned solar plus storage projects by commercial customers. Load increases in the later years are mainly due to EV penetration.

**Graph 7: Adjusted Base Energy Demand Forecast**



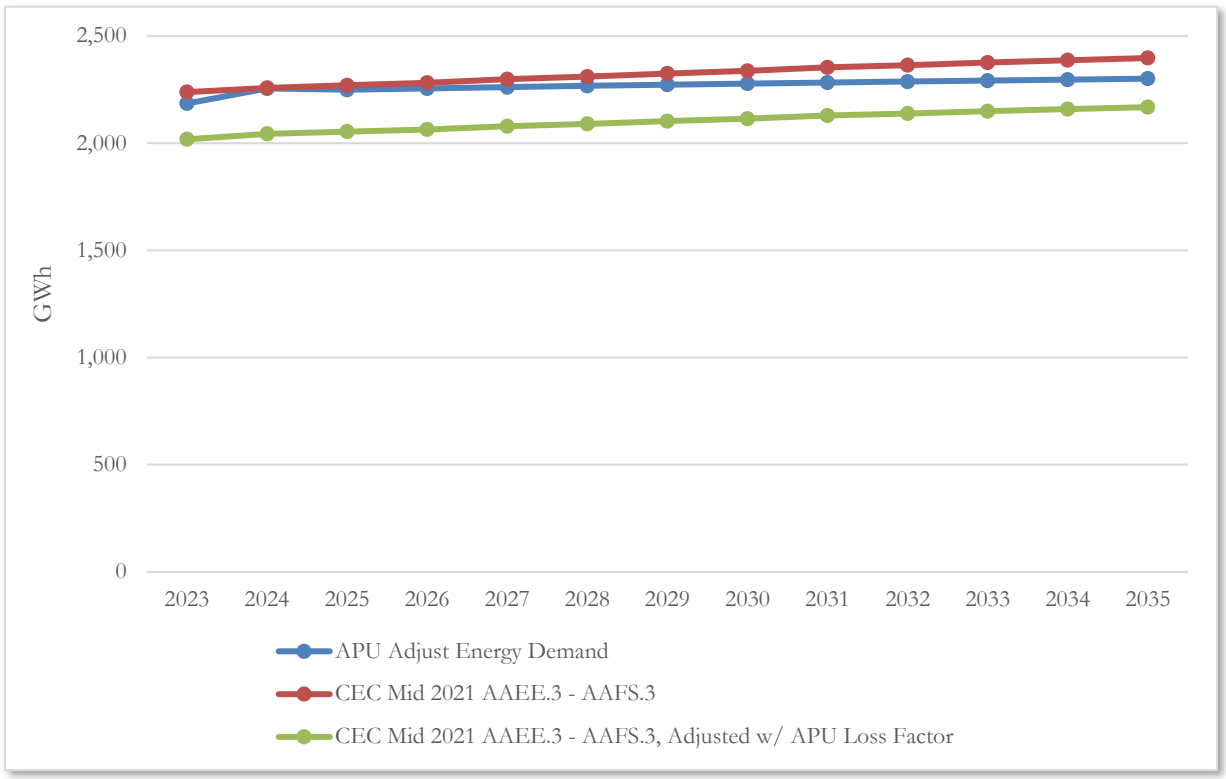

APU's energy demand forecast was completed in 2022. The CEC released its energy demand forecast for the 2021 Integrated Energy Policy Report (IEPR) in February 2022[14]. Staff compared APU's adjusted (or expected) energy demand against the IEPR 2021-2035 demand forecast: Medium Baseline Demand with Medium Additional Achievable Energy Efficiency (AAEE) Scenario 3 and Additional Achievable Fuel Substitution (AAFS) Scenario 3[15]. Scenario 3 represents full compliance with all regulations, including CARB's Advanced Clean Fleets Regulation. APU's forecast is very close to the CEC's forecast in the beginning years, with a 4% variance observed in 2035.

It is noted that the CEC assumes a distribution loss factor of 6.37%. Or, it requires 106.37 MWh of total system energy in order to serve the retail customer consumption of 100 MWh. APU's historical distribution loss factor is typically around 3.5%. When the CEC's forecast is adjusted down with the lower distribution loss factor, it becomes lower than the APU forecast by roughly 6% in 2035. The difference is considered acceptable for long-term planning purposes. In addition, a range of high and low energy demand will be tested under Resource Portfolio Evaluation – Stress Testing.

[14] https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report and https://efiling.energy.ca.gov/GetDocument.aspx?tn=241581

[15] https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report/2021-1 and https://efiling.energy.ca.gov/GetDocument.aspx?tn=241382

**Graph 8: APU vs. IEPR Energy Demand Forecast**



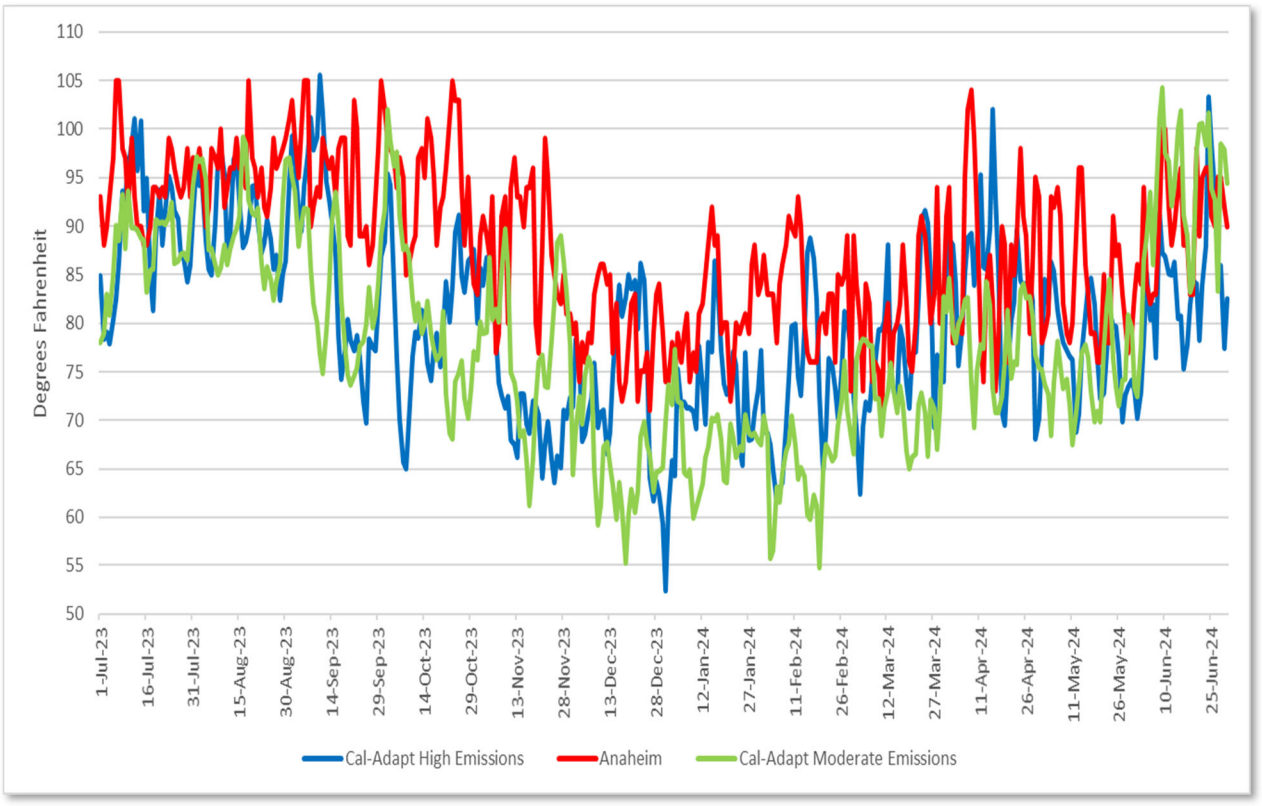

## A.4. OTHER CONSIDERATIONS - EXTREME WEATHER

It is important to analyze the impact of weather extremes on energy demand due to its sensitivity related to temperature changes. Extreme temperature forecasts under high and low emission scenarios are available through Cal-Adapt, a climate change resource database developed by the Geospatial Innovation Facility at the University of California, Berkeley with funding and advisory oversight by the California Energy Commission.

The daily extreme temperature forecast data for the Anaheim area was obtained through Cal-Adapt[16] and then compared to APU's internal temperature forecast, which was developed using five-year minimum and maximum temperatures. APU's forecast consistently produces higher extremes compared to the Cal-Adapt forecast. The deviations between the forecasts are shown in Graph 9, which displays the high and low emissions Cal-Adapt high temperature forecast compared to APU high temperature forecast from July 2023 to June 2024. As the APU forecast produces higher extremes, it was selected to be the preferred temperature forecast to conduct the extreme weather analysis on energy demand.

[16] https://cal-adapt.org/

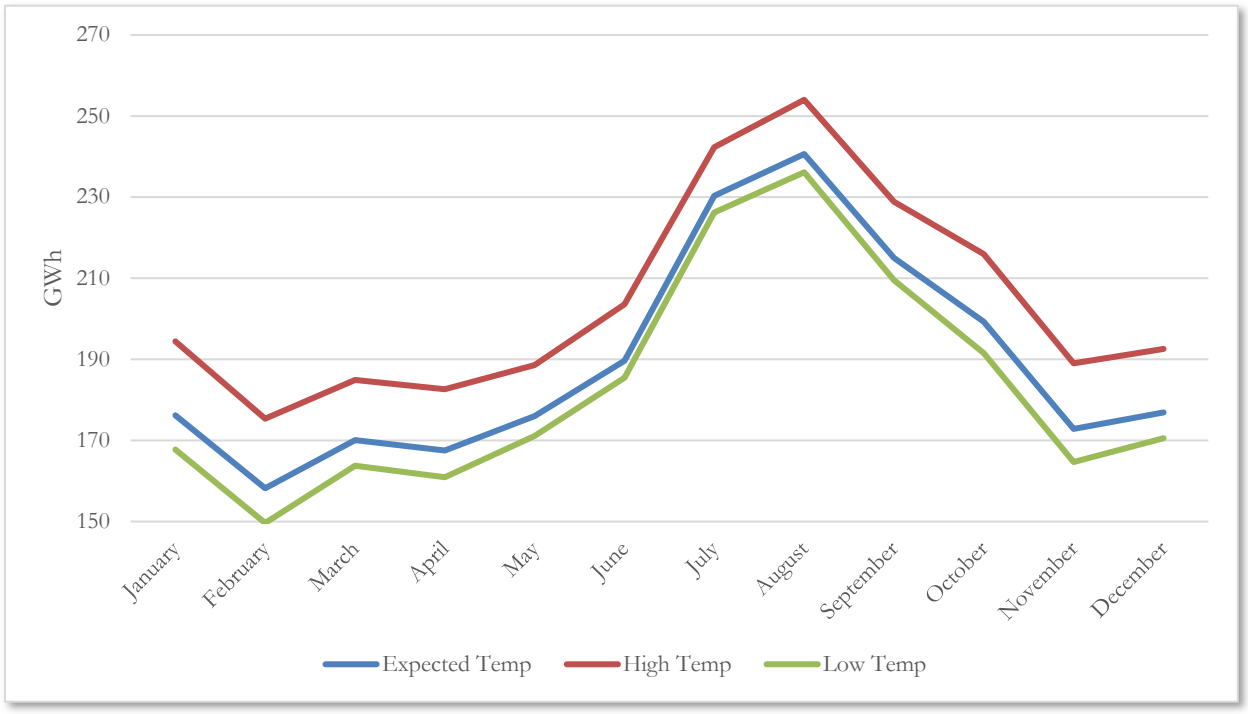
**Graph 9: Cal-Adapt vs APU Maximum Temperature Forecast**




The econometric model described in VI.A.1. estimates a coefficient of 2.19 MWh for the temperature variable. This is interpreted as an increase in energy demand of 2.19 MWh for every degree Fahrenheit increase. For example, an increase in temperature of 20 degrees Fahrenheit results in a corresponding increase in demand for that hour of 43.8 MWh. Applying the extreme temperature forecast to the economic model produces a bandwidth of expected energy demand under high and low temperature extremes.

Graph 10 below displays the estimated deviations from expected energy demand due to extreme weather impacts. The high weather extreme results in an increase from expected energy demand of 180 GWh annually, with the highest monthly impact in the month of January of 18 GWh. The low weather extreme results in a decrease from expected energy demand of 75 GWh annually, with the largest decrease being in the month of February of 9 GWh.

**Graph 10: Forecasted Energy Demand with Extreme Temperatures**




The energy demand variation due to extreme weather impacts will be used to stress test the resource portfolio in VII. F. Stress Testing.

## B. PEAK FORECAST - METHODOLOGY & ASSUMPTIONS

The peak forecast is also developed along with the energy demand forecast for use in consideration of the reliability aspects of power supply Resource Adequacy and electric distribution system planning:

- Peak forecast is used to determine the Resource Adequacy capacity needed to meet reliability requirements.
- Hour-by-hour peak and energy profile analysis is used to determine which resource's generation portfolio provides the best match. It also assists APU's effort to explore possibilities in using clean energy to meet the peak demand.
- APU's Electric System Planning relies on the long-term peak forecast to plan for necessary distribution system expansion.

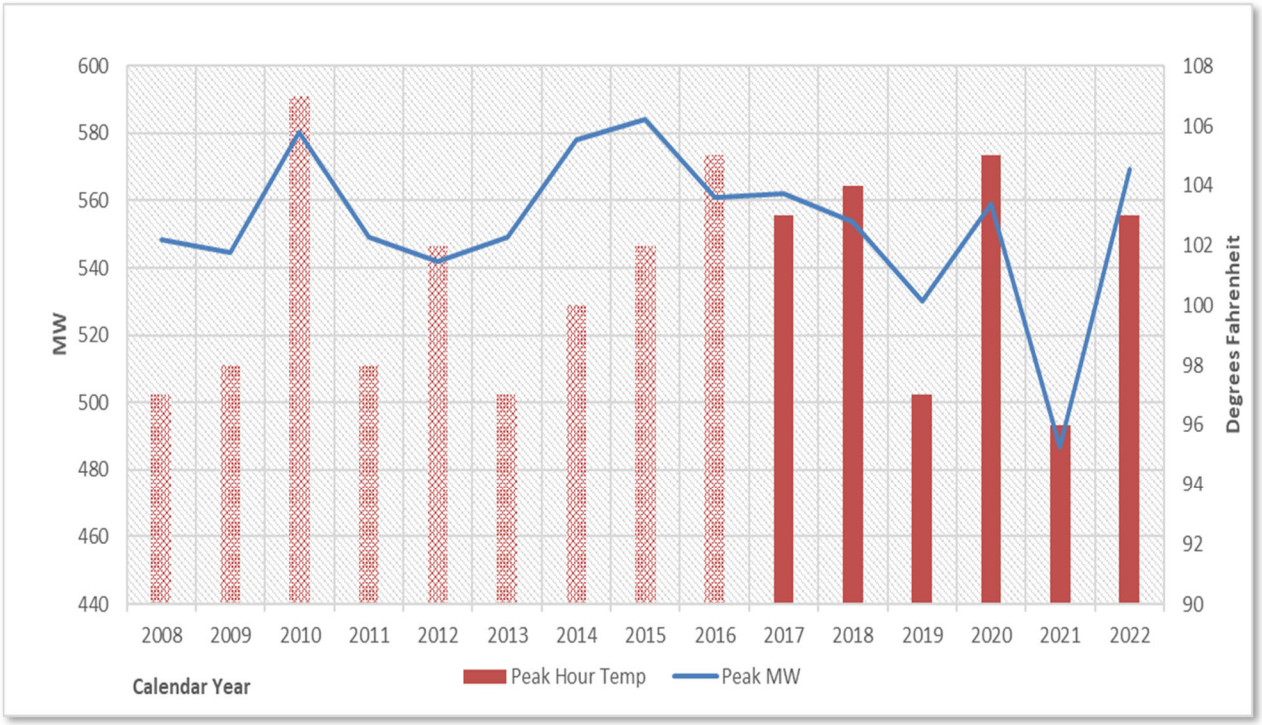
### B.1. CONSIDERATION OF THE HISTORICAL SYSTEM PEAK

Although APU's total energy demand declined from 2017 to 2022, the total system peak has fluctuated over the past several years between 487 and 566 MW. Anaheim saw the lowest peak in 2021 as a result of lower-than-average temperatures of 96 degrees. In 2022, the peak increased sharply compared to 2021, which was

due to temperatures increasing back to the normal average. APU's annual system peak is typically observed in the months of August or September when temperatures average 76 degrees and reach up to 105 degrees.

Graph 11 illustrates the temperature impact on the peak energy demand. Temperature data since 2017 are used for the 2023 IRP forecast and represented in solid red. Peak hour temperature data from earlier years are not used for this forecast and represented in shaded red. The peak energy demand patterns were different in the earlier years due to the differences in the availability of rooftop solar, energy efficiency programs, demand response tools and time-of-use rates.

**Graph 11: APU Historical Peak Demand**




## B.2. DEVELOPING THE PEAK FORECAST

When developing the peak demand forecast, APU considers historical load factors.

APU's load factor is calculated by taking the total energy demand for each month and dividing it by the peak demand for the same month. Historical average load factors are calculated for each month for the most recent five years. The load factors are applied to the adjusted monthly energy demand forecast to develop the peak demand forecast.

**Table 3: Historical Load Factors**

| Month | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | AVERAGE |
|---|---|---|---|---|---|---|---|
| January | | 73% | 79% | 81% | 75% | 79% | 77% |
| February | | 74% | 81% | 79% | 79% | 69% | 76% |
| March | | 79% | 80% | 73% | 75% | 71% | 76% |
| April | | 66% | 70% | 57% | 64% | 53% | 62% |
| May | | 71% | 78% | 60% | 67% | 66% | 68% |
| June | | 67% | 59% | 58% | 61% | 60% | 61% |
| July | 68% | 62% | 60% | 60% | 66% | | 64% |
| August | 60% | 66% | 68% | 55% | 65% | | 63% |
| September | 54% | 66% | 59% | 55% | 59% | | 59% |
| October | 53% | 61% | 60% | 53% | 66% | | 59% |
| November | 67% | 68% | 68% | 70% | 60% | | 67% |
| December | 76% | 76% | 80% | 78% | 78% | | 78% |

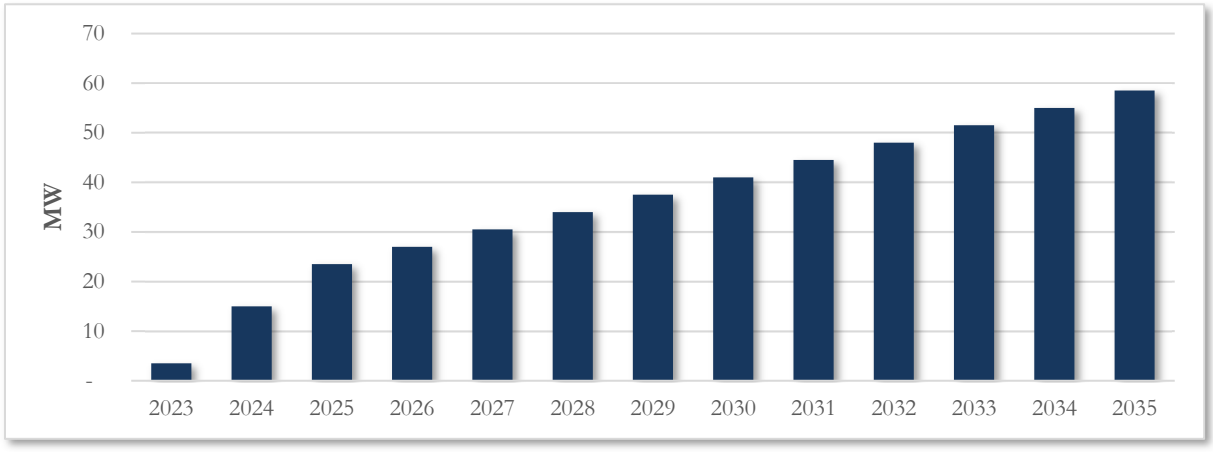
The peak demand forecast is validated by comparing the model's "backcast" output to the previous five year's actual data. The average peak forecast's accuracy to predict monthly peak is between -2.4% and 1.1%. The average annual peak forecast accuracy was in the range of -3.3% to 5.5% and within the acceptable confidence level.

## B.3. OTHER CONSIDERATIONS

### Peak Shift

APU estimates to have 51.5 MW of new solar within the next decade. Graph 12 details the estimated cumulative installed solar capacity for APU's service territory. The initial increase in 2024 and in 2025 is due to planned large commercial solar projects. Solar installation is estimated to remain stable through 2035. Under stress testing, a high demand scenario and a low demand scenario assumes extra low solar installation and extra high solar installation, respectively. More information can be found under Chapter VII. Resource Portfolio Evaluation, TEST 2: EXTREME HIGH DEMAND VS. EXTREME LOW DEMAND.

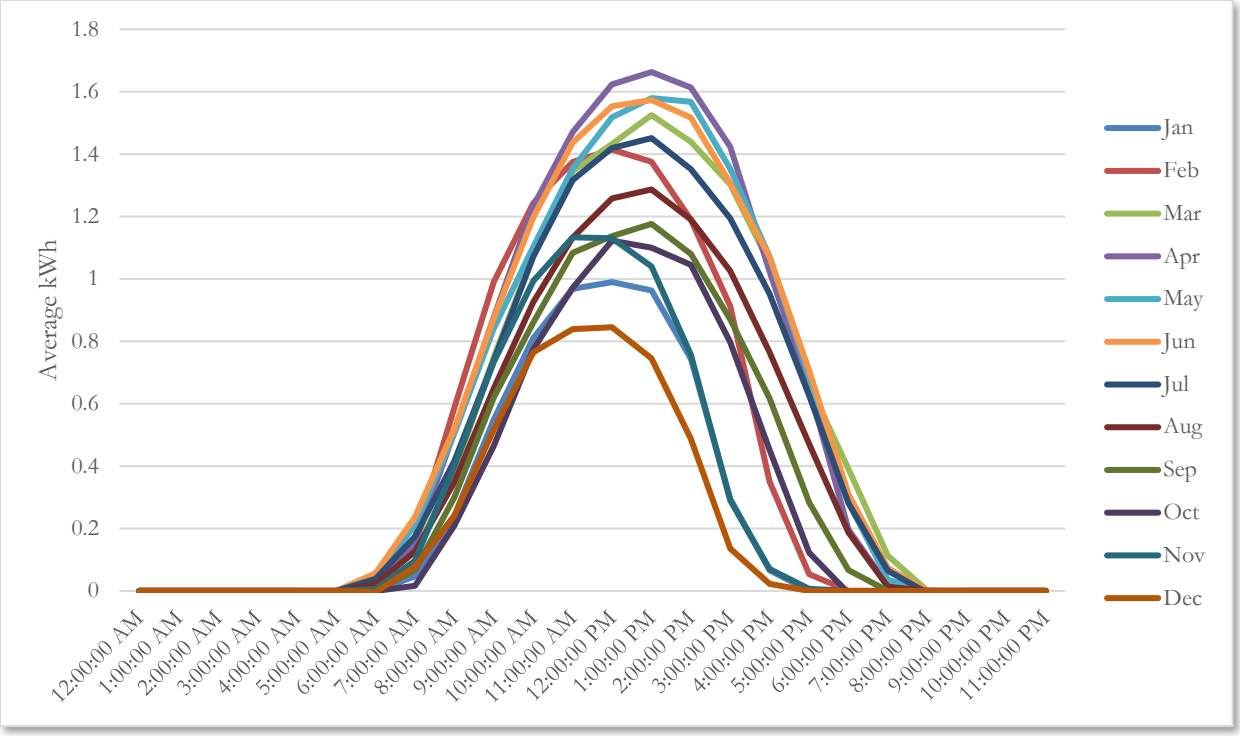
**Graph 12: Estimated Cumulative Distributed (Behind-the-Meter) Solar PV Capacity**



To develop an estimation methodology for customer-owned, behind-the-meter solar generation, APU studied the solar generation from the city-owned Anaheim Convention Center solar system. The system generates approximately 3,400 MWh of solar energy per year (as recorded in 2022) and has a capacity factor of 18%.

In 2022, April produced the highest generation, with 12.5 MWh per day. The month of December produces the least amount of generation per year, on average with 4.7 MWh per day. Graph 13 details each month's average hourly solar profile, as derived from the generation of the Anaheim Convention Center solar system. Peak solar generation is at noon October through February and at Hour 13 (1 PM) for the remainder of the year.

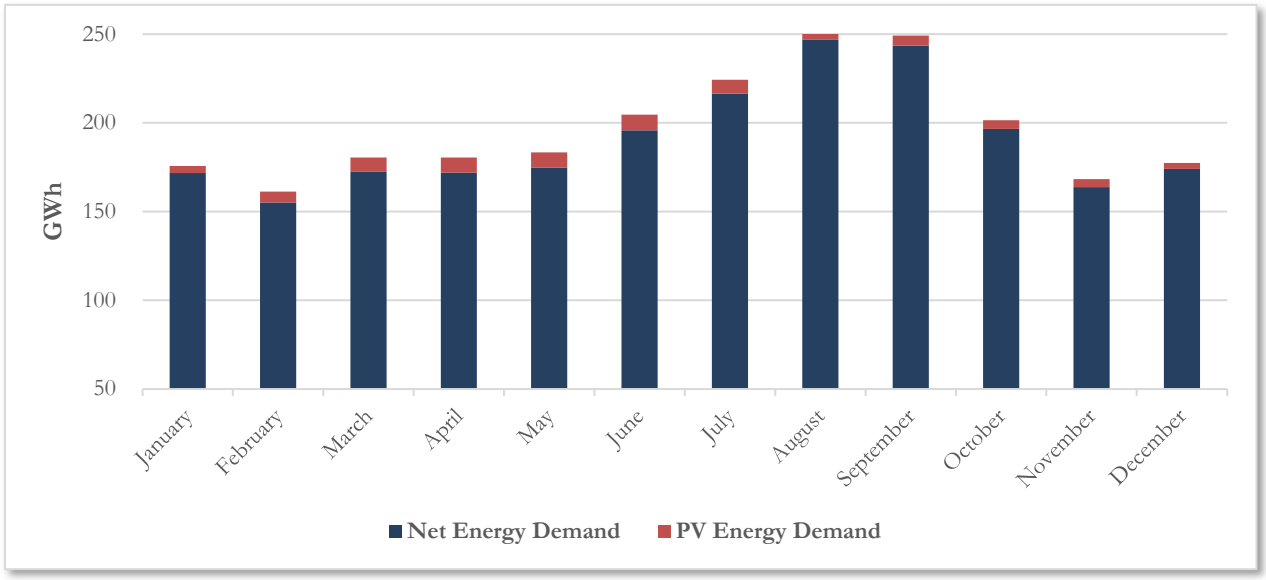
**Graph 13: Average Hourly Solar Profile by Month: Anaheim Convention Center**




Although production varies from system to system, the calculated capacity factor from the Anaheim Convention Center serves as a strong proxy to estimate production from installed private solar capacity within the City. This is especially true because the Convention Center is located in the center of Anaheim and is capable of capturing City specific weather effects.

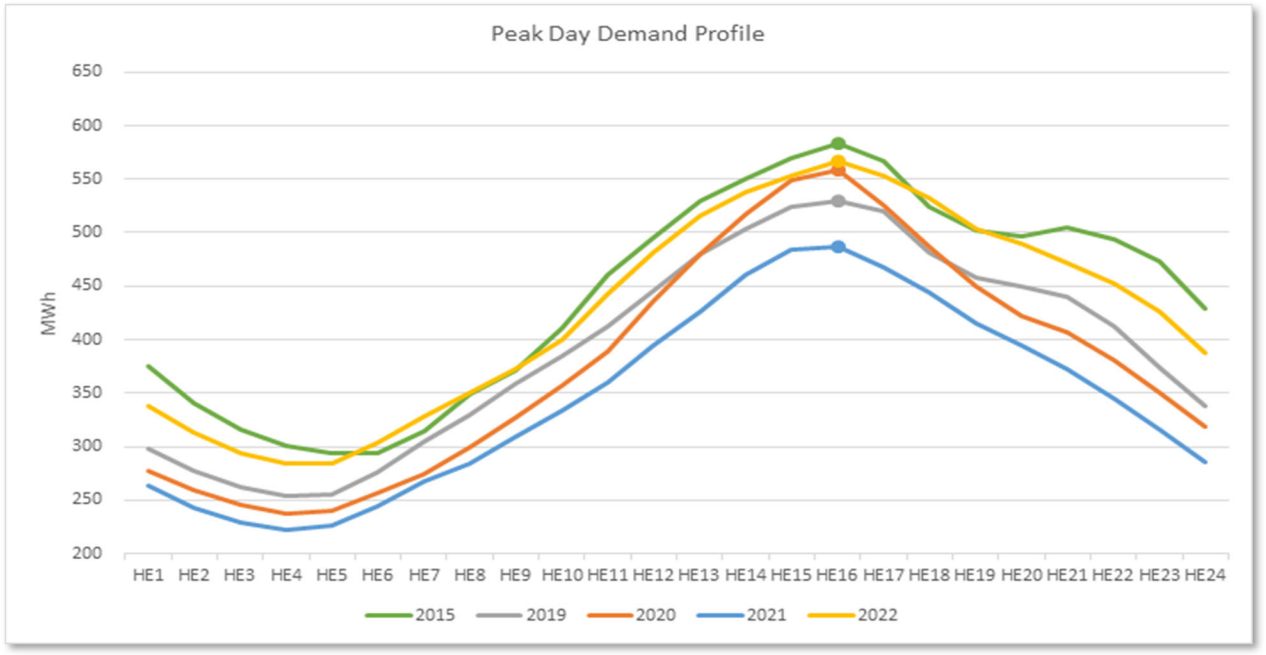
To calculate total distributed solar generation, the 18% capacity factor is applied to solar capacity data collected from SB 1 applications and City permits. Graph 14 details the estimated monthly distributed solar generation in 2022, and its effect on APU energy demand. The total estimated effect on energy demand using the proposed methodology for 2022 was 76,849 MWh, or a 3% reduction of Anaheim's total energy demand.

**Graph 14: Estimated Distributed (Behind-the-Meter) Solar PV Impact to Energy Demand**




While the Anaheim Convention Center's solar production meter data is still an effective tool for estimating the total behind-the-meter solar generation, there is not a direct relationship between solar production and peak shift or peak reduction. Although distributed solar has grown as expected from 2015-2022; the peak has not shifted from HE16 to later in the day, as previously expected in the 2018 IRP. Some of the reasons for the unchanged peak hour may include the introduction of time-of-use (TOU) rates, successful voluntary demand response programs, and the proliferation of EVs and battery storage.

**Graph 15: Peak Day Demand Profile**



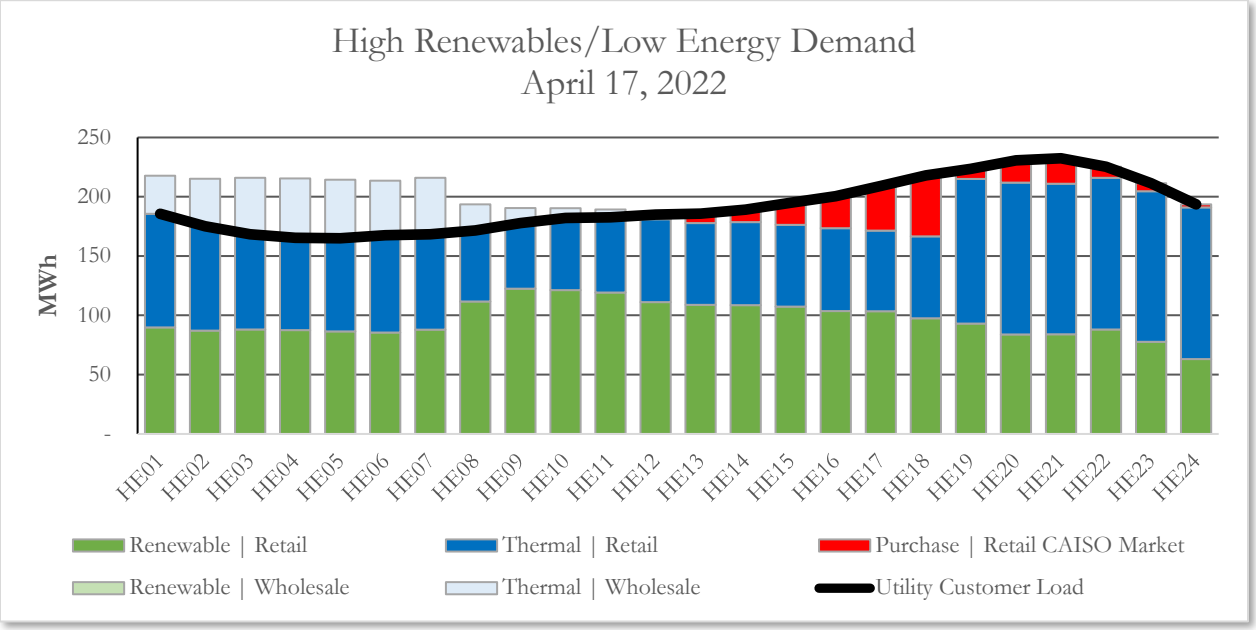
### Clean Peak Analysis

Aligning renewable generation with peak demand is a current industry challenge.

In an effort to meet peak demand with renewable or other clean energy resources, APU takes into consideration its existing renewable generation portfolio, efficiency of Grid operations, energy storage options and forecasts, distributed energy resources, and energy reduction measures such as energy efficiency and demand response programs. This comprehensive consideration ensures APU meets energy and reliability needs during its peak, while reducing the need for new/additional electric generation, distribution, and transmission resources.

During certain times of the year, system peak can be served with a higher percentage of renewable energy. As an example, in April 2022, the Intermountain Power Plant (IPP)[17] underwent a scheduled maintenance outage for most of the month, which caused a significant reduction in generation capacity. On April 17, 2022, APU's 232 MW peak was served by 36% or 84 MW of large hydro and renewables.

**Graph 16: Renewables Serving Peak Demand – Day with High Renewables & Low Energy Demand**




During other times of the year, serving the peak with renewable energy faces its challenges. This is generally due to a higher peak demand, renewable resource availability, and CAISO dispatch signals. APU deployed eight voluntary residential demand response events in summer 2022 to reduce energy demand; however, additional energy was still needed during the hot and humid summer days.

On September 8, 2022, APU reached a system peak of 566 MW; more than double the system peak in the previous example. During the peak hour, only 17% or 96 MW of large hydro and renewable energy was available

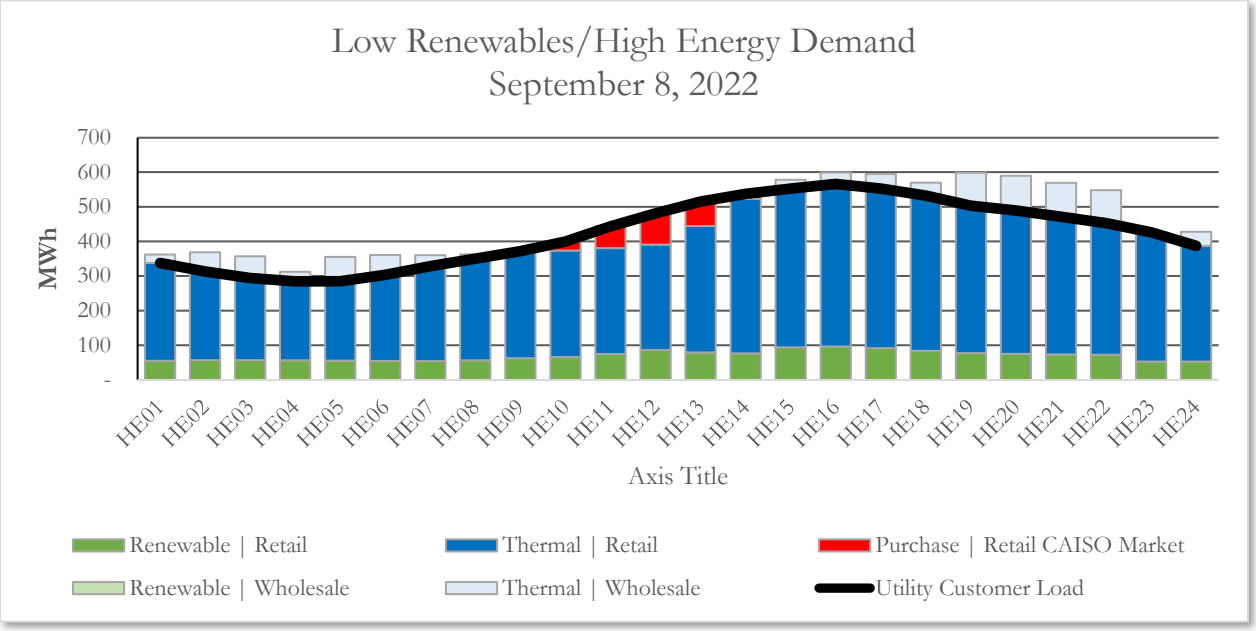
[17] Details of the power plant may be found in Section VIII.B. Generation and Transmission Resources

to meet the demand, even though APU has greater renewable contract capacity. This is due to various reasons, which include:

- De-rated landfill and geothermal generating units due to extreme heat,
- Minimal small hydro energy output due to drought conditions; and
- Wind energy output at 60% of April level.

Also, during the peak day, the CAISO dispatched APU's fossil fuel units to meet not only the APU peak, but also the system demand of other California load serving entities. The light blue bars in Graph 17 indicate the thermal (non-renewable) energy APU sold into CAISO market, per market dispatch signals.

**Graph 17: Renewables Serving Peak Demand – Day with Low Renewables & High Energy Demand**



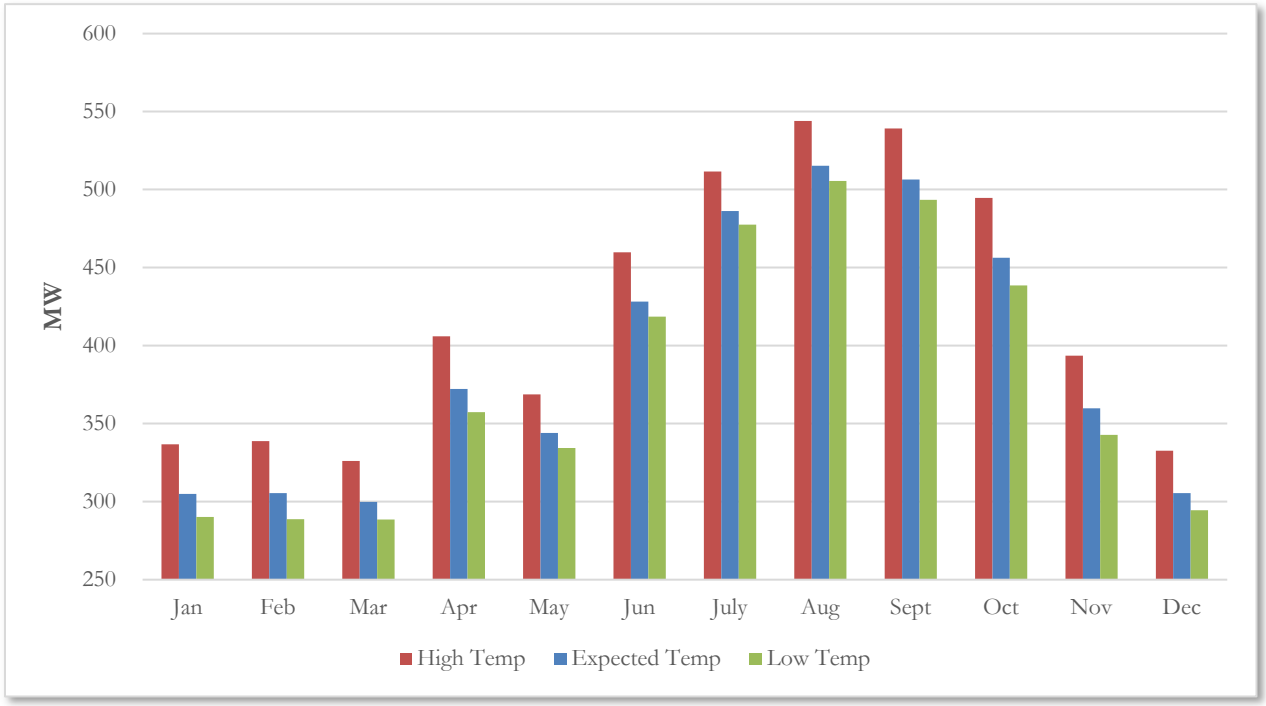

Other than reducing peak demand through efficiency measures and demand response programs, APU takes into consideration how renewables or other zero emission resources may provide more clean energy during the peak hour. APU recently contracted for a solar plus storage project and is actively working on the evaluation and negotiations of three energy storage projects. In addition, the location and generation profile of new renewable projects are also considered. The goal is to acquire renewable projects with generation profiles most aligned with APU's energy demand profile.

### Extreme Weather Impacts

Peak demand estimates are obtained for the extreme weather analysis using the load factor methodology, as described in VI.B.2. DEVELOPING THE PEAK FORECAST. Graph 18 displays the impact of extreme temperatures on peak demand. On average, peak demand is estimated to be 34 MW higher with extremely high

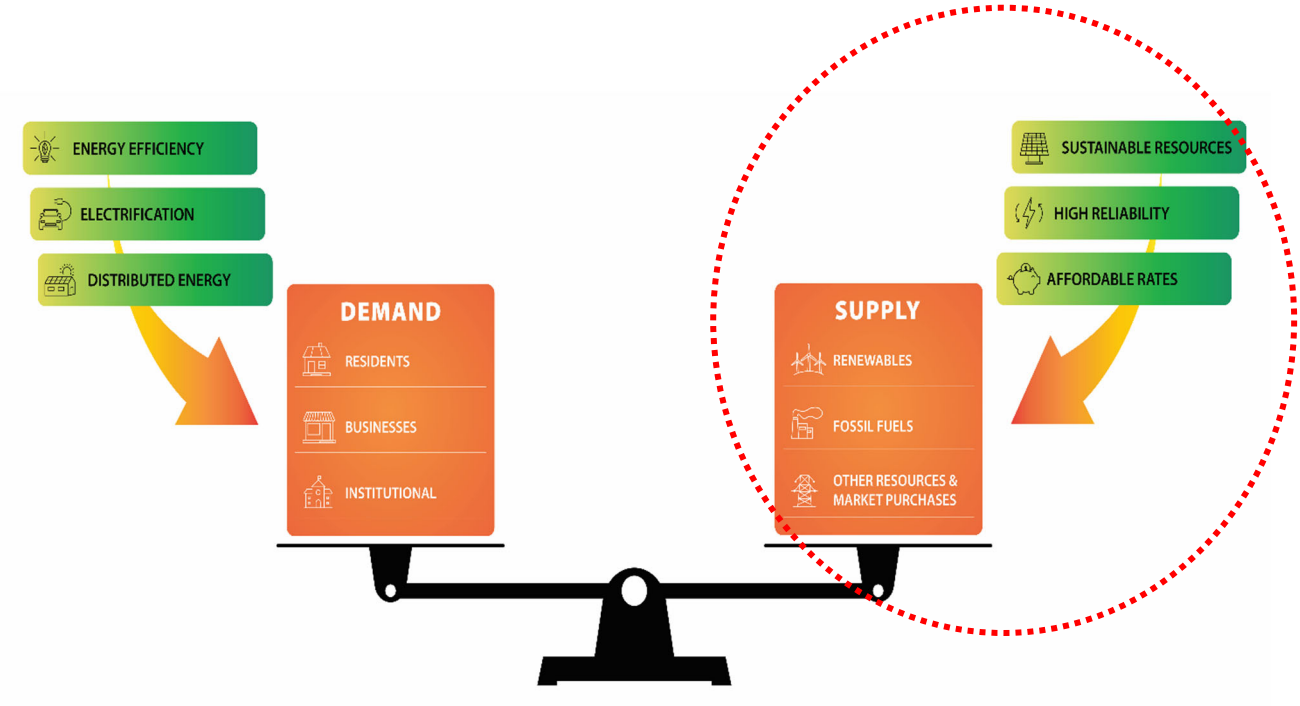
temperatures, with the highest impact of 42 MW in October. Similarly, peak demand is estimated to be 10 MW lower with extremely low temperatures, with the highest impact of 14 MW in October.

**Graph 18: Forecasted Peak demand with Extreme Temperatures**



# VII. RESOURCE PORTFOLIO EVALUATION

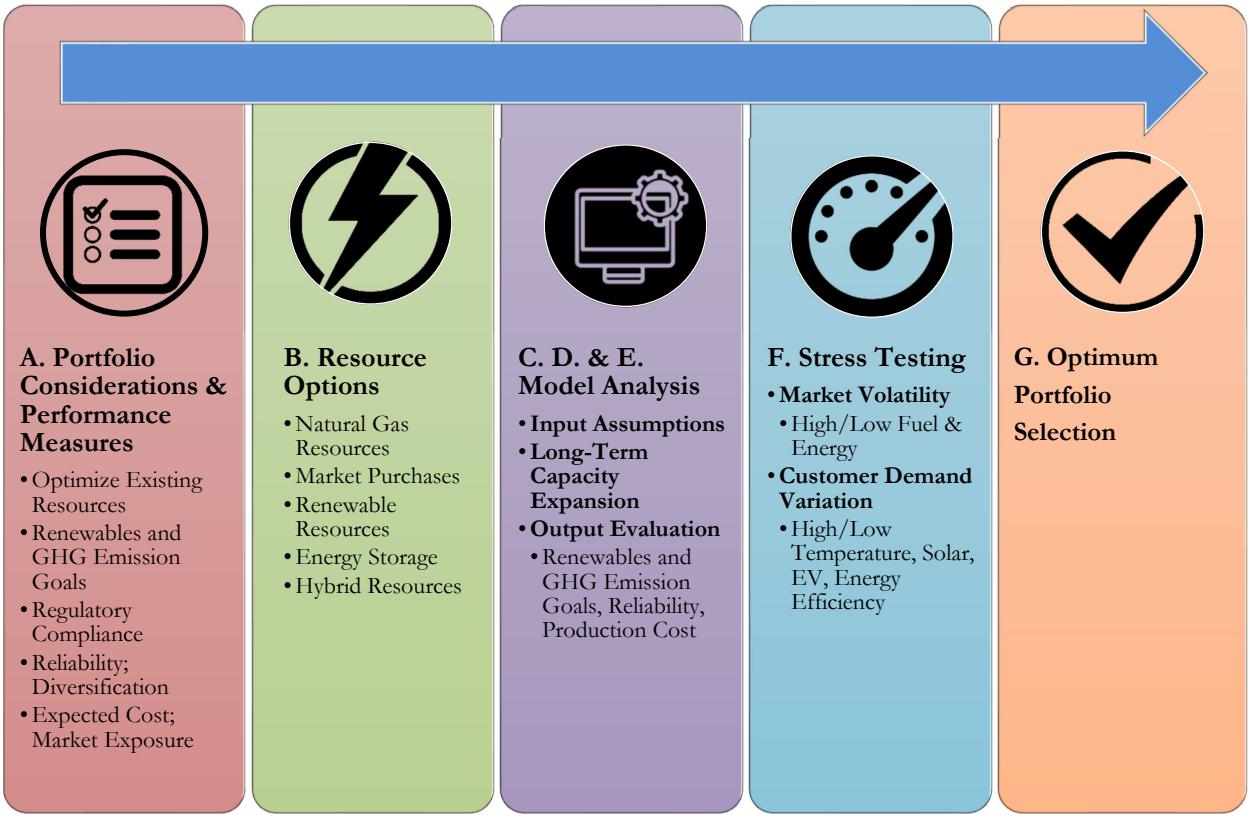
After forecasting the energy and peak demand, the supply side analysis is detailed in this section to answer one question: What is the optimal resource mix to supply the forecasted energy and peak demand given APU's planning goals of sustainable resources, high reliability, and affordable rates?



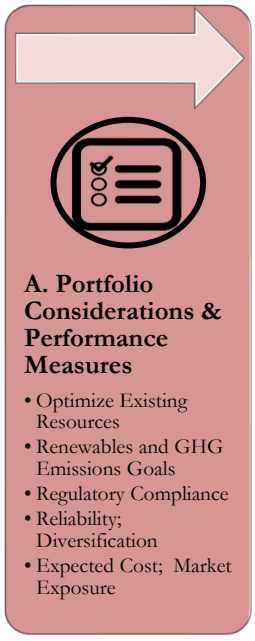

This section starts with basic considerations, such as how to transition from fossil fuels to clean, renewable energy and determining the performance measures to evaluate available supply-side options.

Candidate portfolio scenarios were developed based on commercially available technology and market intelligence regarding the availability of resources. These supply-side options were screened to filter out non-viable scenarios which do not meet APU's planning goals, and the remaining scenarios were analyzed using extensive quantitative production cost modeling analysis. The model outputs were scored and stress tested prior to a final portfolio selection. Graph 19 summarizes the selection process used to choose the optimum resource additions needed to satisfy customer demand, reliability, and sustainability goals. Graph 19 below summarize the selection process used to choose the optimum resource additions needed to satisfy customer demand, and reliability, and sustainability goals:

**Graph 19: Selection Process for the Optimum Resource Portfolio**




## A. PORTFOLIO CONSIDERATIONS AND PERFORMANCE MEASURES




### A.1. COAL-TO-CLEAN ENERGY TRANSITION

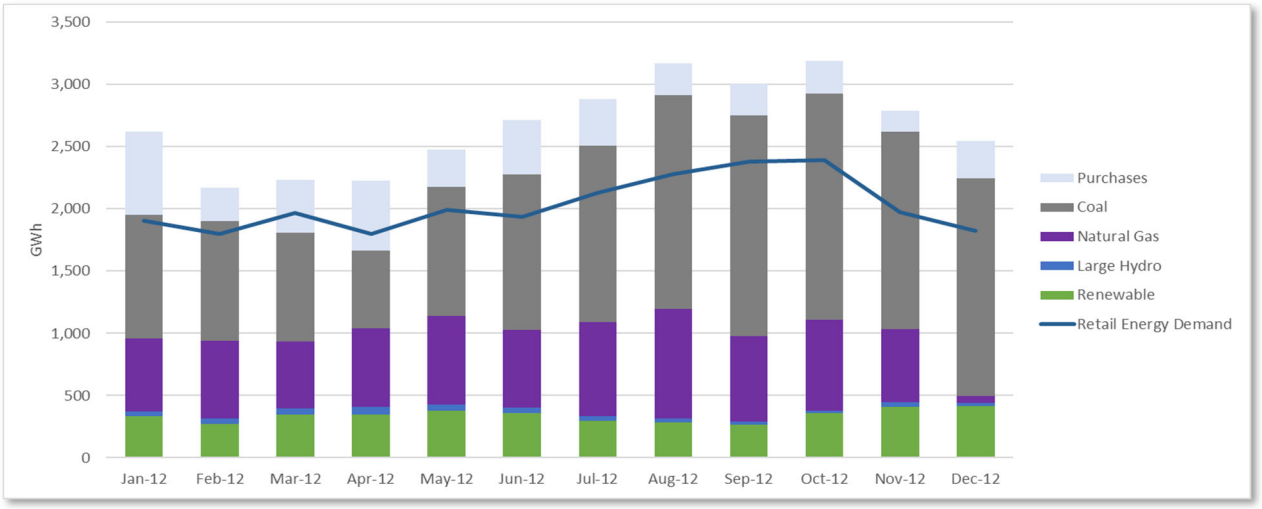
Prior to the heightened awareness regarding the effect of carbon intensive fuels on the environment, APU was fully resourced to meet local energy demand with long-term, low-cost, baseload coal-fired power plants. Coal-fired power plants were historically a nationally preferred resource due to the abundance of coal as a fuel, it's low-cost, and the reliable coal generation technologies available to produce electricity. Also, in the 1980s, nuclear energy fell out of favor due to issues surrounding where to house nuclear waste and the associated capital risk. During that same time, Congress banned the use of natural gas for power generation due to its scarcity and higher value as a space heating fuel. For these reasons, APU invested in two coal facilities that served APU customers for several decades, and approximately two-thirds of APU's energy needs were met by these two coal-fired power plants.

APU has actively transitioned from a carbon intensive resource mix to clean renewable energy since the early 2000's, as demonstrated by the introduction of

renewable resources to the power portfolio and its early exit of the San Juan Coal Power Plant.

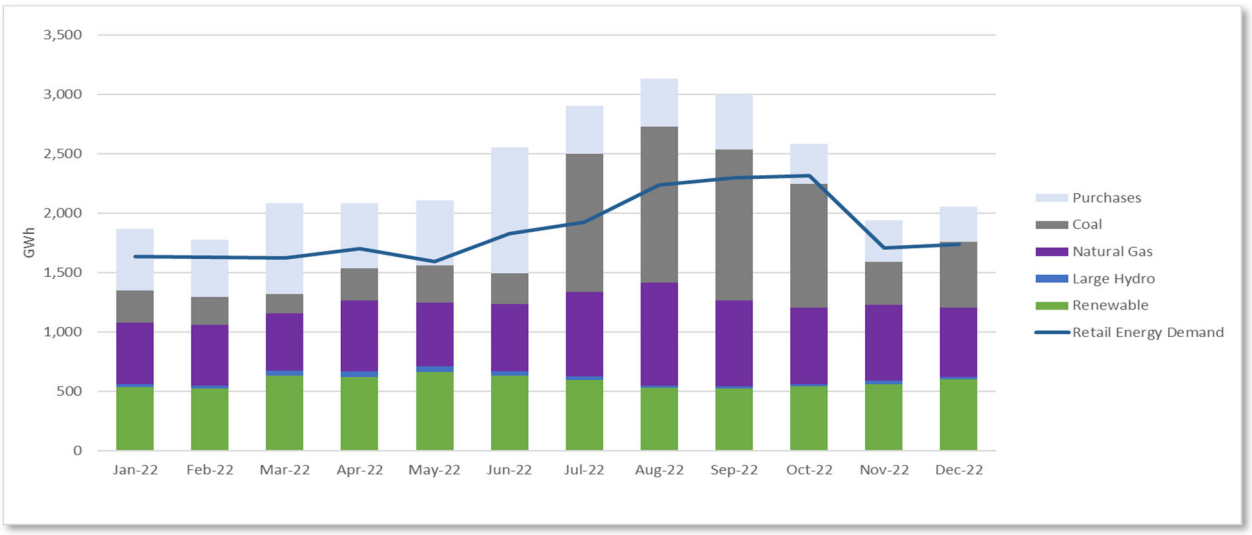
APU has continued to increase the amount of energy delivered to customers from renewable energy resources since the early 2000's, while reducing coal power from 43% to 23%[18] for the years 2012 through 2022. Today, APU's overall resource stack for retail customers and the wholesale market is very different from the historical view, with a much greater percentage of retail energy demand met by sustainable energy. The following graphs show the change in APU's power supply resource stack over the past decade for years 2012 through 2022.

**Graph 20: APU Resource Stack in 2012**




Note: Generation above the retail energy demand was sold into the CAISO wholesale energy market.

**Graph 21: APU Resource Stack in 2022**




Note: Generation above the retail energy demand represents energy sold into the CAISO wholesale energy market.

[18] The 23% coal calculation assumes the same Power Content Label (PCL) calculation methodology is used in 2022. The PCL calculation methodology was updated in 2019 and assumes all coal generation is used to serve the retail energy demand. Previously, it was assumed that a portion of the coal generation served the wholesale market.

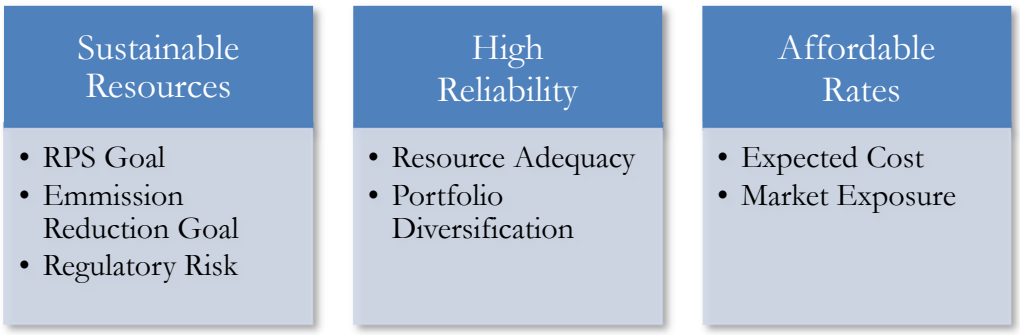
Roughly one quarter of APU's 2022 energy supply came from the Intermountain Power Project (IPP) coal plant. APU has taken action to allow the IPP contract to expire effective 2027. The IPP coal plant will be converted into a natural gas power plant in 2025, at which time APU will have divested itself of coal resources. After the IPP contract expiration in 2027, APU will no longer receive generation from this natural gas resource.

The capacity and generation from IPP will need to be replaced prior to 2027 to maintain high reliability, achieve APU's sustainability goals, comply with State mandates, and mitigate market price risk. To select the optimum resource portfolio, which includes the replacement of the divested coal resources and the gradual reduction in natural gas resources, APU used quantitative performance measures and production cost modeling to evaluate the portfolio scenarios pursuant to its planning goals, as mentioned in Section III. Planning Goals

## A.2. PORTFOLIO PERFORMANCE MEASURES

APU's mission is to be an agile, customer focused, water and power utility operating in an ever-changing energy landscape, while continuing to provide reliable, high quality, environmentally sustainable, and competitively priced water and power, delivering the maximum value to our customers.

The integrated resource planning process maintains three main planning goals to achieve the organizational mission: Sustainable Resources, High Reliability, and Affordable Rates.




### RPS Goal

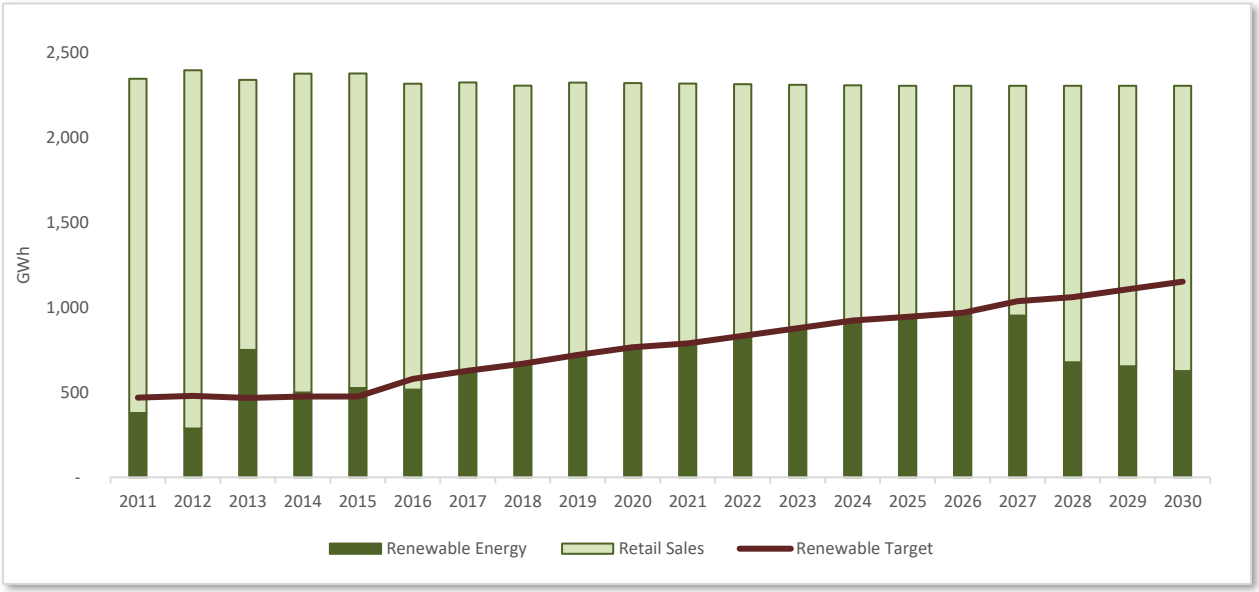
The RPS goal is measured by the percentage of renewable energy delivered to serve retail load. Portfolios considered must achieve at least 60% eligible renewable energy by 2030, 90% renewable or zero carbon resources by 2035, 95% by 2040 and 100% by 2045. In addition, per the RPS statute, 65% of APU's RPS obligation in any given year must come from long term contracts (i.e., greater than 10 years in length).

APU has historically procured more renewable energy than target requirements, leaving a sufficient "bank" of renewable energy credits (RECs) for renewable contracting flexibility. In 2022 and 2023, APU elected not to renew some renewable contracts due to the resources' relatively higher prices and/or the generation profile not being in alignment with the APU system energy demand.

APU has a sufficient amount of banked, existing and soon-to-be executed long-term renewable energy resources to meet RPS compliance through year 2026. With the flexible utilization of short-term renewable agreements and unbundled REC products, APU can meet RPS compliance through 2030. In addition, APU is

in active negotiations with renewable and hybrid resource providers to meet renewable compliance obligations post-2030. Graph 22 details the banked and existing long-term renewable energy and the renewable compliance targets.

**Graph 22: Banked and Existing Long-Term Renewable Energy Credits (RECs)**




## Emission Reduction Goal

The greenhouse gas (GHG) emission reduction goal is calculated with (1) the 2022 Scoping Plan's electricity sector targets: 38 MMT GHG in 2030, 35 MMT in 2032, and 30 MMT in 2035[19], and (2) APU's share of the sector target (1.015%) as recommended by the CEC for the 2017 Scoping Plan.[20] Portfolios considered must meet the GHG emissions reduction targets ultimately established for the electricity sector by the California Air Resources Board.

Graph 23 details the planned GHG reductions assuming both the Magnolia and Canyon power plants remain in the portfolio. The dark bar represents APU system emissions net of emission savings from transportation electrification. The transparent bar represents emission savings from converting internal combustion engine vehicles to electric vehicles. The gray dotted lines represent the GHG emissions target range from the 2017 Scoping Plan. The blue line represents APU's expected share of sector GHG emissions target from the 2022 Scoping Plan. As the 2022 Scoping Plan only provides emissions target through 2035, the blue line is also depicted as a dotted line beyond 2036.

APU system emissions assume that (1) the coal and natural gas power plants' emission factors remain at 2022 levels, (2) the wholesale purchase emission factor equals the published 2021 CAISO GHG

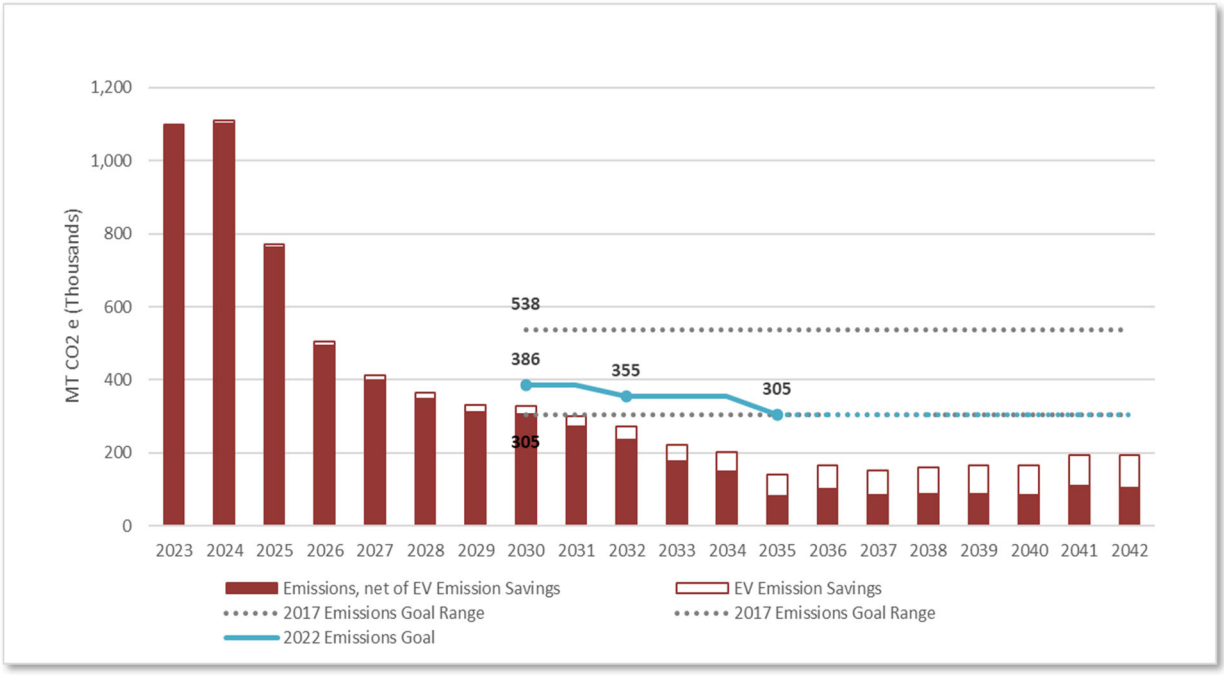
[19] P. 201, Clean Energy Grid – Sector Transition, "2022 Scoping Plan for Achieving Carbon Neutrality", https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf

[20] Table 1, POU 2030 GHG Emissions Targets, "Staff Report: Senate Bill 350 Integrated Resource Planning Electricity Sector Greenhouse Gas Planning Targets", https://ww2.arb.ca.gov/sites/default/files/2020-08/appendix_b_staffreport_sb350_irp.pdf

emissions[21] divided by the corresponding system load[22]; and (3) the wholesale purchase emission factor has a straight-line decline through 2035; when it is at half of the 2022 emission factor and the grid achieves 95% zero emissions goal.

In summer 2025, IPP will be converted into a natural gas unit. By mid-summer 2027, APU will fully exit the IPP natural gas power plant. APU system emissions remain consistent between 2026 and 2030 except for major maintenance scheduled. The emissions start to decline beyond 2023, with more renewable resources added and more widespread transportation electrification beyond 2030.

**Graph 23: Planned Emission Reduction**




## Regulatory Risk

Regulatory Risk measures the ability to remain compliant with current and anticipated future legislative or regulatory changes.

California's RPS targets have steadily increased over the past decade while the GHG emissions target continues to drop. SB 100 (2017) establishes the goal of renewable energy and zero carbon resources to supply 100% of retail sales by 2045, while SB 1020 (2022) establishes interim goals of 90% by 2035 and 95% by 2040. In addition, AB 1279 establishes the goal for California to achieve net zero GHG emissions no later than 2045. While these policy goals are not enforceable mandates, APU must consider the state's climate initiatives, and plan to achieve such goals. Therefore, the optimum portfolio should meet APU-specific requirements to meet the State's policy goals.

[21] "Greenhouse Gas Emission Tracking Report December 2022", http://www.caiso.com/Documents/GreenhouseGasEmissions-TrackingReport-Dec2022.pdf

[22] Table 1.1, "2021 Annual Report on Market issues & Performance", http://www.caiso.com/Documents/2021-Annual-Report-on-Market-Issues-Performance.pdf

The optimum portfolio must consider the technological risk where a generation technology becomes unfit to meet the State's policy initiative. Nuclear and coal generation are two examples of technologies that became out of alignment with the State's policy initiatives. One technology being considered in the 2023 IRP is the use of renewable natural gas (RNG or biomethane). It is currently considered a carbon neutral/renewable resource because RNG projects capture and repurpose highly potent, ozone depleting methane gas which is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere. RNG production reduces the GHGs that would otherwise be emitted from using the same amount of conventional natural gas; however, RNG is not a carbon-free fuel. There is a risk that future policy changes could reclassify RNG an emitting resource, potentially introducing compliance implications.

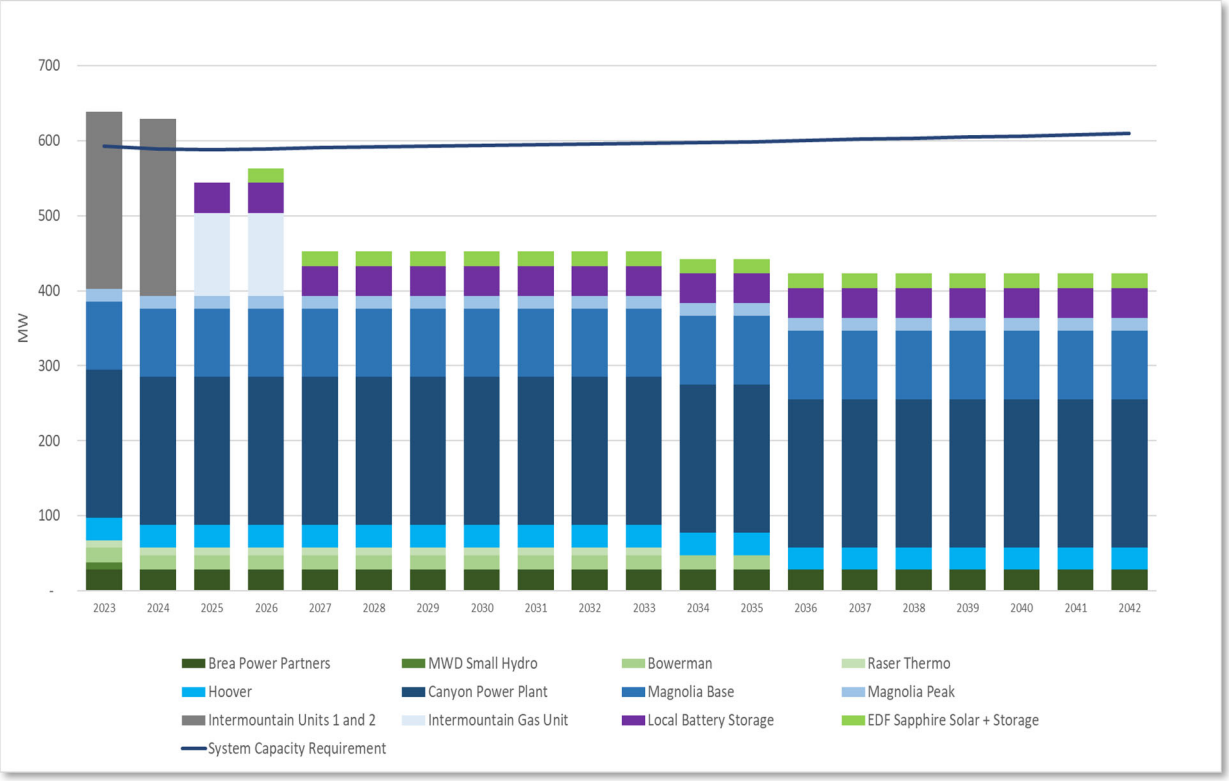
In addition, the accounting for reserve margin, effective load carrying capacity (ELCC) and net qualifying capacity (NQC) has been in discussions lately. APU must consider the possibility of a higher reserve margin requirement, and the likelihood of a resource's ELCC or NQC being reduced in the future.

### Resource Adequacy (Reliability)

Resource Adequacy is measured by the ability to achieve a 15% reserve margin above the system peak forecast while meeting forecasted system, local, and flexible capacity requirements.

Resource portfolios not achieving this measure are still included for consideration by identifying future capacity shortages and planned capacity purchases. Costs for capacity purchases are added to the portfolio.

**Graph 24: Available Resource Adequacy (RA) System Capacity**



Graph 24 illustrates the existing and planned resources APU may use to meet Resource Adequacy requirements. When APU exits IPP in 2027, 140 MW of capacity will need to be procured to ensure resource adequacy and system reliability requirements are met. The new capacity can be in the form of new energy resources with capacity, capacity-only purchases, stand-alone energy storage, or renewable and storage hybrid resources.

Canyon Power Plant and the Bowerman and Brea landfill gas to energy plants are long-term and reliable resources located in or near Anaheim, and they provide more than 100% of the local and flexible generation capacity required by the CAISO.

The Resource Adequacy generation capacity needed after 2027, upon the expiration of the IPP contract, is system wide capacity that may be produced anywhere in the 14 western states so long as it is deliverable to California. Out-of-state capacity requires the use of CAISO Import Capability, which would need to be requested as part of the CAISO annual process, however it is not guaranteed that an allocation will be supplied and may need to be procured from another CAISO participant who has surplus in order to offer the resources as RA units. Without Import Capability Allocations, it is more beneficial to acquire in-state resources for system RA.

APU plans to fully procure the requisite Resource Adequacy at least two years prior to the expiration of the IPP contract through competitive solicitations. APU is in the process of adding stand-alone energy storage within the LA Basin, and is in active negotiations with other renewables, storage and hybrid resources within California. Due to the retirement of natural gas and once-through-cooling power plants, capacity prices during the summer peak months have seen drastic increases. At the same time, the large amounts of new renewable resource interconnections have driven up ancillary service charges along with price disparities over 5-minute intervals. As a result, energy storage, in combination with renewables are beginning to become viable resources to meet RPS requirements and supply RA.

### Portfolio Diversification

Portfolio diversification is measured by the different types and length of resource investment within the portfolio. A diversified resource portfolio increases flexibility, reliability, and overall performance.

APU's 2018 renewable portfolio consisted of 15% intermittent resources and 85% baseload resources. The 2018 IRP recommended the procurement of additional intermittent resources in order to diversify the portfolio. In 2022, APU's renewable portfolio consisted of 38% intermittent resources and 62% baseload resources.

Baseload resources are very reliable and provide local Resource Adequacy capacity, but the cost of these resources is significantly greater than intermittent resources such as solar and wind. Both types of resources, along with energy storage and hybrid resources, are being considered for new resource additions.

### Expected Cost

Expected Cost is measured by the total cost to supply power. Each resource portfolio for the 2023 IRP is being evaluated with a goal to minimize impacts on customer bills and to serve customers at just and reasonable rates.

As previously discussed, APU has been fully resourced to meet local demand with long-term baseload power plants. Any costs associated with additional resource procurement necessary to meet environmental goals must be carefully considered and prudently managed. A key consideration in selecting the optimum resource portfolio is leveraging existing resources and minimizing customer impact.

**Market Exposure**

Market Exposure is measured by the percentage of energy APU must purchase from the wholesale market, and the portfolio's ability to withstand market price volatility. The financial exposure of the overall resource portfolio increases when a larger percentage of energy is procured from the wholesale market.

With 236 MW of capacity, IPP meets the largest portion of APU baseload energy needs, with the remaining baseload energy demand supplied by the natural gas and renewable generation facilities. The predictable cost structure of a baseload unit protects the resource portfolio from price swings in the wholesale market. The replacement energy needs resulting from APU's exit from IPP will come from renewable energy resources. Because of the intermittent nature of variable renewables (i.e., wind and solar), financial exposure must be evaluated when considering replacement energy from these types of resources.

Intermittent renewable energy resources have seasonal and hourly generation profiles that are not always aligned with energy demand and can be unpredictable at times due to changing weather patterns. Due to this variability in production, there are times when generation levels exceed energy demand, resulting in decreases in market prices and revenue from the sales of energy. Conversely, at times of high energy demand and limited amounts of generation available, market prices and the purchase of energy to meet energy demand will increase.

Modeling stress tests are introduced in Section F. Stress Testing to ensure the optimum portfolio's overall performance is stronger under different market cost and energy demand scenarios.

# B. RESOURCE OPTIONS

**B. Resource Options**

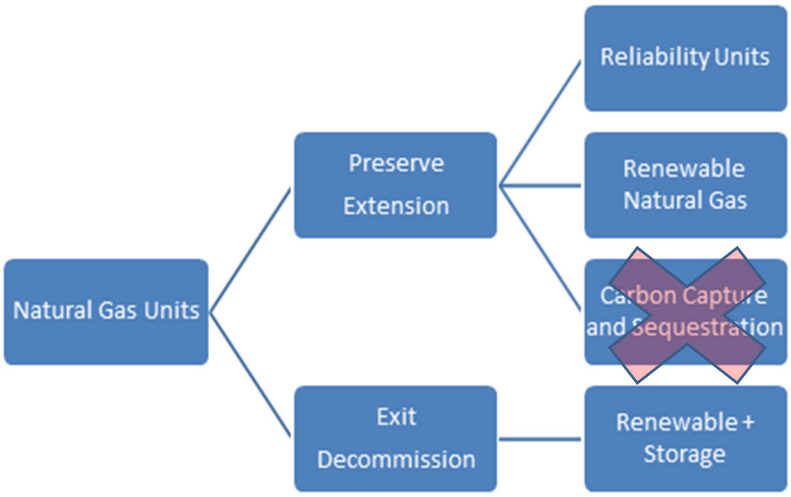
- Natural Gas Resources
- Market Purchases
- Renewable Resources
- Energy Storage
- Hybrid Resources

## B.1. NATURAL GAS POWER PLANT OPTIONS

With extensive quantitative analysis, the 2023 IRP examines several different options for the Magnolia and Canyon natural gas power plants after the IPP exit in 2027.

Graph 25 below shows the screening process used to evaluate the different options for the natural gas units.

**Graph 25: Options for the Natural Gas Power Plants**




1. **Preserve/Extension**: The units can be preserved or extended beyond their expected end dates of 2037 for the Magnolia Power Plant and 2041 for the Canyon Power Plant.

    - **Reliability Units**: The natural gas units may be used as reliability units, serving APU customers and the CAISO system as they historically have been. California narrowly avoided rolling blackouts during the September 2022 heat wave, in which Governor Newsom's Executive Order N-11-21 resulted in dispatching diesel generators to help meet peak demands. With the electrification of transportation, buildings and fuel switching, it is expected that electricity demand will continue to increase. Reliability has become one of the key considerations for new resource additions or extensions. Recent discussions considering the continuation of nuclear and once-through-cooling units in California also validates that baseload and dispatchable units are still necessary to ensure a smooth transition to the State's clean energy future.

    - **Renewable Natural Gas**: The Magnolia Power Plant is certified as an RPS unit allowing for the use of Renewable Natural Gas (RNG) for fuel to generate renewable energy. This option assumes that ample RNG supplies will become available by 2031, and that APU can secure long-term RNG contract(s) for the minimal dispatch portion of the resource. Currently, there is no commodity market for RNG projects. The current cost of RNG varies from $10/MMBtu to $40/MMBtu, depending on size, location, and technology. Higher fuel prices will significantly increase the unit's dispatch cost, and there is a risk that the unit may only be

minimally dispatched in the CAISO energy market. Since Magnolia has a minimum dispatch capacity that can be self-scheduled, the dispatch will not be impacted by fuel price, therefore Magnolia is selected as the RNG unit.

- **Carbon Capture and Sequestration (CCS)**: A third option considered is to retrofit the units with CCS technology. However, based upon initial research, this approach is proven geologically and technologically infeasible due to the urban location of both natural gas units and lack of identifiable sequestration sites or $CO_2$ pipelines to inject the captured carbon. With current CCS technology, the solution is deemed not viable, as very limited space is available at both sites for onsite CCS implementation. In addition, the technology is costly, at $100 to $600/ton CO2e, depending on specific CCS technologies. Using the medium cost of $250/ton, Magnolia's and Canyon's costs increase by $100/MWh and $140/MWh, respectively. As CCS technology matures, cost reductions may occur, and studies are underway for a national $CO_2$ pipeline system that could be used for CCS[23]. While deemed infeasible for the 2023 IRP, this technology may be revisited in subsequent updates.

2. **Exit/Decommission**: Under this option, APU exits the Magnolia Power Plant at the expected end date in 2037 and decommissions the Canyon Power Plant at its expected end date in 2041. Renewable, storage, or hybrid resources will be procured to fill the capacity and energy positions.

In conclusion, three portfolios are evaluated for the 2023 IRP:

1. **Reliability Portfolio**: Both Magnolia and Canyon Power Plants are preserved as natural gas power plants, serving capacity and energy to APU customers and the CAISO system when the renewable resources are not available.
2. **RNG Portfolio**: The Magnolia Power Plant is certified as an RPS unit, using RNG as fuel.
3. **Zero-Emissions Portfolio**: APU exits both natural gas power plants at the expected end dates. New renewable, storage or hybrid resources are procured to fill the capacity and energy shortfall.

## B.2. NEW RESOURCE OPTIONS

The following factors were considered in the development of new resource options. The new resources being considered include renewable, energy storage and hybrid resources. Energy storage may be used to facilitate the integration of unpredictable intermittent resources; however, energy storage itself is not a renewable resource.

1. Determine Annual RPS Requirements

In developing the candidate portfolios, the first step is to calculate the amount of renewable energy needed to meet the RPS requirements. RPS requirements are statutorily established and, in the case

[23] Carbon Capture and Sequestration (CCS) in the United States by the Congressional Research Service, https://sgp.fas.org/crs/misc/R44902.pdf

of publicly owned utilities like APU, are enforced by the CEC. The requirements are calculated as a percentage of customer retail energy demand.

Retail Energy Demand Forecast * RPS % = Renewable Energy Required

Due to the inconsistent nature of renewables development and energy production, there may be years when APU exceeds its projected RPS targets. To preserve the value of the renewable energy resources, the Legislature and State agencies recognize the ability to use any excess renewable procurement for future compliance through the banking of excess renewable energy credits (RECs) as they are produced. APU has banked RECs produced in excess of RPS compliance requirements to date and intends to continue banking any surplus RECs for future use to help satisfy its future RPS compliance targets in the most cost-effective manner possible.

The following assumptions are introduced:

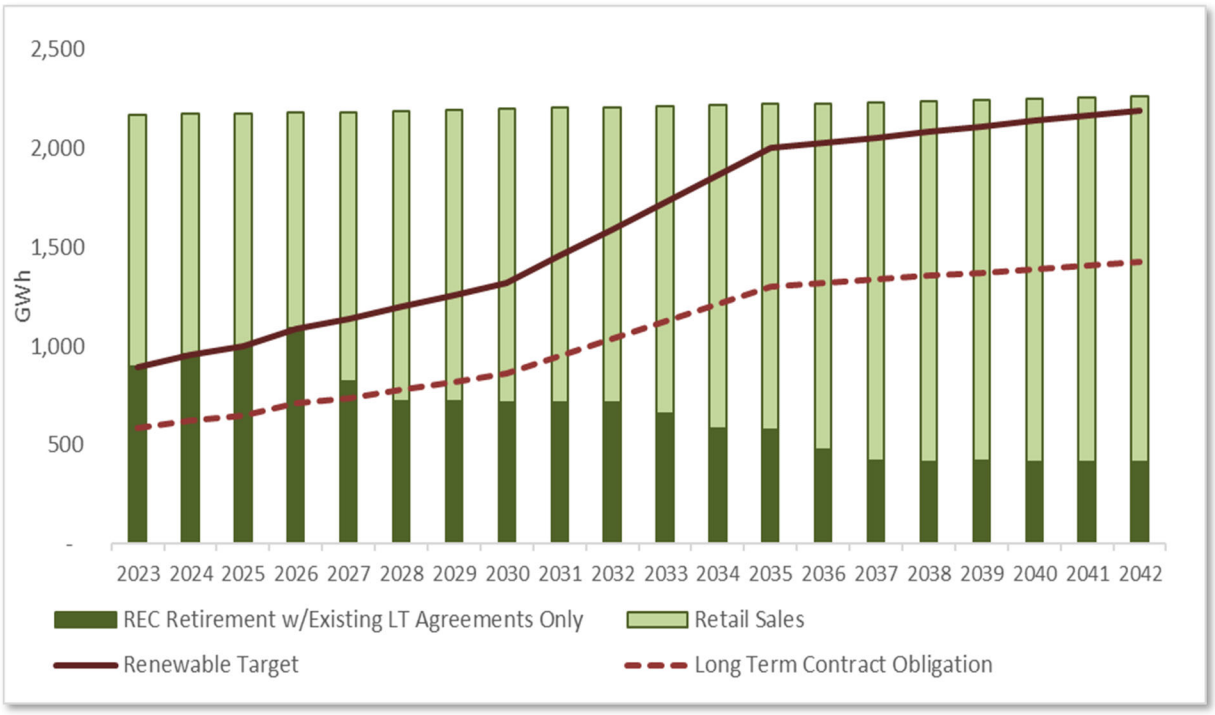
1. A straight-line method is used to determine interim targets between 2030 (60%), 2035 (90%), 2040 (95%), and 2045 (100%).
2. Post 2030, the same rules remain for banking, long-term resource obligation, and the limitations of renewable resources in different "buckets" or categories.

As detailed in the green bar on Graph 26 below, the renewable generation forecast indicates that APU will have procured a sufficient amount of renewable energy to meet its RPS obligations through 2026, with existing long-term renewable agreements only. In order to meet compliance obligations post 2026 APU will need to negotiate extensions of existing contracts, purchase short-term renewable products, and procure new long-term renewable resources.

2. Determine Long-Term Contract Obligation

   Pursuant to SB 350, the RPS Program also requires that starting in the year 2021, 65% of APU's RPS obligations must be met by renewable resources under contract for more than 10 years in length, shown by the dotted line on Graph 26. Currently, the majority of APU's renewable energy comes from resources under long term contracts. APU is in active negotiations to secure additional long-term renewable contracts in combination with short-term renewable purchases in order to meet this compliance obligation.

**Graph 26: Simulated RPS Compliance Requirement**




3. Determine New Resource Costs

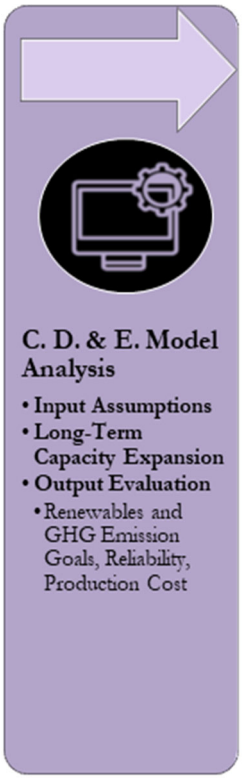
APU utilizes the production cost model's Long-Term Capacity Expansion (LTCE) function, which contains a database with new resource costs for different planning regions. APU selects candidate new resources from the LTCE input database, reviews cost information, and updates it with current market intelligence. Proxy costs may come from the SCPPA Request for Proposals[24] for renewable generation, recently executed/negotiated renewable agreements, or renewable agreements in APU's existing portfolio.

The candidate resources include solar, wind, geothermal, landfill gas, energy storage, and hybrid resources (solar + storage).

Capacity calculations vary by the operating characteristics of the renewable technology. Baseload renewables have a much higher capacity factor than intermittent resources such as wind and solar (95%, 30%, and 25%, respectively). The production cost model's LTCE function calculates the optimal new resource builds based on resource costs, RPS requirements, capacity factor, and APU's planning reserve margin. More details can be found under C. Model Analysis.

[24] http://scppa.org/page/RFPs-ResourceProject

## C. MODEL ANALYSIS – PRODUCTION COST MODEL

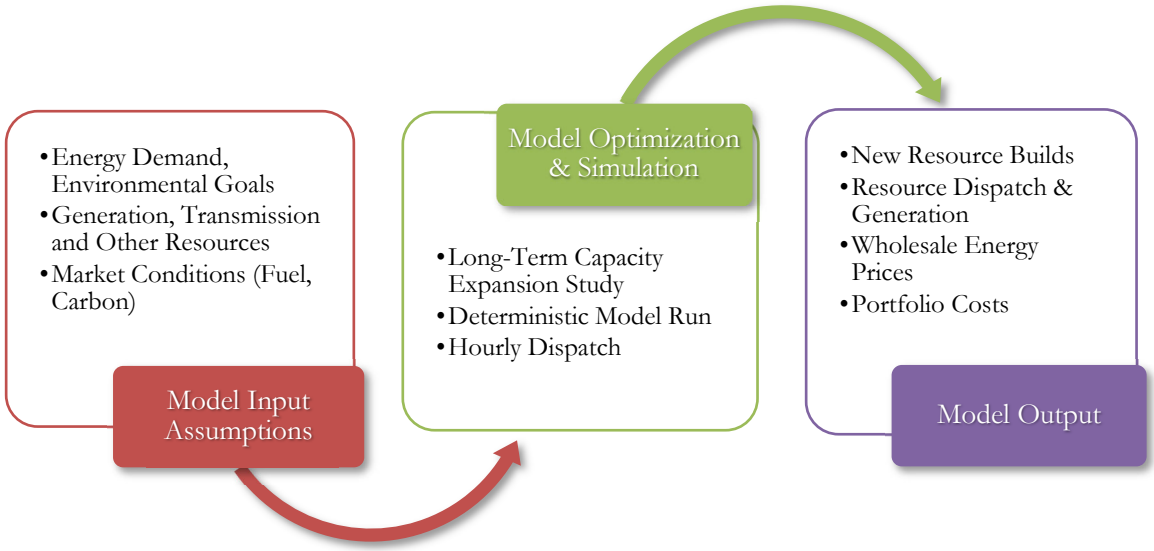



The Public Utilities Code Section 9621(c)(1) requires the IRP to address procurement for energy efficiency and demand response resources, energy storage, transportation electrification, short-term and long-term electricity, electricity related, and resource adequacy products.

Energy efficiency, demand response and transportation electrification are considered in the demand forecast and model stress tests. This section considers energy storage, short-term and long-term electricity, electricity related, and resource adequacy products.

### PRODUCTION COST MODEL

Considerable quantitative analysis was performed to evaluate the candidate portfolios. Staff used a production cost model to perform hourly chronological unit commitment and evaluated dispatch model runs of how APU would meet its energy demand for a 20-year study period, from 2023 through 2042. The following graphic shows the elements of the production cost modeling process.




### INPUT ASSUMPTIONS

The main input assumptions include energy demand, environmental targets, resource constraints and costs, and fuel and carbon prices.

APU's energy demand was developed under Section VI. Energy Demand and Peak Forecasts. APU utilized a production cost model that contains information of other utility areas energy demand forecast, and the generation, transmission, and other resources such as energy storage and demand response.

The production cost model has an extensive database of the Western Interconnect that includes grid wide data such as hydro conditions, fuel prices, heat rates, maintenance schedules, area demand, GHG emissions, transmission constraints, and variable and fixed unit costs. The model obtains grid-wide data via publicly available sources from the North American Electric Reliability Corporation (NERC), the Energy Information Administration (EIA), the Environmental Protection Agency (EPA), and various balancing authorities. Input assumptions are periodically updated, and the model run results are validated against historical actuals.

These base assumptions can be modified to allow utility specific and detailed analysis. APU updates market conditions including fuel prices and carbon allowance costs to reflect the most updated information. Key input assumptions are detailed in D. Model Analysis - Input Assumptions.

## MODEL SIMULATION

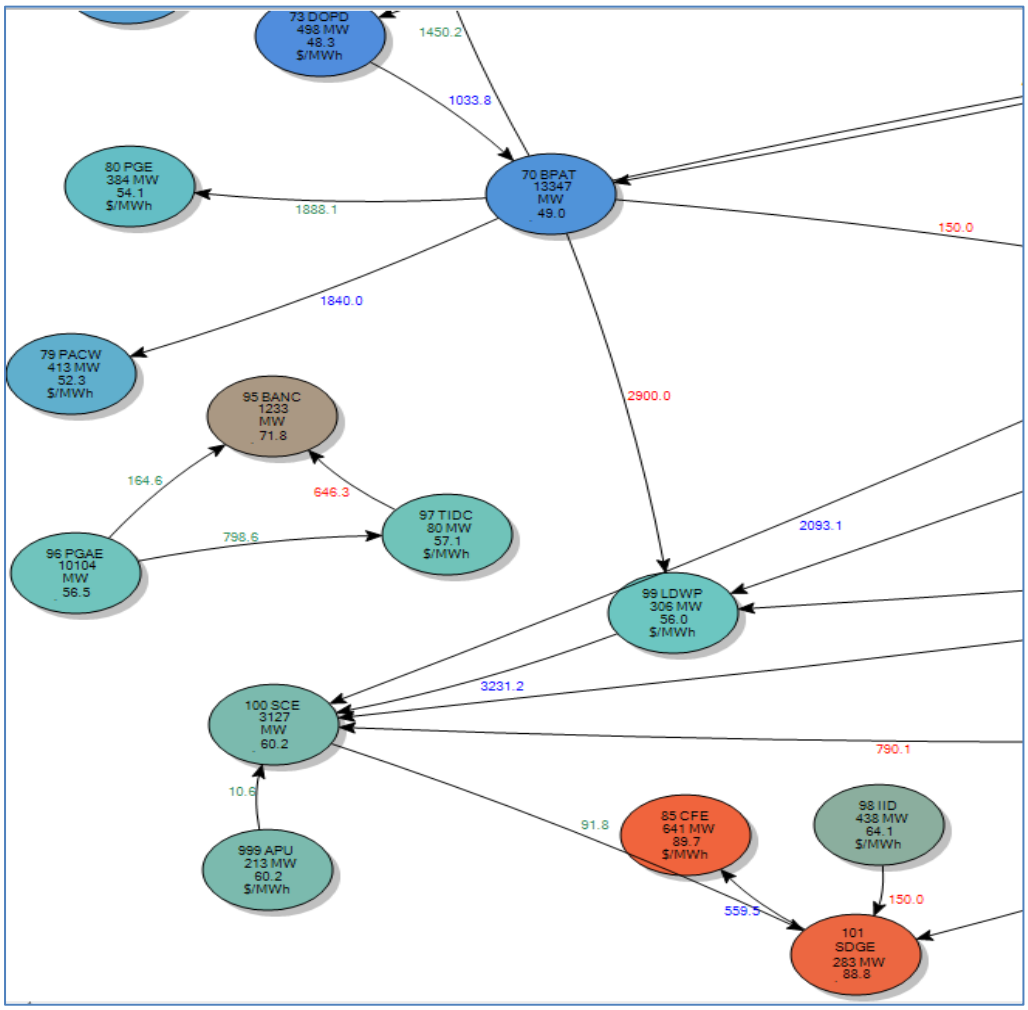
APU first uses long-term capacity expansion (LTCE) studies to determine the optimal new resource builds based on the input assumptions. Once the new resource builds are determined, APU uses the deterministic model which calculates an hourly dispatch to simulate how the energy market will dispatch the available resources to meet the region's estimated energy demand on an hourly basis. A model simulation was performed for each of the candidate portfolios.

Once the input assumptions are incorporated into the database, portfolio simulations or model runs are conducted. As an example, Graph 27 illustrates the system diagram for a particular hour during the model run, including the energy flow from between balancing areas containing loads and resources. The energy demand is displayed within the utility bubble; the energy flows between utilities areas are displayed on the arrows that depict transmission lines. The colors of the bubbles are indicators of energy prices, with red representing the highest and blue representing the lowest energy prices. This process is conducted in hourly intervals for the time span specified by the user. The results of the market simulation are retrieved in the output tables of the associated model run.

Deterministic model runs reflect expected or normal conditions for each hour of the year. For example, under deterministic analysis, weather, unit forced outages, gas prices, and intermittent resource generation are all assumed to be normal on every day of the year. The abnormal or extreme conditions are introduced after the initial model runs, in F. Stress Testing.

Note that APU is set up as a separate area only for reporting purposes. During model simulations, it is considered within the SCE area and has the same market price as the SCE region.

**Graph 27: System Diagram (Partial)**




## MODEL OUTPUT

With the input assumptions and model simulation, the production cost modeling software will produce the model output including the following:

- New resource builds: Optimal new resource builds that achieve the highest net revenues for the planning horizon.
- Hourly resource generation (MWh): The resources that are dispatched to meet the energy demand during the specific hour and their respective dispatch costs.
- Wholesale energy prices: The wholesale energy price for the hour.
- Portfolio costs: The fixed, variable, fuel, and carbon costs

The output for each candidate portfolio was evaluated and compared against each other in E. Model Analysis – Output Evaluation.

## D. MODEL ANALYSIS – INPUT ASSUMPTIONS

Key input assumptions utilized in the production cost model are shown below.


### SYSTEM-WIDE GENERATION RETIREMENT AND ADDITIONS

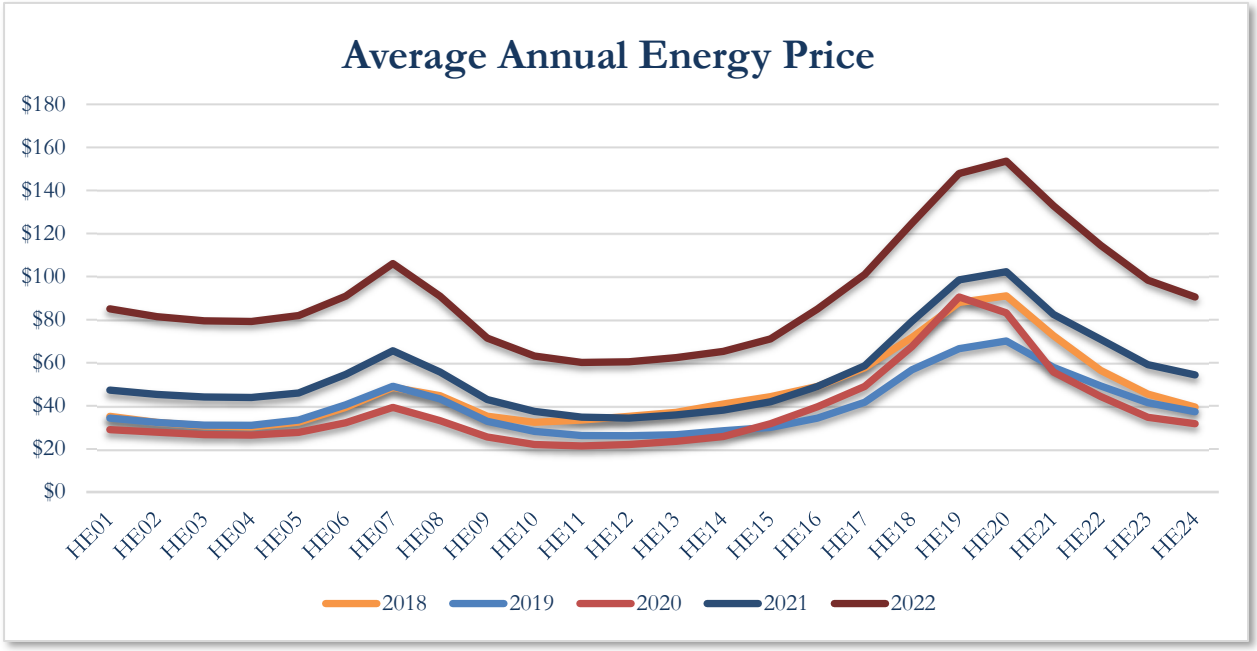
APU's 2018 IRP observed the declining trend of wholesale energy prices at SP 15 from 2013 to 2017 as more renewables were added to the Grid and the conventional fossil fuel generation resources remained. For the next three years, energy prices continued to decline due to the surge of utility-scale renewables without the corresponding increase in demand. The annual average wholesale price was $46.80, $39.50, and $37.90/MWh for 2018, 2019, and 2020 respectively, even though 2020 had a hotter summer which only drove prices up for part of the year.

**Increasing energy prices with power plant retirements**

The trend started to reverse in 2021 with an average energy price of $55.10/MWh, as more fossil fuel generation resources retired. Energy prices increased even further in 2022 at an average of $91.60, along with natural gas price hikes and more fossil fuel generation units retiring.

Graph 28 illustrates the average hourly energy price at SP 15[25] for 2018 through 2022. The retirement of fossil fuel resources replaced by variable energy resources continues to play a major role in shifting the supply curves and corresponding wholesale energy prices.

**Graph 28: Average Annual SP-15 Energy Price**




[25] South of California transmission Path 15, a CAISO pricing zone covering Southern California.

In September 2022, the production cost model vendor released the new WECC Zonal database, which included a calibrated LTCE database with forecasted resource additions and retirement for the next 20 years. The database forecast is based on the various RPS and carbon emissions reduction goals in all WECC States. APU utilizes this database for system-wide planned additions and retirement.

Details of the vendor's WECC Zonal database forecast may not be shared, as it is proprietary information. Staff compared the new LTCE database with the following public reference data sources:

1. CAISO Interconnection list and the Retirement and Mothball list:

   Staff reviewed the CAISO Interconnection list and the Retirement and Mothball list for planned additions and retirement and considered the possibility of using the lists as input data. However, the CAISO lists only contain information for the next few years. In addition, not all resources on the Interconnection List are expected to be built, and the planned retirement dates may change. The LTCE database is considered a preferred data source for long-term resource planning.

2. SB 100 Joint Agency Report RESOLVE Model data:

   Staff reviewed the RESOLVE model data released as part of the SB 100 Joint Agency Report[26]. The LTCE resource builds are compared to the resource builds under the SB100 Reference Case for the "Retail Only" and "Retail + Losses" scenarios for four simulation years 2027, 2030, 2035 and 2040. Differences are observed but deemed acceptable for the long-term planning horizon.

   The 2023 IRP process is looking to compare differences among various approaches for the long-term outlook, and not to determine the absolute values for each approach. Indeed, with a multitude of variables involved in a 20-year long-term analysis, actual market conditions may change very quickly after the conclusion of the 2023 IRP analysis.

3. Current energy market changes:

   Staff made updates to the LTCE database where necessary. For example, the planned retirement dates for the Diablo Canyon nuclear power plant and the Scattergood generating station units are extended to reflect changes after the database release.

## EXISTING APU RESOURCES

For each APU resource or contract, staff examined the generic data in the model, and updated model inputs where necessary. The information updated may include heat rates, minimum run times, startup times, fuel types, variable costs, fixed costs, emission factors, capacity, capacity shape, planned outages, area, resource beginning and end dates, and any other information that impacts the unit dispatch.

[26] https://www.energy.ca.gov/sb100

## NEW APU CANDIDATE RESOURCES

The production cost model's WECC database contains an input table with new candidate resource profiles (including costs) for different planning regions. Staff mapped APU's new candidate resources to the SCE candidate resources in the database. In addition, cost information is reviewed and updated with current market intelligence. The cost may come from the SCPPA Request for Proposals[27] for renewable generation, recently executed or negotiated APU agreements, or renewable agreements in APU's existing portfolio.

The candidate resources include solar, wind, geothermal, landfill gas, energy storage, and hybrid resources (solar + storage).

## ENVIRONMENTAL GOALS

Only the annual RPS goals are used for the LTCE model runs due to the following reasons:

1. Adding both the RPS and emission goals would slow down run time.
2. Portfolios meeting the RPS goals naturally achieves the emissions goals. Staff performs post model run review to ensure the emission reduction goals are met for all LCTE runs.

As previously mentioned, the RPS goals assume that:

1. A straight-line method is used to determine interim targets between 2030 (60%), 2035 (90%) 2040 (95%), and 2045 (100%).
2. Post 2030, the same rules remain for banking, long-term resource obligation, and the limitations of renewable resources in different "buckets" or categories.

## NATURAL GAS PRICE

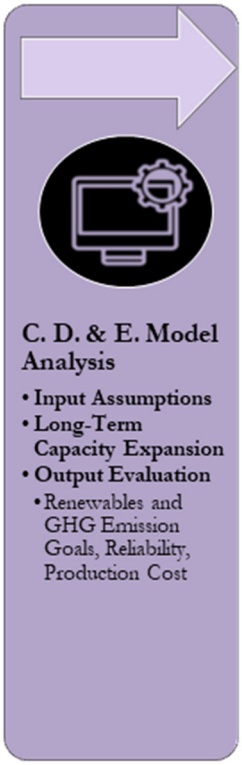
Natural gas prices were derived from the S&P Global gas forward prices and adjusted for basis differential between Henry Hub and the SoCal City Gate. An escalation rate of 2.5% was applied to develop the expected gas forward curve, which is consistent with the inflation rate used for the overall model run.

## CAP AND TRADE ALLOWANCE PRICES

The 2023 IRP assumed the continuation of freely allocated carbon allowances for retail sales compliance through 2030, and APU's practice of purchasing carbon allowances for compliance obligations associated with any wholesale electricity purchases. Consistent with the Cap-and-Trade regulations, the allowance price assumes an escalation rate of 5% + the Bureau of Labor Statistics Consumer Price Index (CPI).

[27] http://www.scppa.org/page/RFP-Request-for-Proposals-Archives

## E. MODEL ANALYSIS – OUTPUT EVALUATION




Market simulations were conducted for each candidate portfolio. All input assumptions were consistent, with the exception of the treatment of the natural gas power plants in each portfolio. This allows the most accurate comparison between portfolios. The candidate portfolios' model simulation results were analyzed and scored based on the six performance measures.

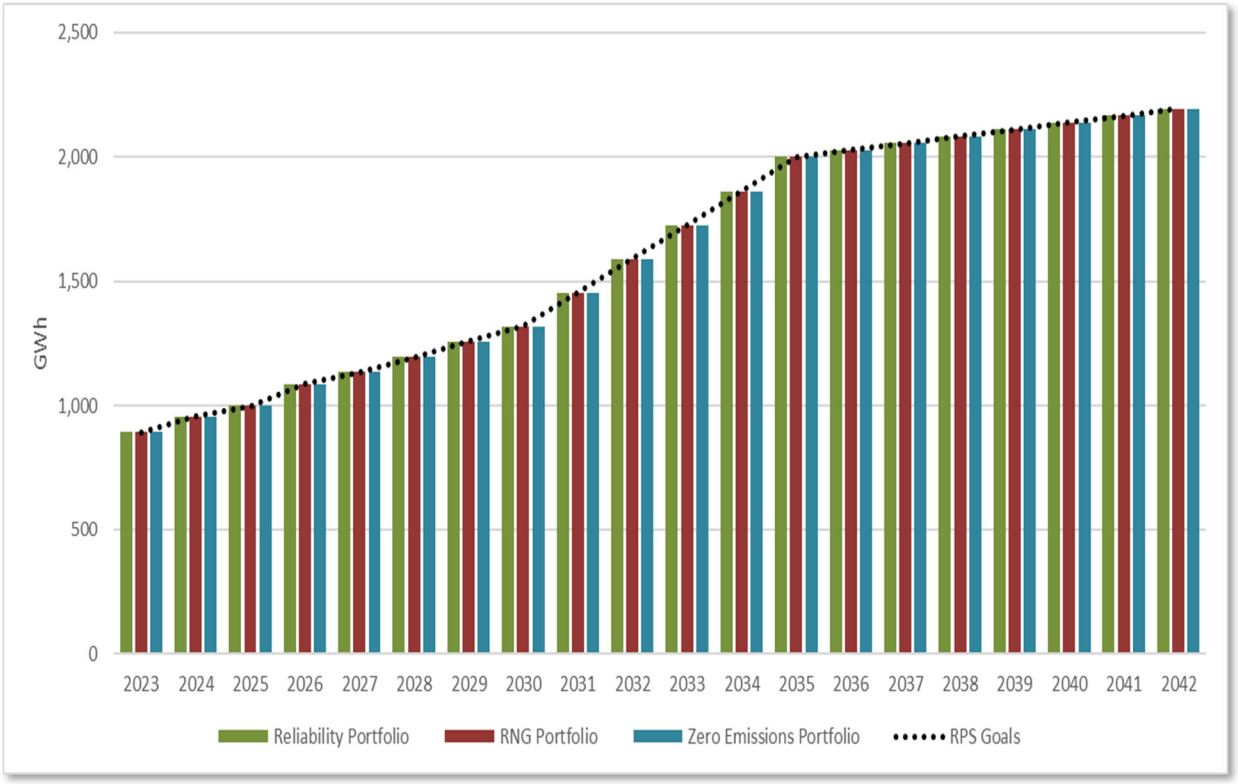
### RPS & EMISSION REDUCTION GOALS

| PERFORMANCE MEASURE | Reliability | RNG | Zero-Emissions |
|---|---|---|---|
| RPS & Emission Reduction Goals | **1** | **3** | **2** |
| Legend: 3=Best, 2=Middle, 1=Worst | | | |

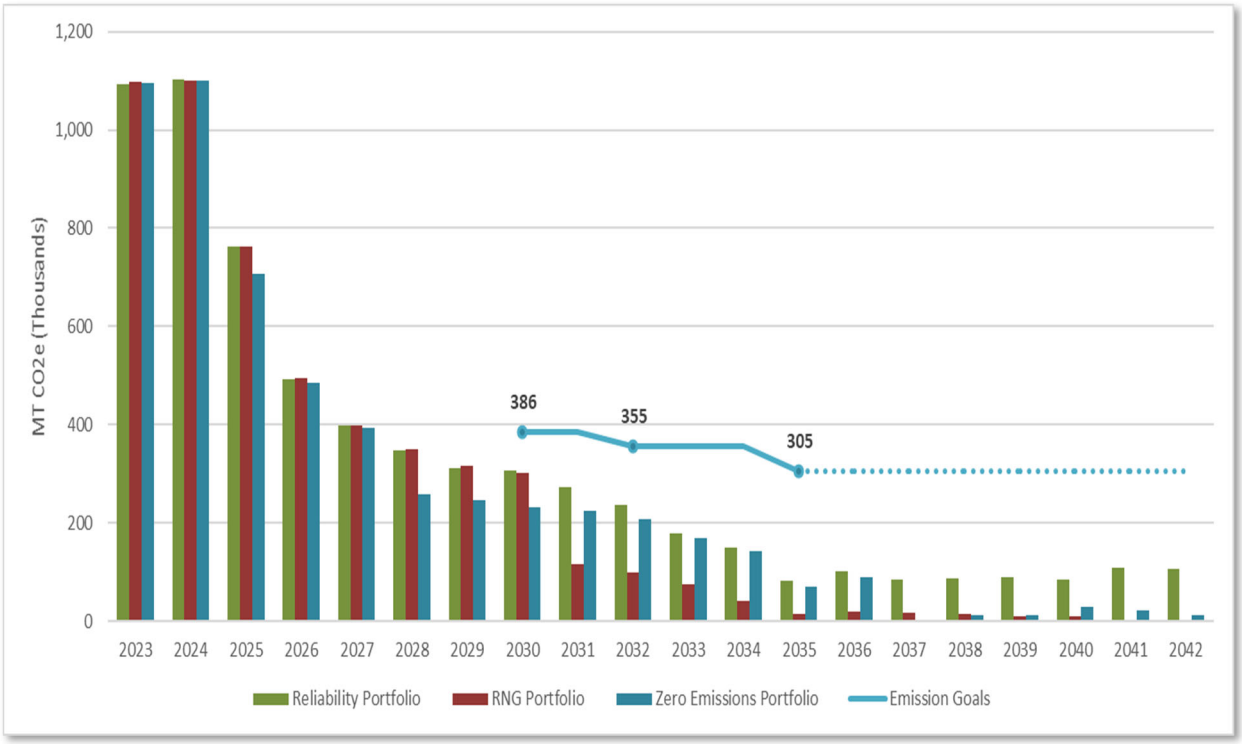
Each portfolio meets RPS and GHG goals, as shown in Graph 29 and Graph 30 below. While each portfolio performed equally in meeting RPS requirements, the RNG Portfolio produces the least amount of GHG emissions. The Reliability Portfolio produces the highest amount of carbon emissions due to the retention of both natural gas power plants through the 20-year planning horizon. Under the RNG Portfolio, the Magnolia Power Plant only uses RNG as fuel starting in 2031 and is therefore considered a carbon-neutral/zero emission resource. Under the Zero-Emissions Portfolio, the Magnolia Power Plant remains in APU portfolio through June 2037. The Zero-Emissions Portfolio also requires higher wholesale purchases in the last few years of the planning horizon, thus increasing the APU system emissions slightly again.

Because all three portfolios equally meet RPS requirements, they are ranked in order of the best portfolio having the least amount of GHG emissions. Using this ranking strategy, the RNG Portfolio performed the best, followed by the Zero-Emissions Portfolio, and then the Reliability Portfolio.

**Graph 29: Candidate Portfolio Results: RPS Compliance**




**Graph 30: Candidate Portfolio Results: Forecasted GHG Reduction**



## REGULATORY RISK

| PERFORMANCE MEASURE | Reliability | RNG | Zero-Emissions |
|---|---|---|---|
| Regulatory Risk | 3 | 1 | 2 |
| Legend: 3=Best, 2=Middle, 1=Worst | | | |

As discussed in Section A. Portfolio Considerations and Performance Measures, the preferred portfolio should also be sufficiently diversified such that APU minimizes the technological risk where one technology becomes obsolete, less cost-effective, or not acceptable under new/changing regulations. In addition, the preferred portfolio also must consider the possible changes in the reserve margin requirement.

The portfolio that has the highest risk exposure is the RNG Portfolio, resulting in 14% of the renewables portfolio coming from the RNG resources. Should RNG no longer be deemed acceptable due to future legislative and regulatory changes, APU most likely would have to honor costly long-term RNG agreements while procuring additional renewable resources to fill the void.

The portfolio that also has regulatory exposure is the Zero-Emissions portfolio. Should the planning reserve margin requirements keep increasing, or the methodology for calculating Net Qualifying Capacity (NQC) continue to further discount certain resources, APU will need to quickly procure additional capacity in an already highly constrained market to meet the Resource Adequacy requirements. More details can be found under the section below, Resource Adequacy.

## RESOURCE ADEQUACY

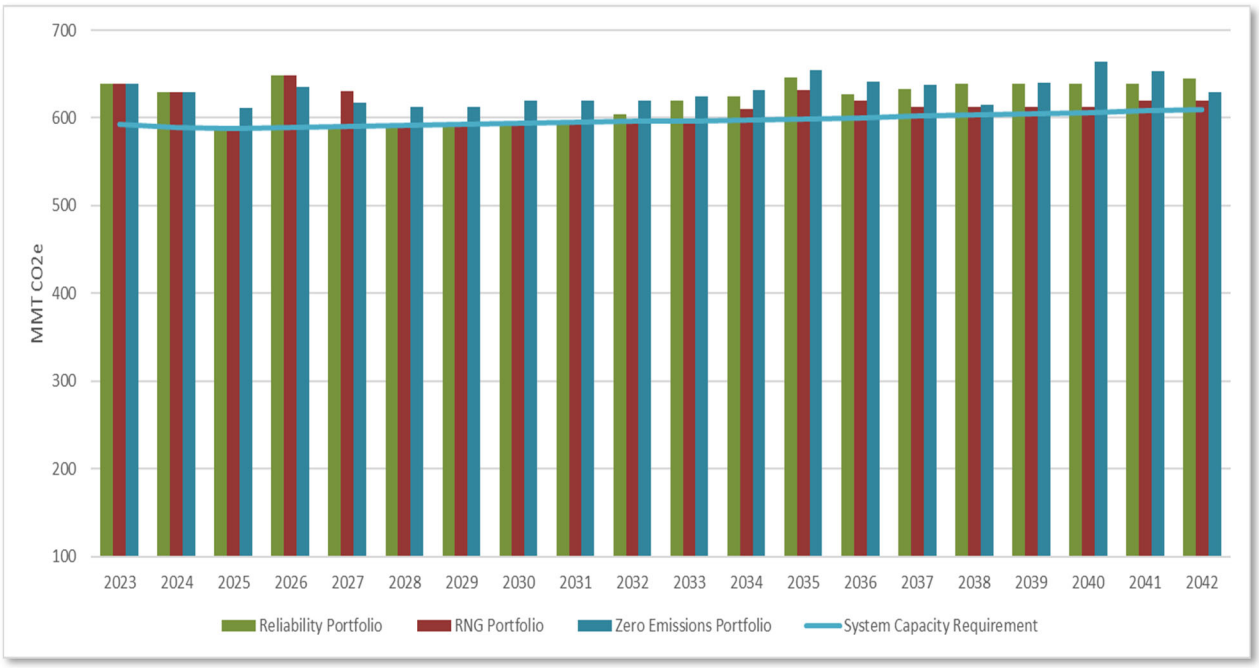
| PERFORMANCE MEASURE | Reliability | RNG | Zero-Emissions |
|---|---|---|---|
| Resource Adequacy | 3 | 3 | 1 |
| Legend: 3=Best, 2=Middle, 1=Worst | | | |

### System Capacity

The new resources in each candidate portfolio all contribute to system capacity. The baseload, solar, and wind contracts are estimated to have a capacity factor of 95%, 30%, and 25%, respectively. Timing of the new resource addition is determined by the LTCE model runs and summarized below in Graph 31. The LTCE optimization aims to meet the capacity and RPS requirements with the highest net revenue portfolios. To allow greater flexibility, staff developed the constraints to allow small amount (25 MW) of capacity shortfall in any given year to be met with short-term capacity purchases. Cost to fill the short-term capacity position are included in the Net Power Supply Costs analysis.

In Graph 31 below, all three portfolios meet the system capacity requirement with the current CAISO Resource Adequacy accounting rules. However, while both the Reliability and RNG Portfolios still offer 333 MW of "firm" resources[28] through 2042, only 128 MW of firm resources are available for system capacity in 2042 under the Zero-Emissions Portfolio. Firm resources refer to geothermal, biomass, biogas, nuclear, gas and coal generation, and are considered preferable under the CPUC reliability evaluations. While APU is not a CPUC-jurisdictional entity, CPUC considerations are considered for potential future impacts to the CAISO Resource Adequacy accounting rules.

**Graph 31: Candidate Portfolio Results: System Capacity**



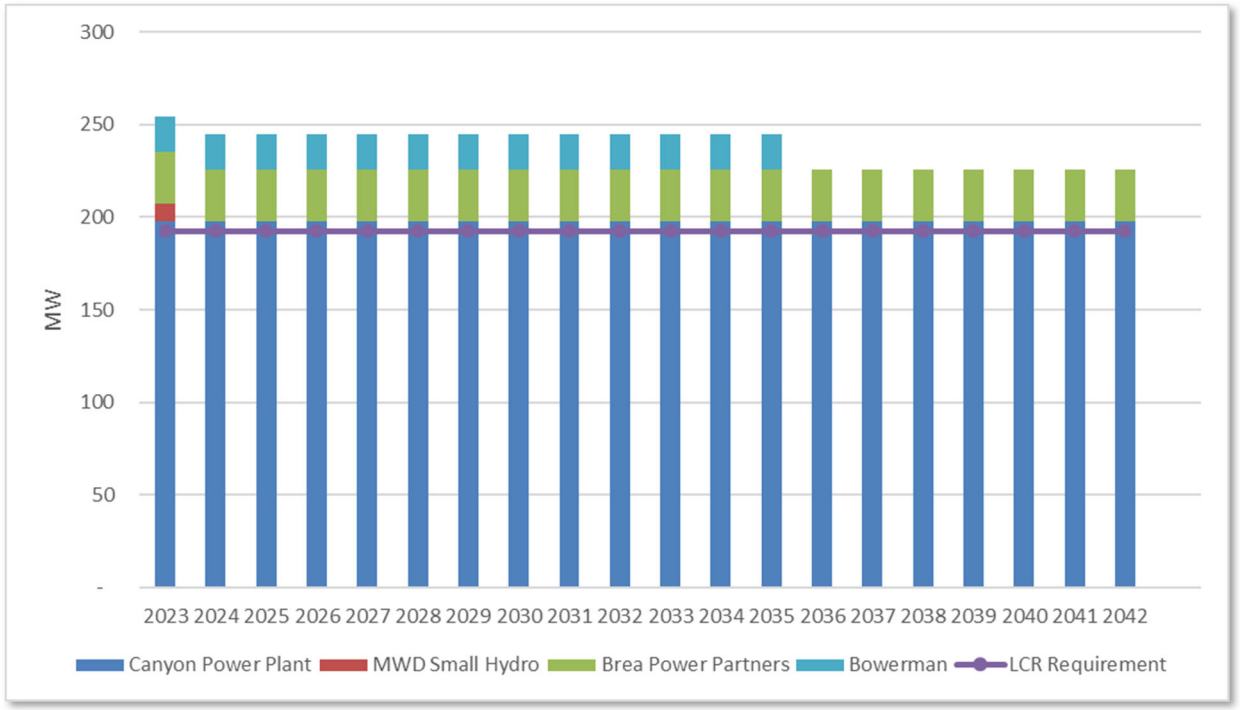

### Local Capacity

The CAISO local capacity requirement is determined by local energy demand and transmission availability and would not vary based on resource portfolio mix. The CAISO local capacity requirement for APU has been below 230 MW over the past few years and remains stable. Currently, APU has over 255 MW of natural gas and baseload renewable power plants located within the LA Basin Area.

Under the Reliability and RNG Portfolios, APU has sufficient local resources that exceed CAISO's local capacity requirements through the 20-year planning horizon. Under the Zero-Emissions Portfolio, APU relies on the battery storage capacity built within the LA Basin.

[28] P.74, CPUC Reliability Filing Requirements for Load Serving Entities' 2022 Integrated Resource Plans, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/20220729-updated-fr-and-reliability-mag-slides.pdf

**Graph 32: Local Capacity Resources and LCR Requirement – Reliability and RNG Portfolios**



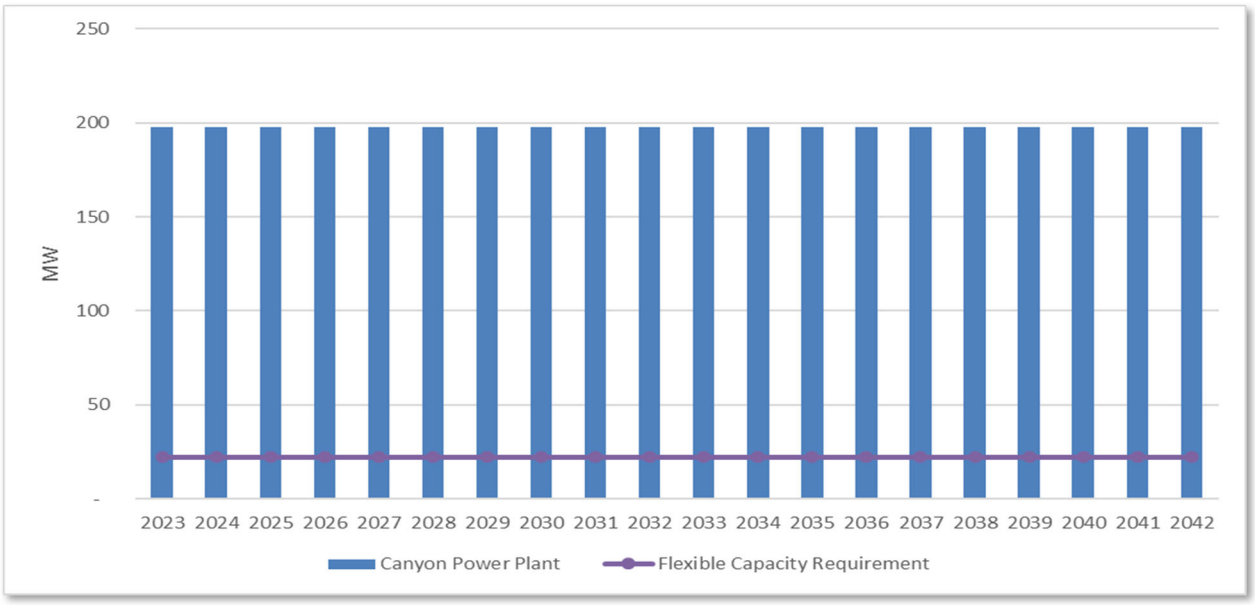

**Graph 33: Local Capacity Resources and LCR Requirement – Zero Emissions Portfolio**

### Flexible Capacity

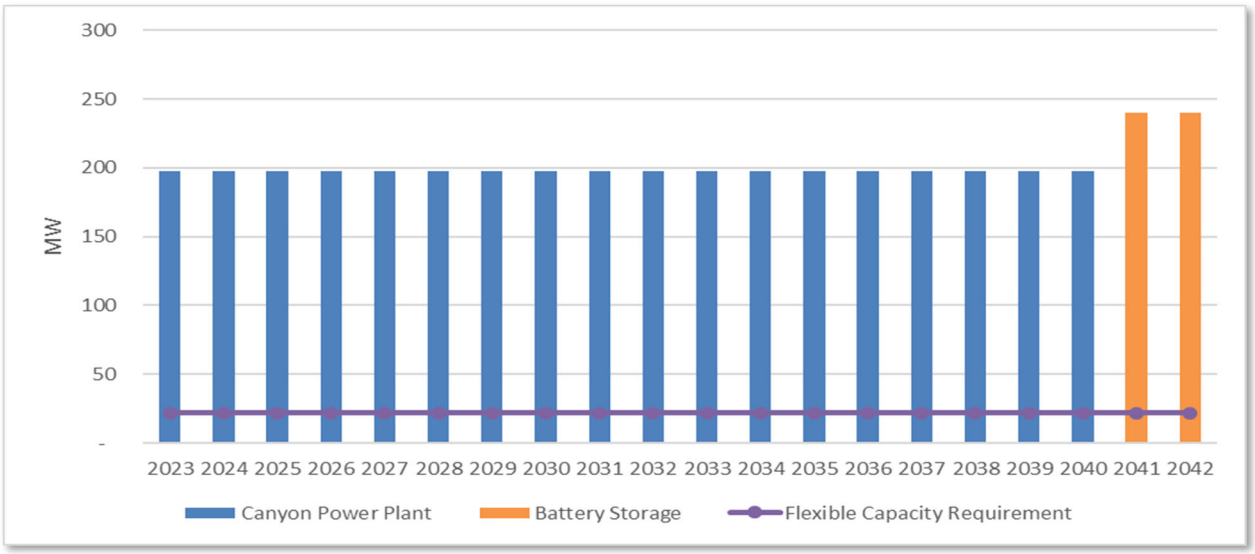
On average, APU has a monthly flexible capacity requirement of 17 MW, which peaks in May with a capacity requirement of 22 MW. Canyon Power Plant, a CAISO Category 1 flexible unit, is a Base Ramping Resource with 194 MW of eligible flexible capacity. APU has sufficient flexible capacity available through Canyon to meet the additional requirements for flexible capacity under the Reliability and RNG Portfolios. Under the Zero-Emissions Portfolio, APU relies on the new battery storage units to provide flexible capacity after Canyon decommissioning.

Graph 34 and 35 show CAISO Flexible Capacity Requirements for both the Reliability and RNG Portfolio and the Zero-Emissions Portfolio.

**Graph 34: CAISO Flexible Capacity Requirement – Reliability and RNG Portfolios**




**Graph 35: CAISO Flexible Capacity Requirement – Zero-Emissions Portfolio**



The Reliability and RNG Portfolios provide the same amount firm system capacity, local capacity, and flexible capacity and are therefore ranked equally. While the Zero Emissions Portfolio also meets the system, local, and flexible capacity requirements, it relies on non-firm resources and therefore is given a lower score.

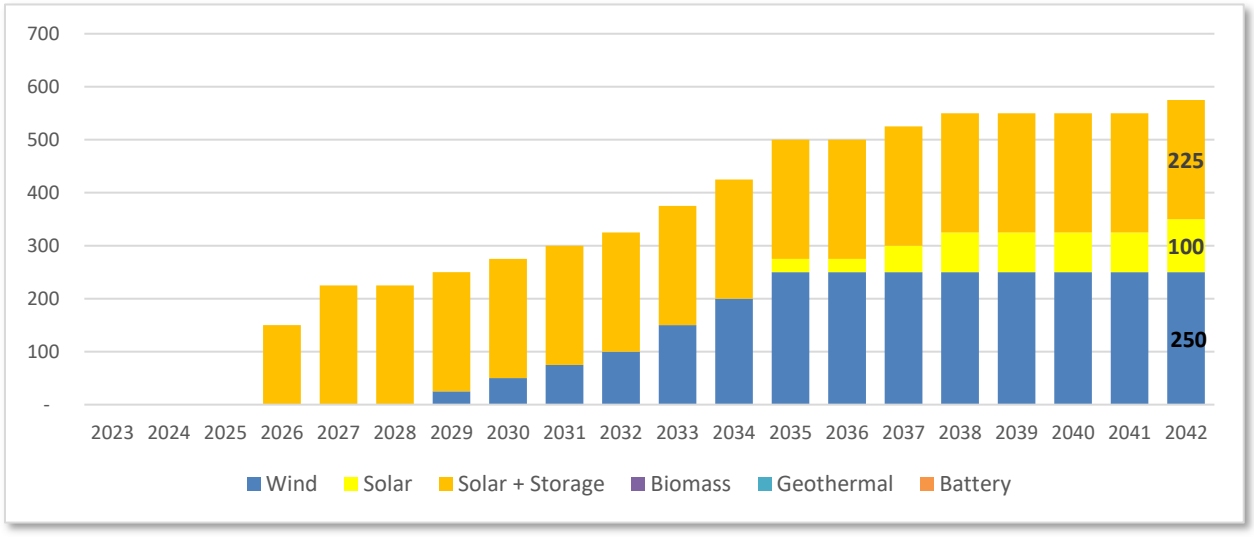
## PORTFOLIO DIVERSIFICATION

| PERFORMANCE MEASURE | Reliability | RNG | Zero-Emissions |
|---|---|---|---|
| Portfolio Diversification | 1 | 2 | 3 |
| Legend: 3=Best, 2=Middle, 1=Worst | | | |

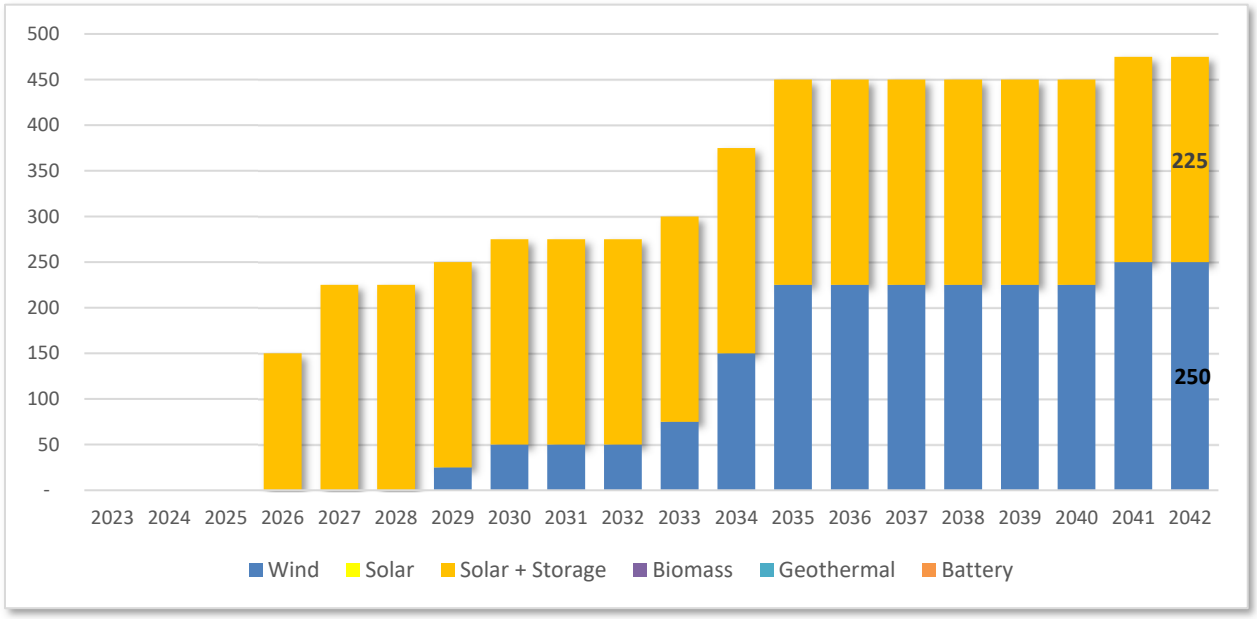
The LTCE run recommends the new resources to be added to the resource portfolio given the RPS requirements. The resource compositions are optimization results from the production cost model's LTCE run and seek the highest net revenues over the planning horizon. When necessary, staff may modify the new resource build constraints to increase the level of diversification. As an example, staff may limit the MW of solar that can be built, even though it is the lowest cost resource to achieve the RPS and GHG emission goals.

Graph 36-38 below show the new resource builds for the different portfolios, as recommended by the LTCE optimization. The legends include all new resource types available for LTCE simulation calculations. The bars represent the resources selected by the LTCE optimization. By the end of 2042, the Reliability Portfolio builds 575 MW of new resources in total: 225 MW of solar and storage hybrid (2/3 solar and 1/3 storage capacity), 100 MW of solar, and 250 MW of wind. The RNG Portfolio builds 475 MW of new resources: 225 MW of solar and storage, and 250 MW of wind. The Zero Emission Portfolio builds 775 MW of new resources: 200 MW of stand-alone battery, 100 MW of geothermal, 300 MW of solar and storage hybrid, and 175 of wind. The biomass resource is not built in any portfolio because it has the highest build cost.

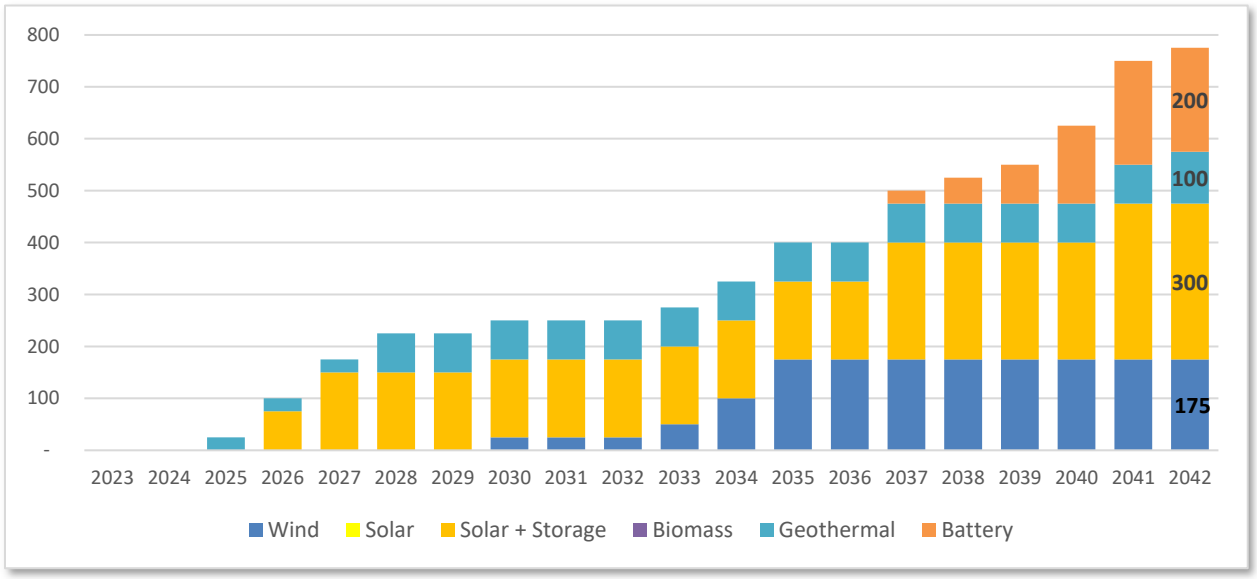
**Graph 36: New Resource Builds: Reliability Portfolio**



**Graph 37: New Resource Builds: RNG Portfolio**




**Graph 38: New Resource Builds: Zero-Emissions Portfolio**




Graph 39 below shows the estimated portfolio diversification for each of the candidate portfolios in 2024. All 3 portfolios are at 95% or above renewable and zero emissions in 2042. As such, only the renewable portion of the portfolio is shown below.

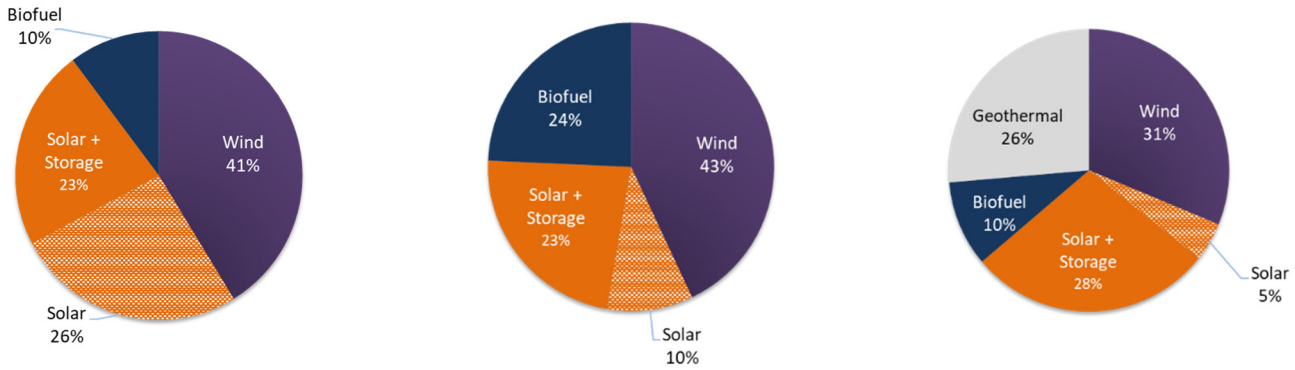
The Reliability Portfolio retains both natural gas units and requires the least amount of firm renewable resources. The battery storage units and natural gas generation can complement the variability in the renewable portfolio. Therefore, a higher percentage of solar and wind resources are observed.

The RNG portfolio restricted Magnolia Power Plant's generation to self-scheduled minimum capacity only, due to the high estimated cost of RNG. The self-scheduled RNG generation is categorized under the biofuel category on the renewable pie chart.

Under the Zero-Emissions Portfolio, new geothermal units are built to offer firm capacity. The renewable pie chart is the most diversified amongst the three candidate portfolios.

As diversity increases flexibility, reliability, and performance, a higher grading is awarded for higher diversity. The highest diversified portfolio is the Zero-Emissions Portfolio; therefore, it is the preferred portfolio under this category.

**Graph 39: New Resource Builds: Zero-Emissions Portfolio**




Reliability Portfolio | RNG Portfolio | Zero-Emissions Portfolio

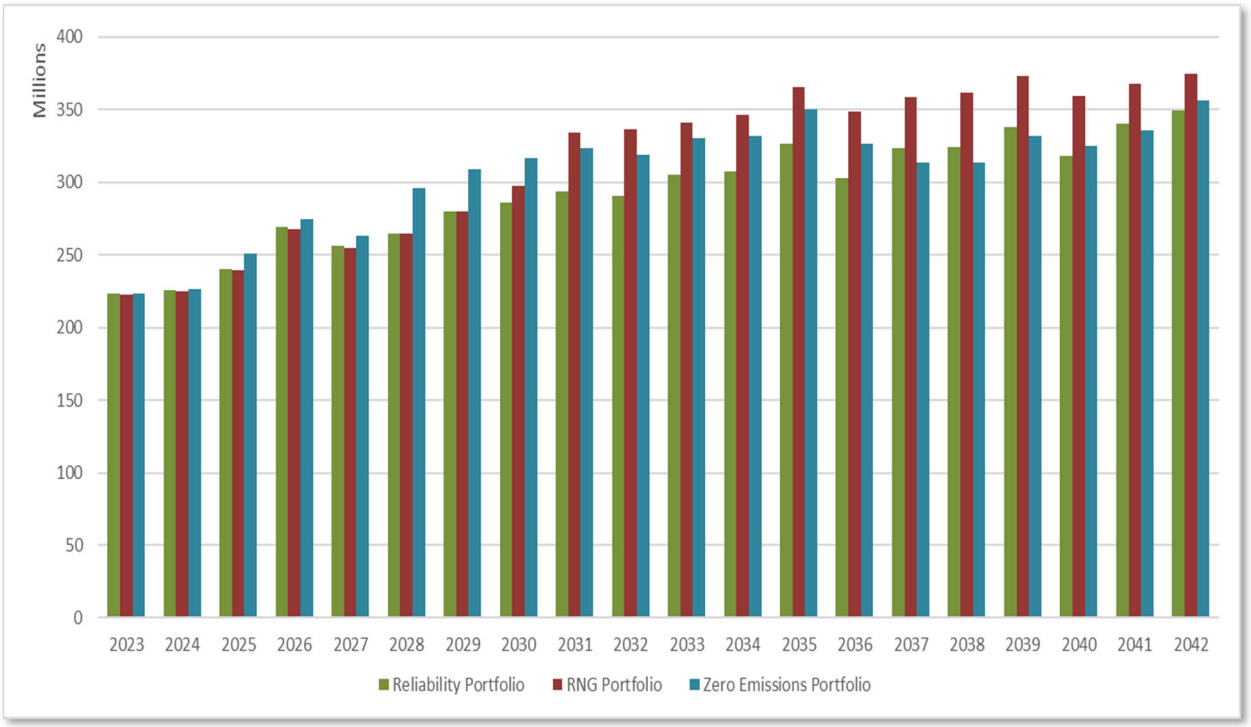
## EXPECTED COST

| PERFORMANCE MEASURE | Reliability | RNG | Zero-Emissions |
|---|---|---|---|
| Expected Cost | 3 | 1 | 2 |
| Legend: 3=Best, 2=Middle, 1=Worst | | | |

One of APU's goals is to minimize impacts on customer bills and to serve customers with just and reasonable rates. As such, the total power supply cost for each portfolio is estimated, with lower cost portfolios being awarded a higher rating.

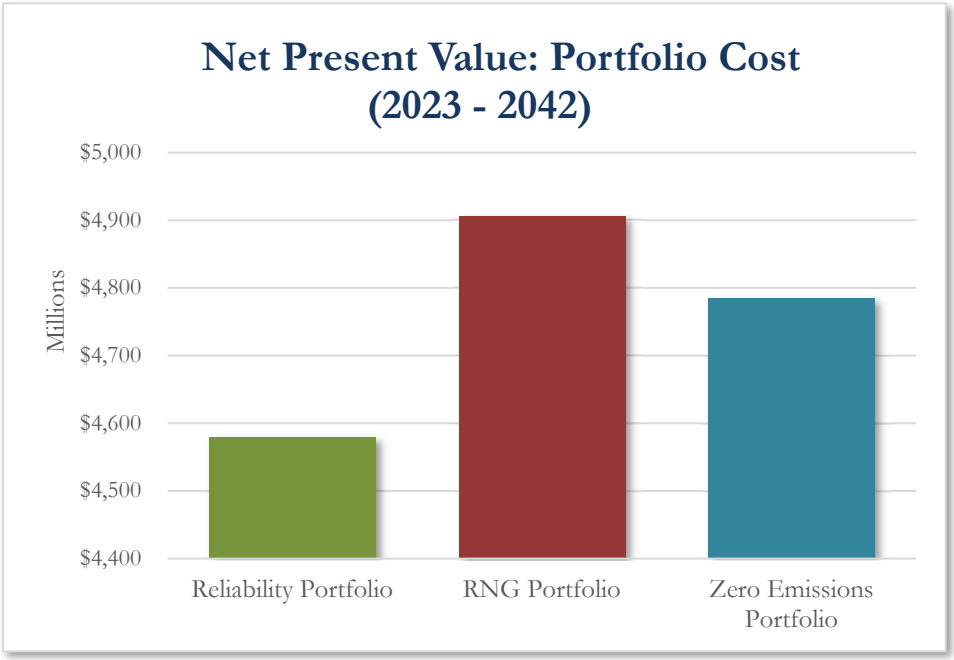
The Reliability Portfolio presents the overall lowest cost while the RNG Portfolio presents the highest costs due to expected high RNG fuel cost. The Zero Emissions Portfolio starts with higher costs to build the new renewable units and to reserve funding for decommissioning costs. However, post 2037, the net cost becomes lower with natural gas unit diversification. Graph 40 demonstrates the annual net power supply cost for each portfolio, and Graph 41 summarizes the Net Present Value (NPV) of the three different portfolios in 2023-dollar values.

**Graph 40: Candidate Portfolio Results: Net Power Supply Cost**




*Net Power Supply Cost = Total power supply costs net of transmission revenues and wholesale energy revenues

**Graph 41: Candidate Portfolio Results: NPV: Net Portfolio Cost**

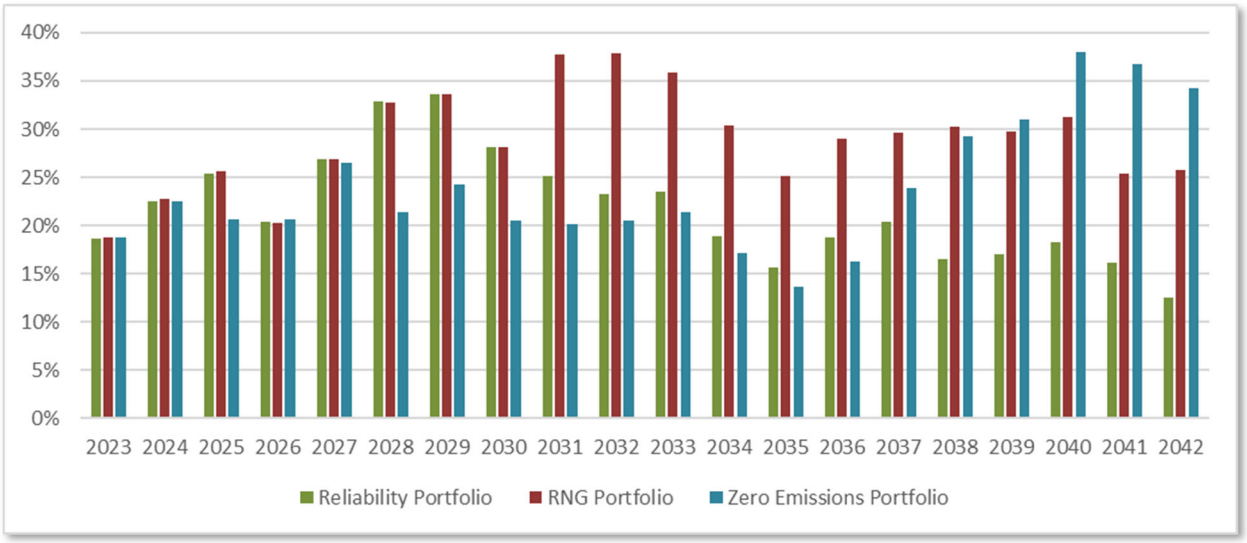


## MARKET EXPOSURE

Graph 42 below displays the estimated market exposure from the candidate portfolios. Market exposure is determined by the percentage of wholesale energy purchases compared to system load. A higher grade is awarded to the portfolios with the least amount of energy purchases required.

Overall, the Reliability Portfolio requires the smallest percentage of wholesale purchases, as both natural gas units are retained to cover short positions when the renewable resources are not available. The Zero Emission Portfolio requires a smaller percentage of wholesale purchase in the initial years, as more renewable resources are layered in earlier in the planning horizon. However, a greater percentage of wholesale purchase is required after the natural gas plants are decommissioned in 2037 and 2041. The RNG Portfolio has the highest overall percentage of wholesale purchases, because the high RNG cost makes the Magnolia Power Plant non-economical to dispatch and is priced out of the market except for the self-scheduled minimum capacity burns. At the same time, fewer other renewables are built as Magnolia is already considered a renewable resource.

**Graph 42: Candidate Portfolio Results: Wholesale Energy Purchase as a % of Total Energy Portfolio**




## SUMMARY

Overall, the Reliability Portfolio performs the best. This portfolio is estimated to have a lower overall power supply cost, offers the highest amount of firm resource capacity, and a declining reliance on natural gas power plants. It also has the least amount of Regulatory Risk and Market Exposure. It achieves both the RPS requirements and emission reductions goals. While the Reliability Portfolio is the least diversified with a greater percentage of intermittent renewables, the lower cost intermittent resources result in lower overall costs.

The RNG Portfolio, which uses RNG as Magnolia's sole fuel source starting in 2031, ranks the lowest. Its cost is the highest due to the high RNG cost and presents the highest regulatory risk with the uncertainty surrounding RNG's status as a carbon-free fuel source. The market exposure is also the highest, as Magnolia is priced out of the market most of the time and fewer other renewables are procured. This portfolio meets both RPS requirements and emission reductions, with the lowest

emission amount. In addition, it offers the same amount of firm resource capacity as the Reliability Portfolio, and its portfolio diversification is ranked in the middle.

The Zero Emissions Portfolio, which exits both natural gas power plants, ranks in the middle. It presents the highest level of diversification and the lowest level of firm resource capacity. Other than diversification and resource adequacy, it ranks in the middle for all other categories.

The following table displays a summary of the performance measure results for each portfolio scenario considered:

| **PERFORMANCE MEASURE** | **Reliability** | **RNG** | **Zero Emissions** |
|---|---|---|---|
| RPS & Emission Reduction Goals | 1 | 3 | 2 |
| Regulatory Risk | 3 | 1 | 2 |
| Resource Adequacy | 3 | 3 | 1 |
| Portfolio Diversification | 1 | 2 | 3 |
| Expected Cost | 3 | 1 | 2 |
| Market Exposure | 3 | 1 | 2 |
| **Total** | **14** | **11** | **12** |

# F. STRESS TESTING


Additional analysis of the candidate portfolios was conducted using stress tests to determine whether the portfolio performance would change under extreme market and load changes. Portfolio simulations were performed for each candidate portfolio to address the following situations.

## F.1. COMPONENTS OF THE STRESS TESTS

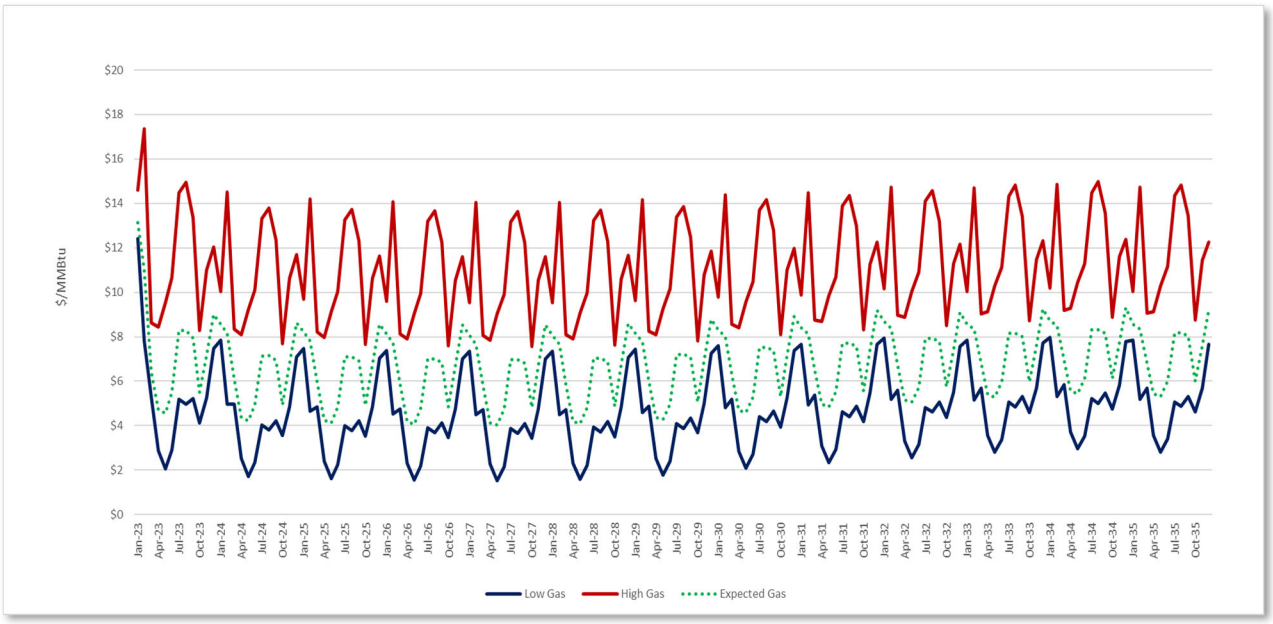
### TEST 1: EXTREME HIGH-COSTS VS. EXTREME LOW-COSTS

A market simulation stress test was conducted by simulating portfolio performance under extreme cost situations. Each case uses the extreme high and low estimates of natural gas prices and the utility-scale renewable growth. In addition, a higher reserve margin of 17% was also added to the extreme high-cost scenario.

### GAS PRICE

APU's power supply portfolio includes resources that use natural gas as a fuel. In addition, resource dispatch and market prices are heavily influenced by gas prices. Two standard deviations were added to the expected gas price to develop the high gas price scenario. One standard deviation was deducted from the expected gas price to develop the low gas price scenario. Standard deviations were calculated using five-year historical data of the SoCal Citygate price. Graph 43 shows the gas prices used to stress test the three portfolios. The market volatility has increased significantly since APU's 2018 IRP evaluation.

**Graph 43: Stressed Gas Prices (Partial)**



## UTILITY SCALE RENEWABLES GROWTH

In September 2022, the production cost model vendor released the new WECC Zonal database which included a calibrated LTCE database with forecasted resource additions and retirement for the next 20 years. The database forecast is based on the various RPS and carbon emission reduction goals in all WECC States.

The high utility-scale renewables growth scenario was developed assuming a 25% increase of all existing LTCE new resources in the production cost model database. The low utility-scale solar growth assumed a 25% decrease from the LTCE new resource builds. Since the database contains proprietary information, a graph is not shown for comparison.

### TEST 2: EXTREME HIGH DEMAND VERSUS EXTREME LOW DEMAND

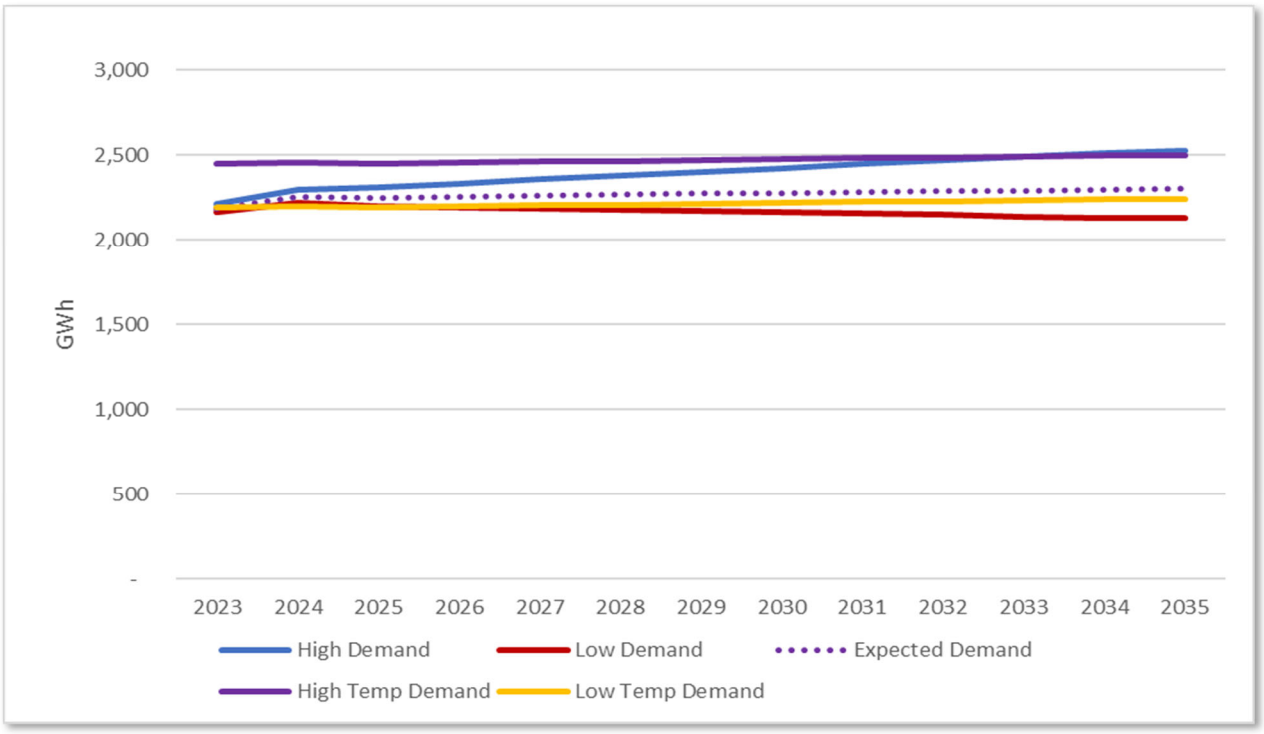
A high demand scenario was developed by applying extremes to the base demand forecast described in Section V.A. Energy Demand Forecast Methodology & Assumptions. Energy efficiency and solar growth effects were removed from the base demand forecast, and accelerated growth in transportation electrification was applied at 25% above the expected growth.

Similarly, a low demand scenario was also developed by applying extremes to the base demand forecast described in Section V.A. Energy Demand Forecast - Methodology & Assumptions. Electric vehicle growth was reduced by 25%, while energy efficiency and solar growth was increased by 25%.

Once the High Demand and Low Demand scenarios were calculated, they are further compared to the High Temperature Demand and Low Temperature Demand developed under Chapter VI. Energy Demand and Peak Forecast – Extreme Weather Impact. Staff took the higher of the High Demand or High Temperature Demand as the final extreme high demand scenario. Similarly, staff took the lower of the Low Demand or the Low Temperature Demand as the final extreme low demand scenario.

Graph 44 below also displays the Expected Energy Demand, High Demand, High Temperature Demand, Low Demand and Low Temperature Demand scenarios. As observed in Graph 44 below, for the final extreme high demand scenario, the High Temperature Demand was used for the initial years, followed by the High Demand. For the final extreme low demand scenario, the Low Demand was used for most years, except for a few initial years when the Low Temperature Demand was used.

**Graph 44: Stressed System Load Growth or Reduction (GWh)(Partial)**




## F.2. MODEL RESULTS UNDER STRESS TESTS

For each portfolio, the model runs performed for the four extreme scenarios are as follows:

1. Extreme high demand scenario: A new LTCE run is completed in case new resources need to be added to provide for the higher energy demand.
2. Extreme low demand scenario, extreme high-cost scenario, and extreme low-cost scenario: A standard model simulation is completed assuming the resources with long-term agreements cannot be disposed of during the planning horizon.

Four extreme scenarios were run for each of the three portfolios. In total, twelve new model runs were conducted to compare the high and low demand, and high and low-cost scenarios.

The following table displays a summary of the performance measure results after stress testing each portfolio scenario.

| PERFORMANCE MEASURE | Reliability | RNG | Zero Emissions |
|---|---|---|---|
| RPS & Emission Reduction Goals | 1 | 3 | 2 |
| Regulatory Risk | 3 | 1 | 2 |
| Resource Adequacy | 3 | 3 | 1 |
| Portfolio Diversification | 1 | 2 | 3 |
| Expected Cost | 3 | 1 | 2 |
| Market Exposure | 3 | 1 | 2 |
| **Total** | **14** | **11** | **12** |

The model simulation results held constant for all three portfolios under the stress tests, with the Reliability Portfolio performing the best. Below are details of the tests:

Under either stress test of High versus Low Costs or High versus Low Demand, the portfolio scores of the following performance measures stayed the same: Compliance, Regulatory Risk, Resource Adequacy, Portfolio Diversification, and Market Exposure. The only components that could change are Expected Cost, or the net power supply costs, as detailed below.

Graph 45 below displays the year-over-year simulation results for each candidate portfolio under these cost extremes. The total portfolio cost for each candidate portfolio with high and low-cost scenarios are displayed as lines, and total retail revenue is displayed in columns, at the current retail rate.

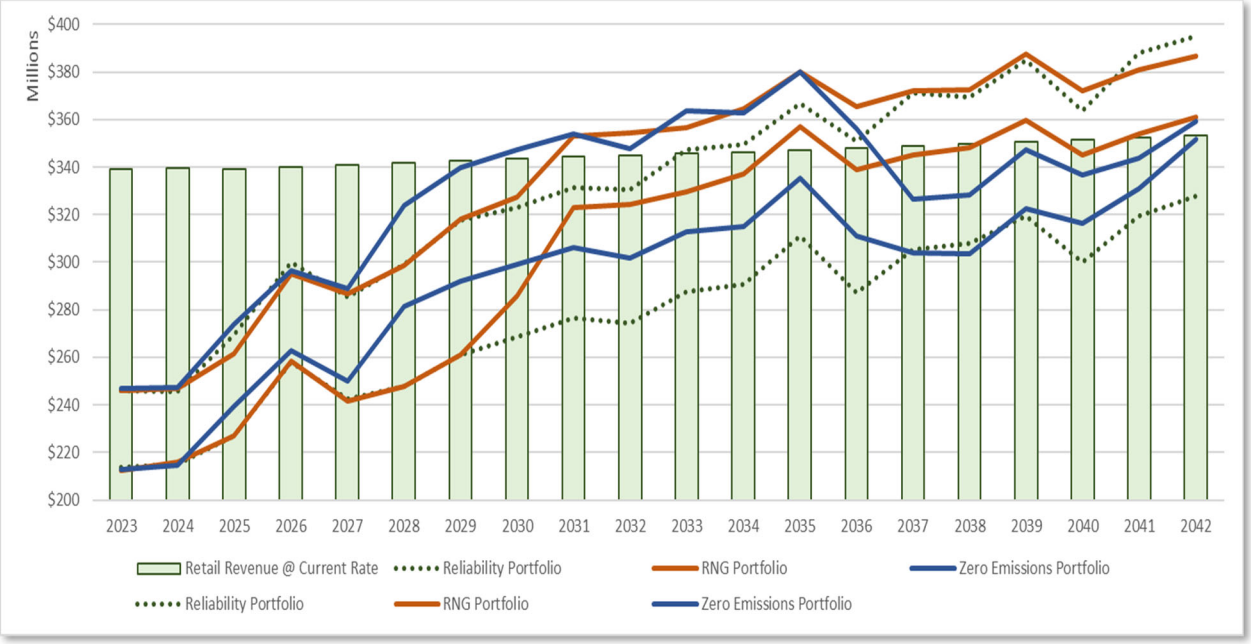
The Reliability Portfolio performs extremely well under the extreme low-cost scenario. The cost increases drastically with the high-cost scenario. APU is aware of the portfolio sensitivity to natural gas prices and is in the practice of procuring mid-term and long-term natural gas products to hedge against market price volatility.

The RNG Portfolio presents a very high cost under the extreme low-cost scenario, as the RNG Portfolio has a long-term fixed price contract floating against the stable Henry Hub price and not the volatile So Cal City Gate price. On the other hand, because the fixed cost of RNG is not impacted by the natural gas market volatility, it outperforms the Reliability Portfolio in the last two years of the planning horizon.

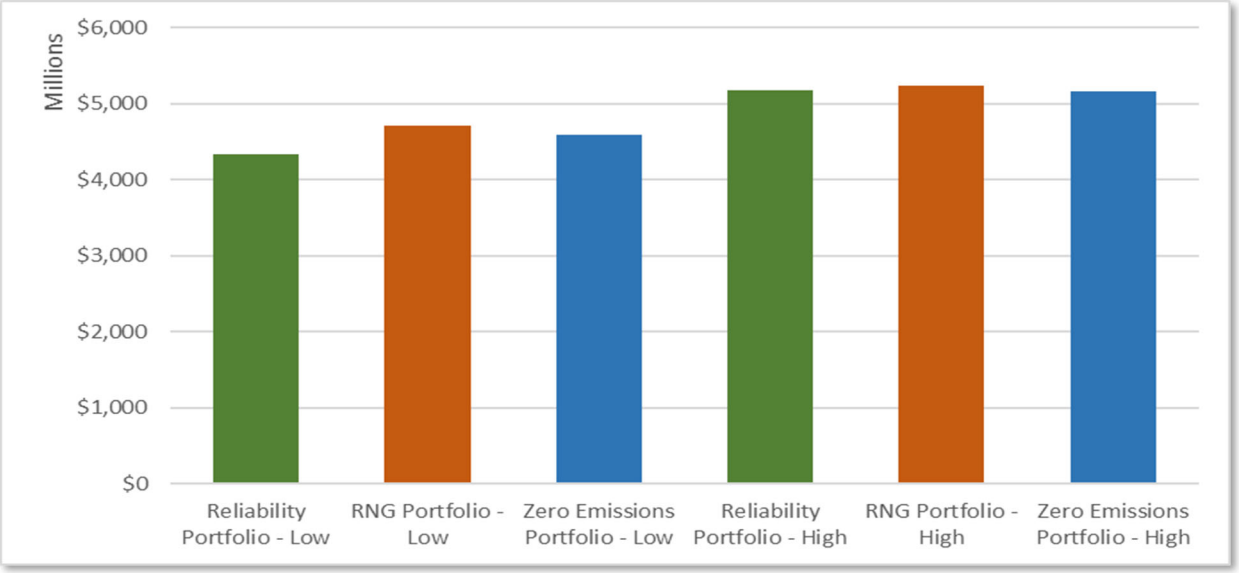
The Zero Emissions Portfolio starts out with higher costs as renewables are added earlier in the planning horizon, and as more baseload renewable (geothermal) is added to the portfolio for reliability purposes. Costs start to decrease after APU exits the natural gas power plants. In 2041 and in 2042, the overall net power supply costs start to converge, because APU is able to sell excess energy at a higher price in the "high cost" environment where insufficient generation is built for the Grid.

Over the 20-year planning horizon, the Reliability Portfolio still outperforms the other two portfolios. Graph 46 displays the Net Present Value (NPV) under extreme cost conditions for all three resource portfolios. The only extreme scenario that outperforms the Reliability Portfolio is the Zero Emission Portfolio under the extreme high-cost scenario, where its NPV is 0.3% lower than the Reliability Portfolio. When the natural gas price is two standard deviations higher than expected through 2042, and the entire WECC's new resource builds is 25% lower than the policy goals, the total NPV of the Zero Emissions Portfolio is marginally lower than the Reliability Portfolio.

**Graph 45: Stress Test Results: Extreme High Costs vs. Extreme Low Costs**



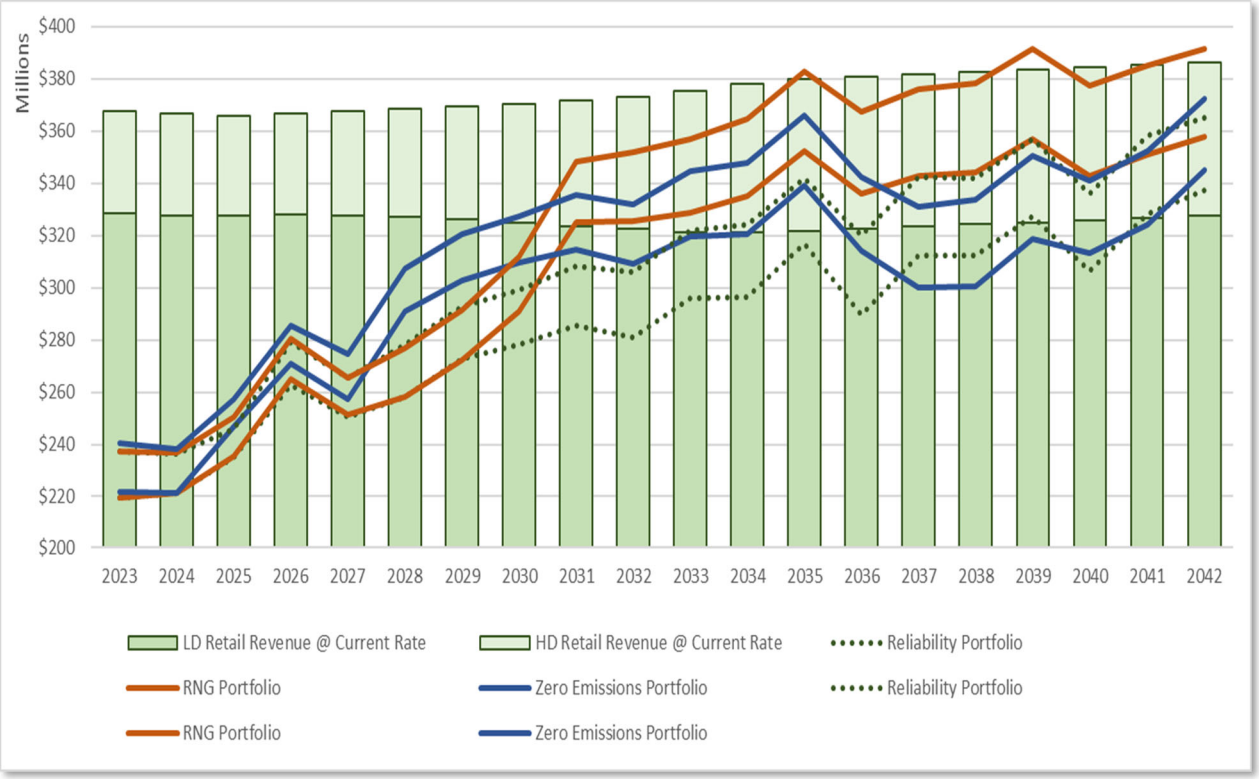

**Graph 46: Stress Test Results: Portfolio Comparison - Extreme High Costs vs. Extreme Low Costs**



Similarly, stress tests were conducted by simulating portfolio performance under extreme demand situations. A high demand extreme incorporates assumptions of high temperature or high EV growth, low solar, and low energy efficiency. A low demand extreme incorporates assumptions of low temperature or low EV growth, high solar, and high energy efficiency. Graph 47 below displays the simulation results for each candidate portfolio under these load growth extremes.

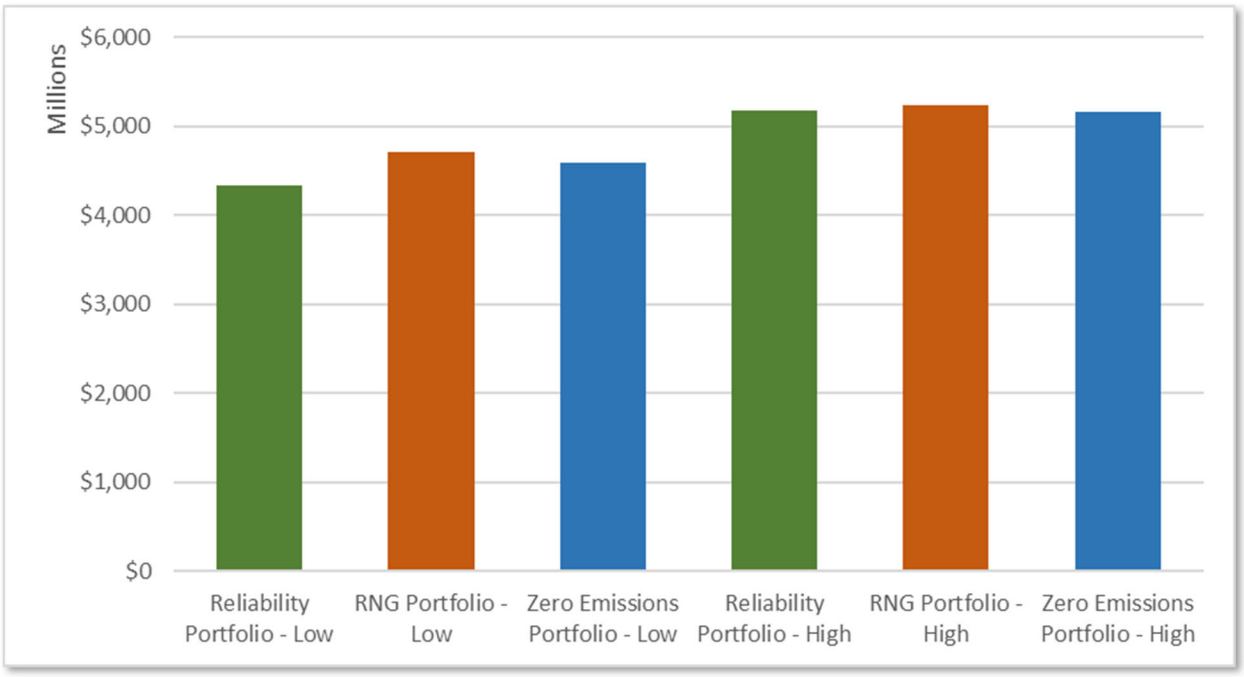
In Graph 47, the total portfolio cost for each candidate portfolio under high and low load growth scenarios are displayed as lines, and total retail revenue is displayed in columns. Estimated retail revenue for the low demand scenario is displayed as only the dark green column, while estimated retail revenue for the high demand scenario is displayed as the total of the light green columns. The Reliability Portfolio, shown as the green dotted line, performs the best under both demand situations. The RNG Portfolio performs the worst, with expenses being notably higher than the Reliability Portfolio. The scaling to retail revenue is intended as a reference to potential rate increases needed to supplement the changing demand scenarios.

**Graph 47: Stress Test Results: Extreme High Demand vs. Extreme Low Demand**




Graph 48 below illustrates that under the extreme demand scenarios, the Reliability Portfolio performs the best and offers the lowest overall net power supply cost. The Zero Emissions Portfolio comes in second, and the RNG Portfolio has the highest net power supply cost.

**Graph 48: Stress Test Results: Portfolio Comparison - Extreme High Demand vs. Extreme Low Demand**




**G. Optimum Portfolio Selection**

## G. OPTIMUM PORTFOLIO SELECTION

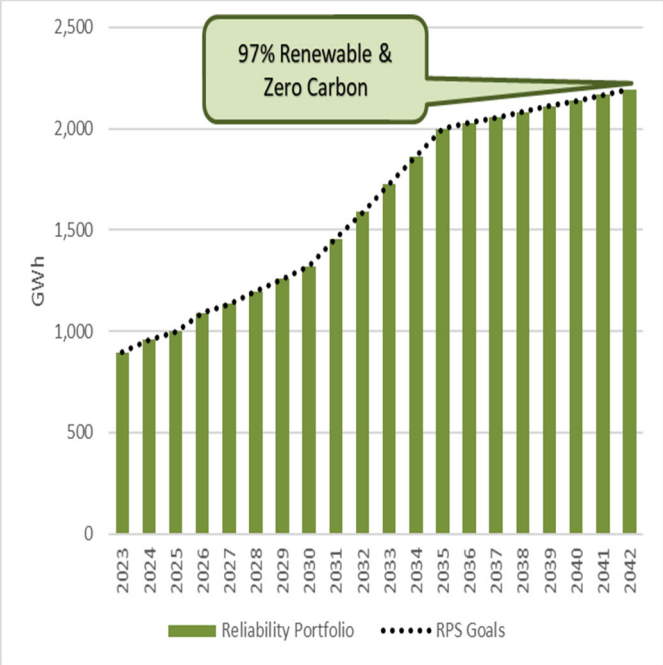
The optimum portfolio selection is the Reliability Portfolio, which keep both the natural gas units for reliability purposes while increasing renewable energy to serve the retail customers. The Reliability Portfolio performed the best under normal, as well as stress conditions. It meets the RPS and emission reduction goals, provides the highest reliability and the lowest power supply cost, regulatory risk, and market exposure.

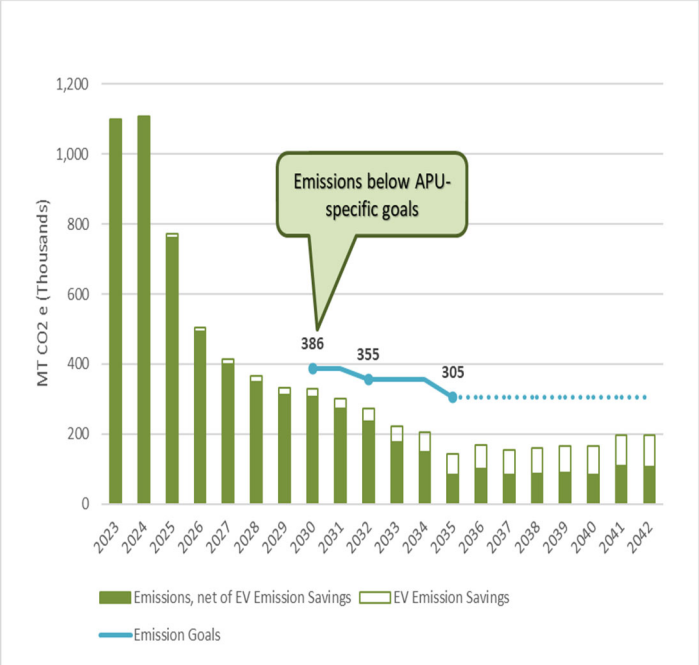
### ENVIRONMENTAL GOALS AND REGULATORY COMPLIANCE

As shown in Graph 49, the Reliability Portfolio is in compliance with current legislative and regulatory requirements and meets or exceeds renewable goals and GHG emission reduction targets. APU meets the RPS goal of 97% RPS or zero carbon by 2042. In addition, APU system emissions net of EV emissions savings, are below the utility-specific goal of 305,000 MT CO2e by 2035.

Lastly, the Reliability Portfolio presents the least regulatory risk, as it best responds to potential changes to the treatment or accounting of renewable natural gas resources, reserve margin or NQC.

**Graph 49: Reliability Portfolio Meets or Exceeds Environmental Goals**




## RESOURCE ADEQUACY & RELIABILITY

The Reliability Portfolio meets Resource Adequacy requirements for system, local and flexible capacity requirements. Local and flexible capacity requirements are presumed to be met with the Canyon Power Plant. Graph 50 displays the change in system capacity position from 2023 to 2042.

According to the best available information when the model run started in mid-2022, a 40 MW battery project would be added in 2025 and that other new resources would be added starting in 2026. Therefore, a 44 MW capacity short position appears in 2025, when IPP is converted to a natural gas power plant. As of the writing of the 2023 IRP, APU has entered into negotiations with several renewable, hybrid and battery storage providers, and is confident that the short capacity position in 2025 will be covered with long-term resource contracts instead of short-term capacity purchases.

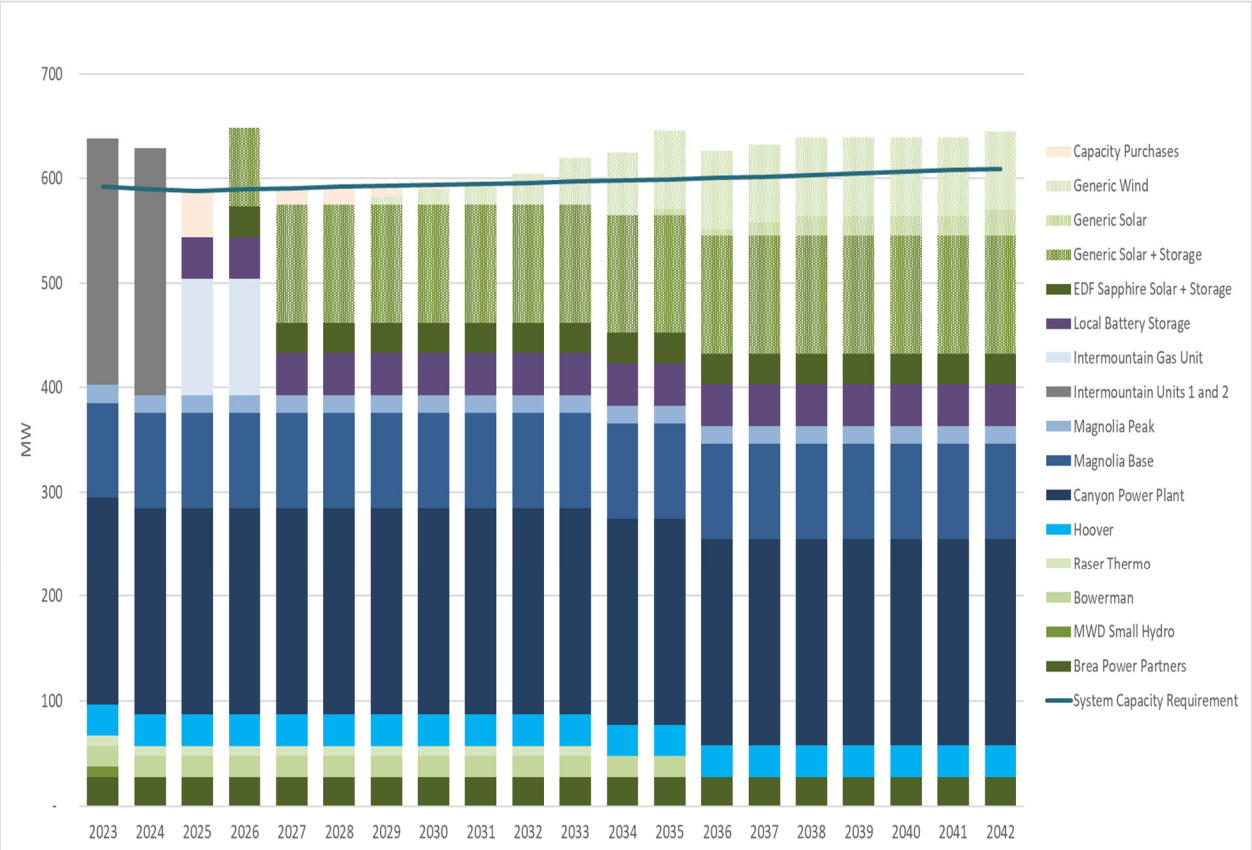
A small amount of capacity purchase is observed between 2027 and 2030, because LTCE constraints are loosened for flexibility. The model is set up to allow a small capacity gap (25 MW) to be filled by short-term capacity purchases for a few summer months only. When it happens, the capacity purchase costs are added to the net power supply costs.

The majority of APU's system capacity will be fulfilled by firm capacity units including natural gas power plants, geothermal generation, and landfill gas units. Storage systems are also introduced to fill the capacity gap after IPP divestiture, including a local battery storage system and solar plus storage hybrid resources. A smaller percentage of wind and solar capacity is introduced later in the planning horizon to fill the remainder of the capacity position.

Graph 50 below assumes that solar resources have 25% dependable capacity, wind 30%, and solar plus storage 50%. The solar plus storage resources are set up to pair 1 MW of storage capacity with 2 MW of solar. As an

example, 75 MW of solar plus storage generation is composed of 25 MW of battery and 50 MW of solar; therefore, it provides 25 MW capacity from the battery and 12.5 MW capacity from solar, totaling 37.5 MW capacity.

**Graph 50: Reliability Portfolio Forecasted Resource Adequacy**

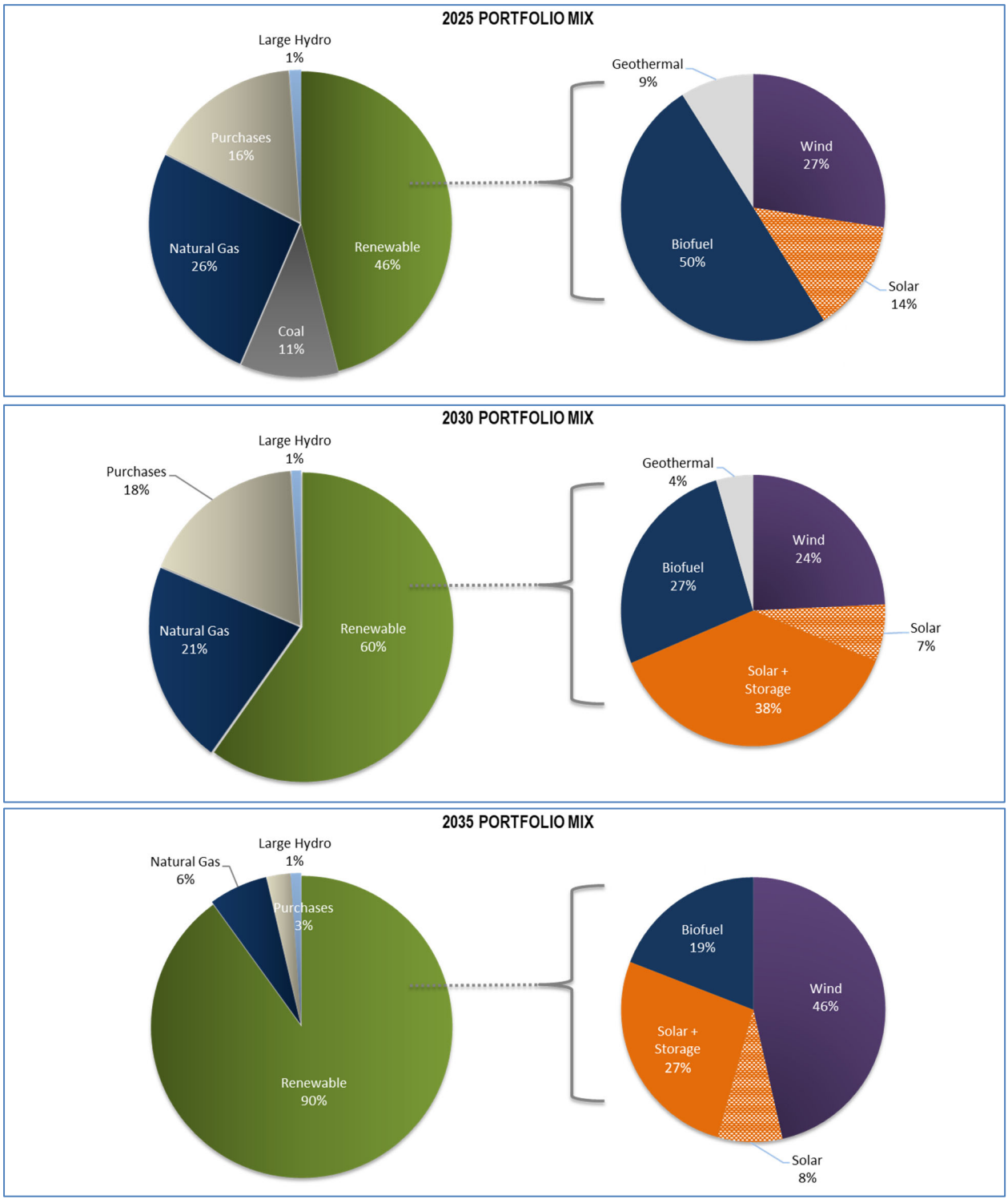


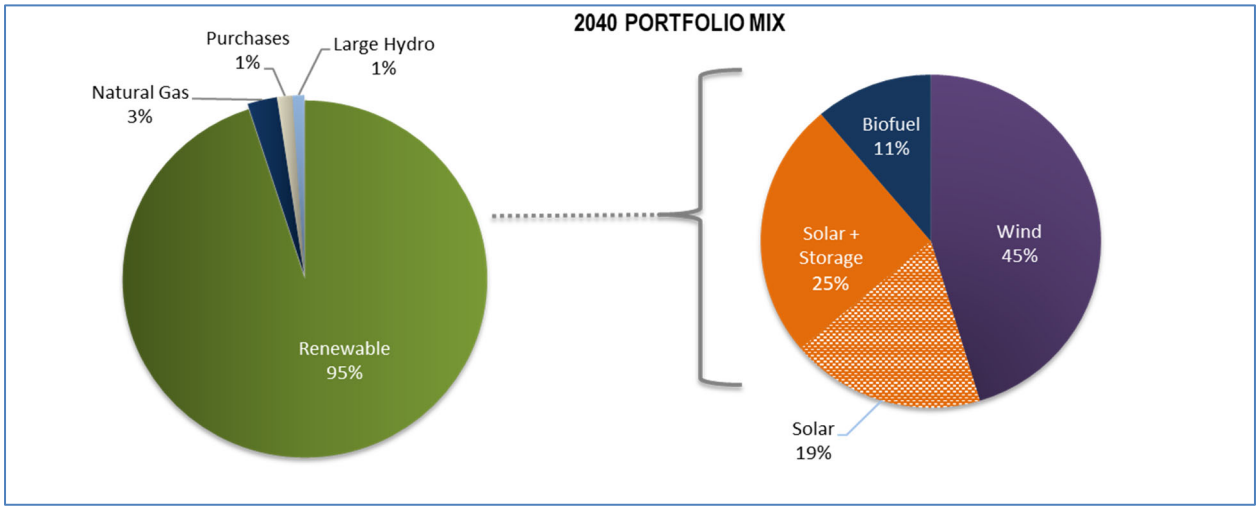

## DIVERSIFICATION

Graph 51 below displays the changing resource mix under the Reliability Portfolio. The new resources are recommended by the optimization model runs, which honor the RPS constraints and planning reserve margin requirements and seek to meet the environmental and reliability goals while keeping the costs down.

The renewable portfolio percentages continue to increase over the years. It starts out with more geothermal and biofuel resources. As agreements end over time, new resources with lower costs are added to the portfolio: solar plus storage, solar, and wind.

**Graph 51: Resource Mix for Retail Energy Demand: 2025, 2030, 2035, 2040**

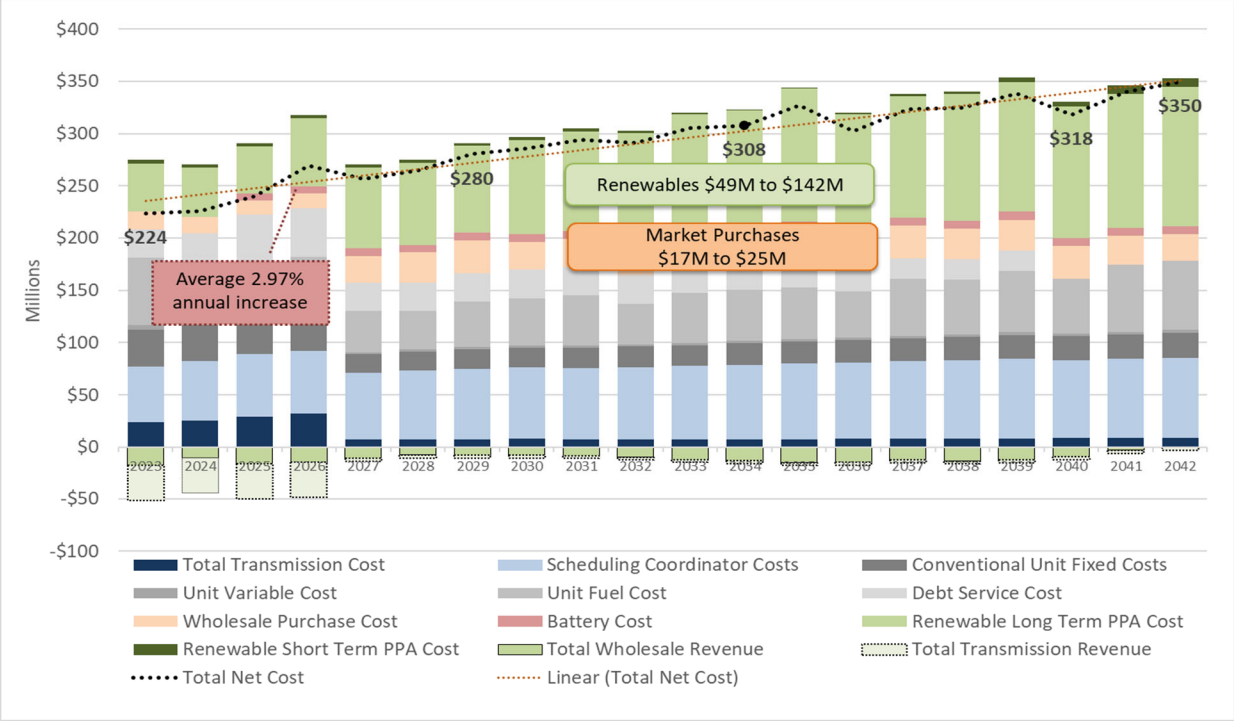





## PORTFOLIO COSTS

The change in resource mix has a corresponding impact on the cost structure in future years. Graph 52 below displays the power supply cost structure of the portfolio in 2023 and 2042. The net cost to supply power is estimated to be $126 million higher in 2042 compared to 2023, or a 2.97% average annual increase over the next 20 years. The increase is mainly driven by procurement costs for the resources necessary to meet the State's carbon-free energy goals and GHG emissions reductions (carbon neutrality by 2045), as well as an increase in scheduling service fees for participation in the CAISO markets.

**Graph 52: Reliability Portfolio Power Supply Cost Structure**




*Net power supply costs = Total power supply costs net of transmission revenues and wholesale energy revenues

**Overall Net Cost Portfolio**

The years 2025 and 2026 show a jump in net costs due to the new debt service for the IPP gas unit and the STS transmission line upgrade. APU will no longer be responsible for the debt service after IPP divestiture. A steady cost increase is observed throughout the remainder of the planning horizon, except for when debt service drops off in 2036 and 2040, or when a renewable resource starts or ends during a certain year.

**Renewables vs. Thermal Resource Costs**

As more renewable energy sources are being included in the portfolio, the cost of renewable energy is expected to increase by $93 million. Conversely, the divestiture in fossil fuel resources results in a cost savings totaling $38 million.

The total energy cost will increase over the planning horizon. New renewable build cost has been increasing due to inflation, labor shortage and supply chain issues. In addition, the natural gas units have a higher fixed cost component relative to the renewable resources. With more renewable generation and no proportionate decrease in natural gas unit costs, the overall portfolio cost will increase.

**Wholesale Sales and Purchases**

Immediately after IPP divestiture, wholesale sales decreased noticeably while wholesale purchase increased at the same time. Wholesale sales remain at the lower level for the remainder of the planning horizon. Wholesale purchases show a slight increase of $8 million, a combined effect of lower MWh purchases and higher energy market prices.

**Transmission and Scheduling Services**

The CAISO scheduling services costs are expected to be $23 million higher in 2042 compared to 2023. These charges consist of CAISO transmission access charges (TAC), grid management fees, congestion, losses, ancillary services, and other energy charges. Capacity purchases to meet the Resource Adequacy requirements are also included here.

Of all CAISO charges considered, the TAC has the highest rate of increase, as California strengthens the existing transmission facilities to prevent wildfires and builds new transmission lines to interconnect additional renewables at an unprecedented rate. According to the 2021-2022 Transmission Access Charge Forecast Model[29], CAISO expects a cumulative 30.5% TAC rate increase between 2023 and 2030, and a cumulative 2.4% rate increase between 2031 and 2036. APU's transmission cost model adopts CAISO published data of TAC rates of $17.0188 to $21.9406 from 2023 to 2036, and assumes that beyond 2037, the TAC rate grows at the average annual growth rate between 2031 and 2036.

The TAC increase is offset by the $15 million transmission expense reduction from the NTS and STS lines when APU exits the IPP power plant. The combined effect of increased CAISO scheduling services costs and reductions in transmission expenses yields an increase of $8M from 2023 to 2042.

[29] 2021-2022 Transmission Access Charge Forecast Model with New Capital (9/23/2022 14:44), http://www.caiso.com/planning/Pages/TransmissionPlanning/Default.aspx

## MARKET EXPOSURE

The Reliability Portfolio has the best overall performance under stress testing. It also has the lowest market exposure, measured by wholesale purchases as a percentage of system load. During high energy prices, natural gas units are dispatched to serve not only the retail customer but also the CAISO market. The CAISO market dispatch brings in additional wholesale revenues that bring down the net power supply costs.

Stand-alone battery storage also mitigates price volatility. It charges during hours of low costs and discharges during hours of high costs, lowering the costs to serve energy. Similarly, the solar plus storage hybrid resources stores solar generation in the midday, when both the energy demand market prices are lower. It discharges solar generation during the late afternoon and early evening, when both the energy demand and market prices are higher.

## CONCLUSION

Since the introduction of the RPS standard, the energy market has gone through significant changes over the past decade. On the demand side, the energy demand becomes less predictable due to weather pattern changes and regulations promoting electrification. On the supply side, the resource costs become less predictable due to inflation, labor shortage and system-wide additions and retirements. Over-generation was a key concern not too long ago; whereas, insufficient resources have become the key concern today and these changes are expected to continue, and likely at a more rapid rate.

The Reliability Portfolio is the optimal portfolio selected for the 2023 IRP. It meets the overall resource planning goals of affordability, reliability, and sustainability. APU is keenly aware of the need to allow flexibility to quickly respond to changing market conditions and will make adjustments to the Reliability Portfolio, as necessary, going forward.

It is important to note that the IRP process is looking to compare differences among various approaches for the long-term outlook, and not to determine the absolute values for each approach.

Indeed, with a multitude of variables involved in a 20-year long-term analysis, actual market conditions may change very quickly after the conclusion of the 2023 IRP analysis. To name a few, these market conditions include inflation, natural gas prices, renewable resource costs and availability, timing of transmission and generation additions, and retirements within the WECC, etc.

APU works collaboratively with SCPPA members, neighboring utilities, and regional planning authorities (e.g., Southern California Association of Governments), and frequently reviews planning and forecast data from regulatory agencies. APU's resource planning data along with its fiscal impact is updated annually as part of the City's budget process and is reported to, recommended for approval, and approved by the Public Utilities Board and the City Council.

## H. RATE IMPACT

### ANAHEIM ELECTRIC RATES

APU strives to find resources that are cost-effective and minimize rate impacts to customers while still meeting its compliance obligations for increased renewables and lower GHG emissions. By responsibly divesting of its coal assets and utilizing its peaking resources to integrate more renewable purchases, APU has been able to maintain affordable electric rates. The selected Reliability Portfolio is expected to help APU maintain affordable electric rates over the planning period as net power supply costs are expected to increase by only 2.97% per year, on average, which is less than the five-year average inflation rate.

APU strives to provide affordable rates to its customer-owners. Consistent with state and federal mandates, Section 1221 of the Anaheim City Charter requires that electric rates be based on the cost-of-service requirements for each customer class. The Anaheim City Council has adopted electric rates in accordance with this requirement, and additional Charter requirements that electric rates be sufficient to pay for all costs necessary to provide electric service to Anaheim customers, including maintenance, operations, power supply, and infrastructure-related investment costs. APU has designed its rate schedules to not only recover these costs, but also to maintain simplicity in how rates and resulting bills are read, and to send pricing signals encouraging reduced consumption of electricity or shifting consumption to different parts of the day when power resources are more available and less expensive. As a publicly owned utility, APU offers several optional and standard base rate options to its customers, allowing them to choose a rate schedule that is advantageous and most fitting for their needs. These base rates are listed below.

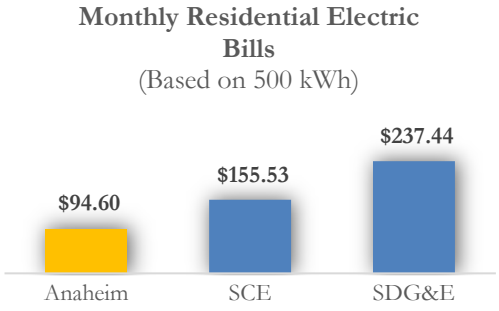
| STANDARD BASE ELECTRIC RATES | OPTIONAL BASE ELECTRIC RATES |
|---|---|
| • Domestic Service (residential) | • Thermal Energy Storage |
| • Small Commercial | • Feed-In Tariff |
| • Medium Commercial | • Economic Development / Business Retention |
| • Large Commercial / Industrial | • Domestic Time-of-Use |
| • Agricultural | • Commercial Time-of-Use |
| • Lighting | • Industrial Time-of-Use |
| • Municipal | • Net Energy Metering |
| | • Domestic Electric Vehicle |
| | • Commercial / Industrial Electric Vehicle |

APU's rate structure includes a fixed customer charge, energy charges, a rate stabilization adjustment (RSA), and an underground surcharge that pays for undergrounding of overhead power lines to improve reliability and beautify the City. Rates for each customer class include these components, while medium and large commercial and industrial rates include a demand charge as well. Additionally, time-

of-use rates include higher rates during on-peak time periods when the demand for energy is high and lower rates during mid-peak and off-peak time periods when the demand for energy is lower. Generally, all costs of APU's Electric System, including power supply costs, are recovered through the application of these base rates, while the RSA recovers fluctuations in power generation, fuel, environmental mitigation, and other power-related costs, facilitating timely cost recovery while keeping customer rates stable over time.

Most recently, APU added a commercial electric vehicle (EV) rate customer class to encourage further adoption of electric transit buses, school buses, delivery vehicles, and other fleet vehicles within the City, with this effort enhancing the City's economic justice efforts by encouraging public transportation agencies to invest in EV fleets that serve a broad array of demographics within the City. In addition, although APU fulfilled the State's requirements pertaining to net energy metering rate incentives in May 2019, APU implemented a new program in March 2020 to offer a net energy metering rate option for more solar customers that better aligns with the cost of providing electric service.

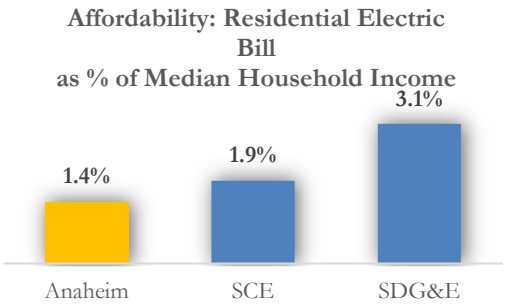
## RATE AFFORDABILITY & COMPETITIVENESS




**Graph 53: Monthly Avg Residential Electric Bills**

One of APU's key tenants is maintaining affordable rates. To that end, APU continuously monitors how the cost to provide electric service impacts customer bills over time. APU performs rate comparisons throughout the year. As the only publicly owned utility providing power in Orange County, APU compares its rates to the two investor-owned utilities, Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E), who provide power to other customers in the county. Graph 53 [30] shows that an average Anaheim residential customer (using 500 kWh monthly) pays at least 39% less than customers served by another utility in the county. Anaheim also does not impose a utility user's tax, which increases the bill total for customers in other cities.

APU's affordability ratio, a measure of the total annual energy costs paid by a typical residential customer using 500 kWh monthly relative to the city's median income[31], is approximately 1.4%. Historically, APU has maintained this ratio at low levels, indicative of how electric rates remain affordable for customers. Compared to other electric utilities serving Orange County[32], this ratio compares



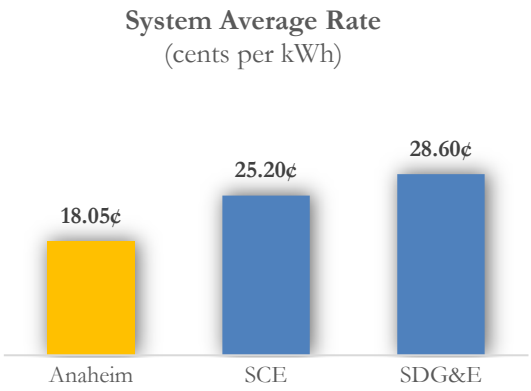

**Graph 54: Residential Electric Bill as % of Median Household Income**

[30] Graph is current as of March 2023, and includes all applicable taxes and surcharges on a residential customer's bill.

[31] Median household income taken from most recent U.S. census data.

[32] To make an appropriate comparison, SCE household income was calculated using Orange County median household income data, which is considerably higher than Anaheim. SDG&E household income was calculated using San Diego median household income.

favorably. For those customers struggling to pay their bills, APU helps them through bill deferrals, payment plans, income-qualified discounts, medical allowances, and fee waivers. APU offers a 10% bill discount for customers who are 62 years of age or older, have a long-term disability, or are military veterans, and who meet income guidelines based on the size of their household and yearly household income.




**Graph 55: System Average Rate**

Another rate comparison is the system average rate[33], which divides the total sales revenue from all retail customers by total volumetric sales from those same customers. Graph 55 shows that, on average, Anaheim customers pay nearly 30% less per kWh than customers served by other utilities in the county. To be fair, each of the utilities shown in the chart face different risks in serving their respective service territories. Nonetheless, all of the comparison charts taken together demonstrate how APU's rates remain affordable and competitive relative to the other electric utilities who serve the remainder of the county.

## COST IMPACT OF RELIABILITY PORTFOLIO

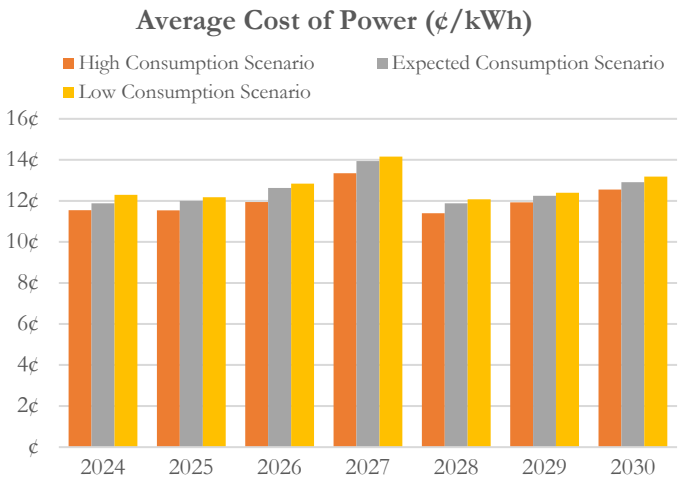
APU performed cost impact analyses under high, medium, and low load growth scenarios to determine the potential cost impact of various changes in regulatory requirements and resulting impacts on power supply costs. For the purposes of the 2023 IRP, the different scenarios under evaluation were overlaid onto existing forecasts of net power supply costs. Cost impacts reflected in the 2023 IRP are calculated on a system-wide basis. Please note the following information on the methodology and assumptions of the study.

- The high energy consumption scenario adopts the higher of the two following scenarios: (1) same EE, solar and EV assumptions as the expected scenario, but under extremely high temperatures, or (2) high EV growth, low EE growth, and low local solar, under moderate weather conditions. For the majority of the planning horizon, the high energy consumption scenario is impacted by extremely high temperatures. Additionally, note that the high energy consumption scenario will result in a lower average cost of power because these costs are recovered over a greater number of billing units.
- The low energy consumption scenario adopts the lower of the two following scenarios: (1) same EE, solar and EV assumptions as the expected scenario, but under extremely low temperatures, or (2) low EV growth, high EE growth, and high local solar, under moderate weather conditions. For the majority of the planning horizon, the low energy consumption scenario is impacted by the low EV/high EE/high solar assumptions. The low consumption scenario will result in a higher average cost of power because there are fewer billing units to allocate these costs to.

[33] APU's system average rate was calculated based on actuals from the most recent fiscal year ending June 30, 2022.

- The expected consumption scenario assumes moderate weather conditions.
- For additional context, the average cost of power for FY 2022 was 12.59 cents per kWh and APU forecasts FY 2023 will be at 12.91 cents per kWh.

The results of this evaluation principally reflect how the projected cost impacts to customers is relatively modest, even under the low consumption scenario where the average cost of power peaks at approximately 14 cents per kWh in FY 2027; under this scenario, the average cost of power increases modestly at a compound annual rate[34] of 2.37% over five years to reach this hypothetical peak. As shown in the chart, the average cost of power is forecast to dip thereafter, as Anaheim will exit from a fossil-fuel generated resource and no longer be subject to the associated cost obligations.




**Graph 56: Average Cost of Power (cents per kWh)**

This analysis was based on forward-looking assumptions and is subject to change due to commodity price fluctuations, policy changes, technological developments, and/or changing customer behavior. APU will continue to update its long-term plan as expectations change in order to maintain accurate forecasts. While the model used for the 2023 IRP analysis was based on information available at a single point in time, it is not uncommon for assumptions to change over time as additional information is made available.

[34] This is calculated using the geometric mean or compound annual growth rate over five years.

# VIII. RELIABILITY & ELECTRIC SYSTEM OVERVIEW

This section starts with an introduction to APU's Electric System (**A. APU Electric System Overview**) and generation and transmission resources (**B. Generation and Transmission Resources**).

PUC Section 9621 requires POUs to adopt an IRP to ensure that the POU meets the goal of ensuring system and local reliability. APU's Balancing Authority is the CAISO, which has reliability and Resource Adequacy requirements for load serving entities. Section **C. CAISO Resource Adequacy Requirements** discusses how APU plans to meet the CAISO system, local and flexible capacity requirements during the 2023 IRP's planning horizon.

PUC Section 9621 also requires POUs to adopt an IRP to ensure POUs achieve the goal of strengthening the diversity, sustainability, and resilience of the bulk transmission and distribution systems and local communities.

APU has several transmission contracts through Southern California Public Power Authority (SCPPA) and with the Los Angeles Department of Water and Power (LADWP) to ensure the energy from APU's owned or contracted resources is consistently delivered into the CAISO from resources located outside of the CAISO footprint. On October 10, 2006, APU transferred operational control of its transmission resources to CAISO. According to the North American Electric Reliability Corporation (NERC) reliability standards, APU is a Distribution Provider (DP), but not a Transmission Operator (TOP), Transmission Owner (TO), Transmission Planner (TP), Transmission Service Provider (TSP), Generator Owner (GO), or Generator Operator (GOP). As such, the CAISO is responsible for evaluating the regional short-term and long-term infrastructure needs during its annual Transmission Planning Process.

APU has a long-standing reputation for providing its customers with highly reliable electric distribution services over a robust and well-maintained electric distribution system. In 2020, the American Public Power Association recognized APU, once again, as a Reliable Public Power Provider (RP3). The RP3 designation lasts three years and recognizes utilities that demonstrate high proficiency in reliability, safety, work force development, and system improvement. Of the 2,000 public power utilities nation-wide, only 275 hold the RP3 designation. APU's distribution system and reliability considerations are described in section **D. Distribution System Overview**.

## A. APU ELECTRIC SYSTEM OVERVIEW

The City of Anaheim is the second largest city in Orange County and tenth largest city in California. It is best known as the home to the Disneyland® Resort, Honda Center, and the Anaheim Convention Center.

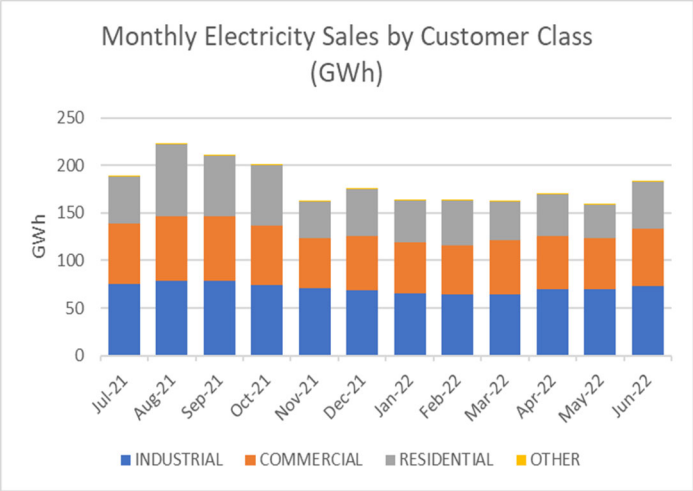
APU is a City-owned, not-for-profit electric and water utility that offers quality electric and water services to residents and businesses in Anaheim at rates among the lowest in California. It operates the only municipal electric utility in Orange County. That means that the customers of the Anaheim community own their utility, and therefore, have a say in decisions concerning its operation.

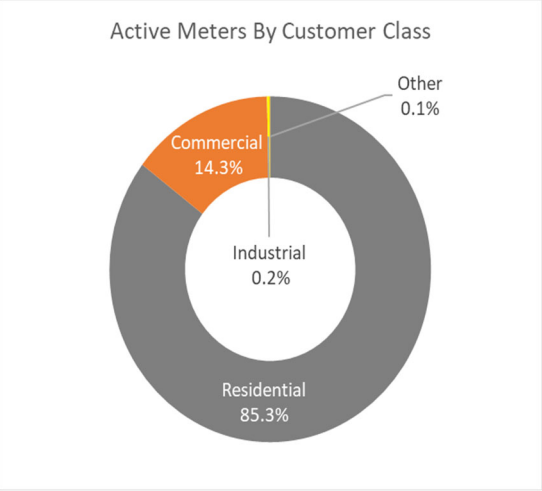
Anaheim citizens are more than just utilities customers; they are owners of their utility. They have input to the decision process both directly and through an appointed citizen advisory Public Utilities Board. With final authority vested in Anaheim's elected City Council, decisions are made that are in the best interest of its citizens, quality of life, and local economy. As a municipal, not-for-profit utility, APU's rates are based on the costs of providing water and electricity.

APU's system delivers electricity to Anaheim's 350,000 residents and more than 15,000 businesses, including multimillion-dollar tourism, sports, and manufacturing customers.

Although residential customers make up approximately 85% of APU's total customers, nearly 75% of total electrical load is consumed by commercial and industrial customers. APU experiences seasonal trends in which the summer months experience higher loads due to cooling needs, while the rest of the year tends to remain fairly stable.

**Graph 57: Customer Class Data**



## B. GENERATION AND TRANSMISSION RESOURCES

APU's power supply comes from resources located in Anaheim and across the western United States. This section introduces APU's long-term generation and transmission resources.

### GENERATION RESOURCES

### BOWERMAN POWER FACILITY

APU executed a Power Purchase Agreement with Bowerman Power, LLC for the purchase of 19.6 MW of renewable energy generated from landfill gas from the Frank R. Bowerman Landfill in Irvine, California.

Transmission is provided by the CAISO. The 20-year contract expires on April 30, 2036.

### BREA POWER II

APU executed a Consolidated, Amended, and Restated Power Purchase Agreement with Brea Generation LLC and Brea Power Partners II, LLC to deliver landfill gas renewable energy to APU to help satisfy demand.

The original 5 MW contract was superseded by a second long-term contract for a total of 27 MW from the new unit at the Olinda Landfill project. The 33-year contract expires on October 31, 2045.

## DESERT HARVEST

The Cities of Anaheim, Burbank, and Vernon have contracted with Desert Harvest II, LLC, through SCPPA for a share of intermittent solar energy from the Desert Harvest project. APU's share is 36 MW. Transmission is provided by the CAISO. The 25-year contract expires on November 30, 2045.

## THERMO NO. 1

APU executed a Power Purchase Agreement with this resource for energy from an 11 MW geothermal project. The project is located in central Utah and energy is being delivered over the Northern Transmission System at the Mona interconnection tie in the Los Angeles Department of Water and Power (LADWP) control area. Additional transmission costs are required to get the energy delivered from Thermo No. 1 to the Mona interconnection point. This 20-year agreement expires on September 30, 2033.

## HIGH WINDS ENERGY CENTER

APU purchased 6 MW of intermittent renewable wind energy from Avangrid Renewables, LLC (a subsidiary of Iberdrola USA, Inc.). Transmission is provided by the CAISO.

The contract includes mutual termination rights at year 20 provided notice is given on or before December 31, 2022. Notice was given and the agreement expires on December 31, 2023.

## PLEASANT VALLEY ENERGY CENTER

APU has purchased 30 MW of intermittent renewable wind energy from Avangrid Renewables, LLC (a subsidiary of Iberdrola USA, Inc.). Energy from the Pleasant Valley Wind Energy Center is delivered through the Northern Transmission System at the Mona interconnection tie into the LADWP control area.

APU receives and pays for energy only when the units are operating. The 20-year contract expires on June 30, 2025.

## SAN GORGONIO WIND FARM

APU executed a Power Purchase Agreement with San Gorgonio Farms, Inc. for 31 MW of intermittent renewable wind energy from the existing San Gorgonio Farms Wind Farm located in Whitewater, California (near Palm Springs). Transmission is provided by the CAISO. This agreement has an initial term of ten years ending December 31, 2023, with an option to extend for two additional 10-year periods. The parties exercised the option for a 10-year extension of the agreement which extends the term through December 31, 2033.

## WESTSIDE SOLAR PARK

APU executed a Power Purchase Agreement with Westside Assets, LLC for the purchase of 2 MW of renewable intermittent solar energy. This project is located in Kings County, California.

Transmission is provided by the CAISO. This 25-year contract expires on June 30, 2041.

## MWD COYOTE CREEK, PERRIS, RIO HONDO AND VALLEY VIEW

The Cities of Anaheim, Azusa, and Colton have contracted with The Metropolitan Water District of Southern California (MWD), through SCPPA, for 17.1 MW of intermittent renewable hydro electricity from four small hydroelectric plants located in the Los Angeles Basin. APU is entitled to 56.5% of the project's output, or 9.7 MW from all four plants. Transmission is provided by the CAISO. The 15-year, 2-month contract expires on December 31, 2023.

## HOOVER DAM

The Boulder Canyon Project (Hoover Dam) consists of 17 hydroelectric generating units located approximately 25 miles from Las Vegas, Nevada. Forty-six (46) participants within the states of Arizona, California, and Nevada participate in the Hoover Dam project. SCPPA members have obtained entitlements totaling 665 MW (32% of the Plant Capacity, of which APU has 1.9477%) through its Power Sales Agreements with SCPPA.

The new Electric Service Contract with Boulder Canyon expires on September 30, 2067.

## CANYON POWER PROJECT

The Canyon Power Project (CPP) is a conventional simple cycle, natural gas-fired peaking facility comprised of four combustion turbine generators located in the Canyon industrial area of Anaheim. CPP is owned by SCPPA and operated by APU who has 100% entitlement to the 200 MW nameplate capacity and energy thought a Power Sales Agreement with

SCPPA. CPP provides enhanced local reliability and is dispatched when its generation costs are less than the cost to serve APU's load.

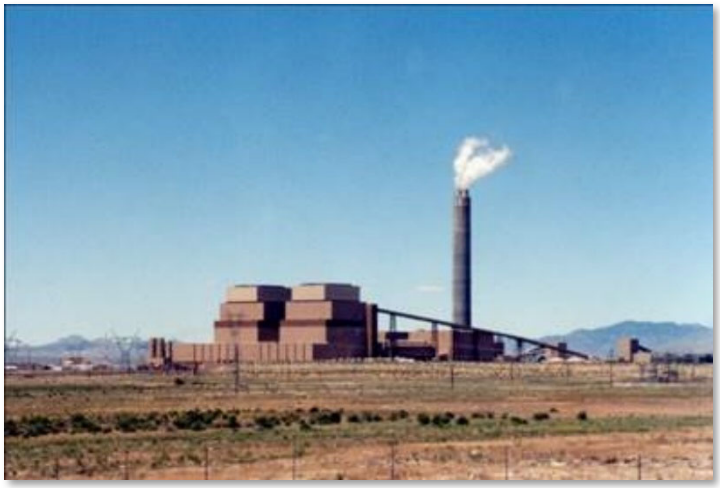
## MAGNOLIA POWER PROJECT

The Magnolia Power Project (MPP) is a clean, natural gas-fired, combined cycle conventional electric generating plant located in Burbank, California. MPP is owned by SCPPA and operated by Burbank Water & Power.

APU has a 38% (92 MW base capacity and 26 MW of peaking capacity) entitlement in the project through a Power Sales Agreement with SCPPA.

## INTERMOUNTAIN POWER PLANT (IPP)

APU executed into a Power Sales Agreement with Intermountain Power Agency (IPP) in the early 1980s for 13.225% of the energy output from IPP. Thirty-six utilities serving California and Utah receive capacity and energy from this project. Energy is delivered to Anaheim and other California participants through the Southern Transmission System (STS) to the Victorville/Lugo interconnection with the CAISO. Upon the conversion of IPP to natural gas in 2025, APU will take energy from the natural gas plant until June 17, 2027, when the original 40-year contract expires.



# TRANSMISSION RESOURCES

## MEAD-ADELANTO TRANSMISSION PROJECT

APU entered into a transmission service contract with SCPPA to acquire transmission capacity from the Mead-Adelanto Transmission Project to bring in energy from Nevada based projects.

A 202-mile, 500 kV AC transmission line that runs from the Marketplace Substation near Boulder City, Nevada to the Adelanto Substation near Victorville, California. The transmission line has a transfer capability of 1,291 MW; APU's share is 159 MW.

## MEAD-PHOENIX TRANSMISSION PROJECT

APU entered into a transmission service contract with SCPPA to acquire transmission transfer capacity from the Mead-Phoenix Transmission Project.

A 256-mile, 500 kV AC transmission line that extends from the Westwing Substation near Phoenix, AZ, connects with the Mead substation near Boulder City, NV, and terminates at the Marketplace Substation nearby. The transmission line has a transfer capability of 1,923 MW, APU's share is 155 MW.

## NORTHERN TRANSMISSION SYSTEM (NTS)

APU entered into a transmission service contract with LADWP to acquire a share of LADWP's transfer capability of the Northern Transmission System (NTS) to bring power from the Intermountain Power Plant (IPP) in Utah to the Mona substation in Utah and the Gonder substation in Nevada.

A 490-mile, 500 kV DC transmission line that extends from IPP near Delta, Utah to the Adelanto Substation in Southern California, with an AC/DC converter station at each end of the transmission line. The transmission line has a transfer capability of 2,400 MW, APU's share is 257 MW.

## SOUTHERN TRANSMISSION SYSTEM (STS)

APU entered into a transmission service contract with SCPPA to acquire transfer capability of the Southern Transmission System (STS) to bring power from the Intermountain Power Project (IPP) near Delta, Utah to the Adelanto Substation in Southern California.

A 490-mile, 500 kV DC transmission line that extends from IPP near Delta, Utah to the Adelanto Substation in Southern California, with an AC/DC converter station at each end of the transmission line. The transmission line has a transfer capability of 2,400 MW, APU's share is 424 MW.

## ADELANTO-VICTORVILLE/LUGO TRANSMISSION SYSTEM

APU entered into a firm bi-directional transmission service contract with LADWP to bring power between the Adelanto and Victorville Substations and the Lugo/Victorville line near Victorville, California to Anaheim.

The approximately 23-mile, 500 kV AC transmission line extends between the Adelanto and Victorville Substations and the midpoint of the Lugo/Victorville 500 kV line. The transmission line has a transfer capacity of 2,400 MW; APU's share is 110 MW.

# C. CAISO RESOURCE ADEQUACY REQUIREMENTS

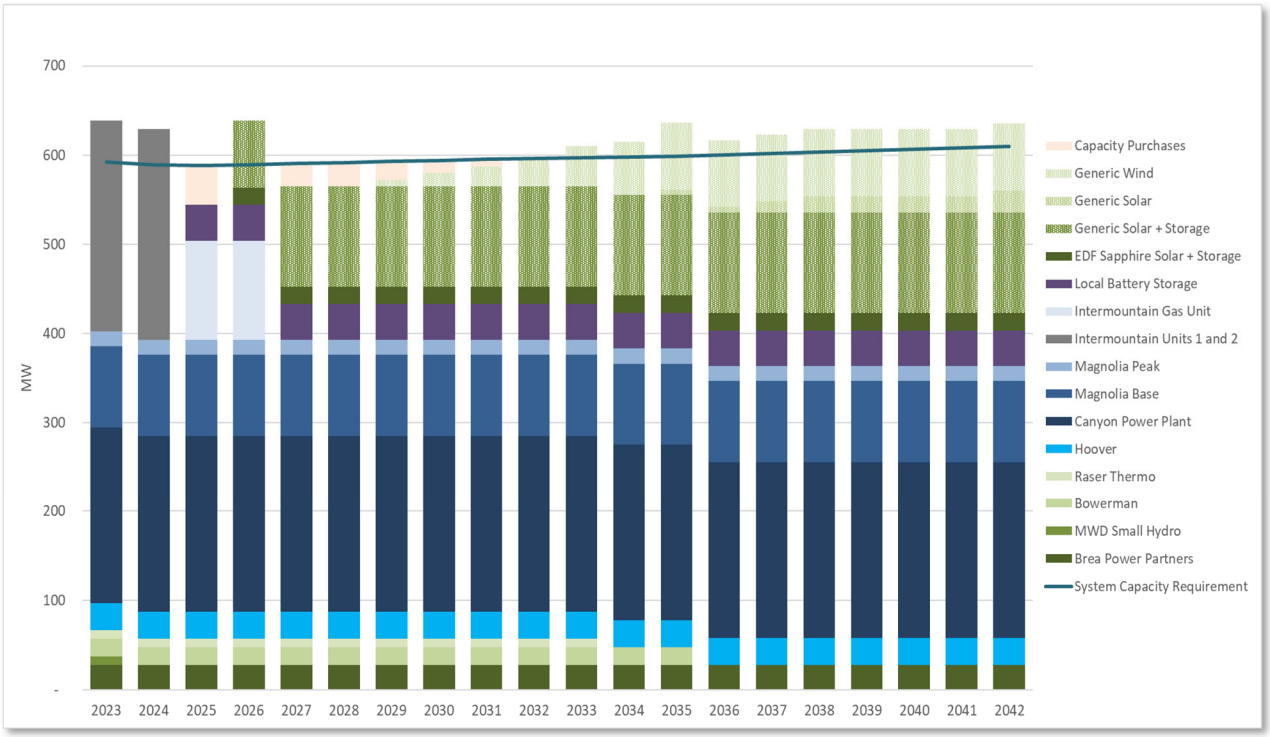
## C.1. SYSTEM RESOURCE ADEQUACY

The consequences of the California energy crisis from 2000 to 2001 highlighted several fundamental flaws in California's existing electricity market design soon after the partial deregulation of the electric market. Key issues were identified such as the lack of long-term contracting between the unbundled generation and distribution sectors, and the over-reliance on spot market transactions as major causes for the market disruptions impeding system reliability. Immediately after the energy crisis, the CAISO began addressing underlying infrastructure challenges such as transmission and generation deficiencies and began a comprehensive market redesign and technology upgrade (MRTU) program upon the Federal Energy Regulatory Commission's (FERC) approval.

State regulators implemented a Resource Adequacy (RA) obligation in 2004 requiring Load Serving Entities (LSE), such as APU, to procure capacity resources for 100% of their total forecasted customer load, as well as an additional 15% Planning Reserve Margin (PRM), for a total of 115% to ensure adequate energy resources are available when needed. This requirement is known as the "system" RA requirement.

APU uses a mix of its owned and contracted resources to meet the system RA obligations. These resources include both renewable and conventional generation within the State and imported into the State from various regions. The optimum portfolio, Reliability Portfolio, requires small capacity purchases between 2027 and 2031. It meets the system capacity requirement with the current CAISO resource adequacy accounting rules from 2023 to 2042. The cost of capacity contracts is included in the power supply cost evaluation.

**Graph 58: Reliability Portfolio Forecasted Resource Adequacy**



## C.2. LOCAL RESOURCE ADEQUACY

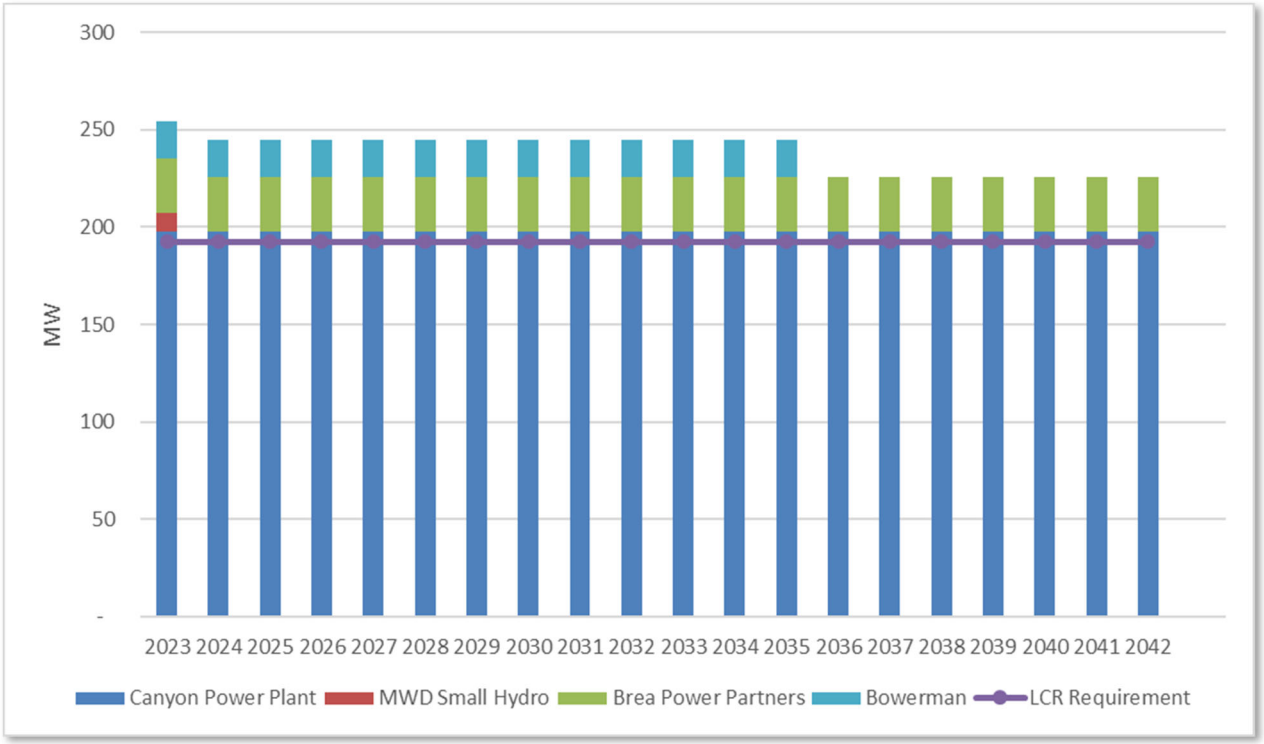
In addition to the overall system RA requirement, the CAISO also requires that a certain amount of a LSE's RA obligation must meet criteria known as "local" and "flexible" RA requirements. The local RA requirement addresses reliability concerns within transmission-constrained areas where local generation resources are needed to ensure reliable electric grid operations to serve the area.

Under the CAISO Local Capacity Requirement (LCR) program, CAISO completes an LCR study each year using the most up-to-date information available for transmission system configuration, generation tied to the grid, and load forecasts approved by the CEC. The CAISO uses the annual LCR Study results as a basis for establishing each LSEs proportionate share of LCR for RA purposes.

The CAISO identifies 10 transmission-constrained local pockets. APU is in the local area defined as the LA Basin Area. Results from the 2023 Local Capacity Technical Analysis issued by the CAISO on April 28, 2022, assigned a LCR of 192.31 MW for APU within the LA Basin Area.

The CAISO local capacity requirement for APU has been below 230 MW for the past few years and remained stable. Currently, APU has over 255 MW of natural gas and baseload renewable power plants located within the LA Basin Area. During the planning horizon of the 2023 IRP, APU has sufficient local resources that exceed CAISO's local capacity requirements under the recommended Reliability Portfolio.

**Graph 59: CAISO Local Capacity Requirement – Reliability and RNG Portfolios**



## C.3. FLEXIBLE CAPACITY RESOURCE ADEQUACY

The last component of RA procurement addresses the need to have generation resources available that can respond quickly to "up" and "down" electrical demand on the Grid. To meet energy demand at certain times of the day when the CAISO must respond quickly to variations in load, LSEs are required to procure a certain amount of its RA obligation from resources defined as "flexible" in the CAISO tariff.

Similar to the LCR process, the CAISO performs annually a system wide assessment of flexible capacity needs using a Monthly Maximum Three-Hour Net Load Ramp plus the higher of the most severe single largest contingency or 3.5% of expected peak load to determine the required procurement target for each LSE. The net load curves represent the variable demand that the CAISO must meet in real-time. In order to maintain reliability, the CAISO must match the demand for electricity with the supply on a second-by-second basis using the remaining dispatchable generation fleet. To ensure reliability under the changing conditions seen on the Grid, the CAISO requires flexible resources with operational characteristics as follows:

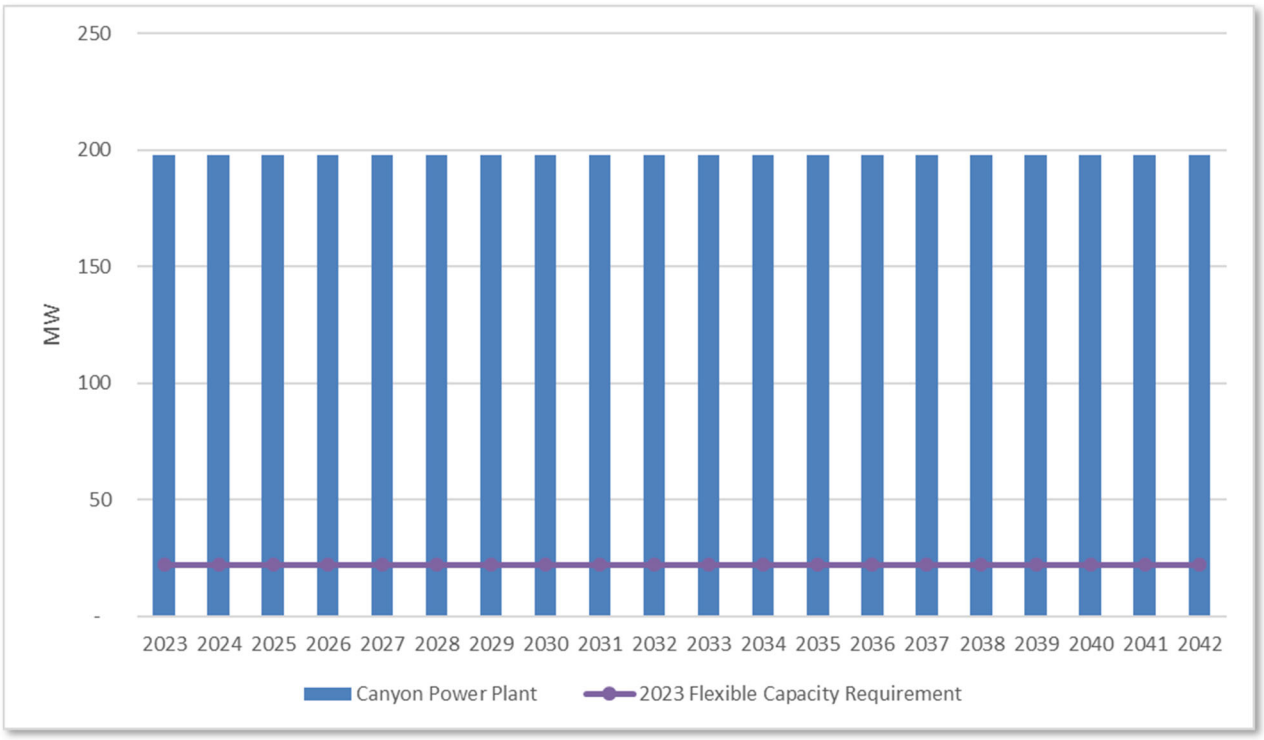
- Ability to sustain upward and downward ramps;
- Respond for a defined period of time, change ramping direction quickly;
- React quickly and meet expected operating levels;
- Start with short notice from zero or low electric operating level; and
- Start and stop multiple times per day.

To satisfy the CAISO's procurement target for flexible capacity, APU typically utilizes the Canyon Power Plant. This resource is not only local to APU's load but has the ability to start at a moment's notice to ramp up or down as needed throughout the day providing 194 MW of eligible flexible capacity.

On average, APU has a monthly flexible capacity requirement of 17 MW, which peaks in May with a capacity requirement of around 20 MW.

As Canyon Power Plant has 194 MW of eligible flexible capacity, APU has sufficient flexible capacity available through Canyon to meet the additional requirements for flexible capacity. Even though the optimum portfolio, Reliability Portfolio, adds intermittent renewables and may require higher flexible capacity later in the planning horizon, the Canyon Power Plant provides more than sufficient flexible capacity to accommodate the additional intermittent resources.

**Graph 60: CAISO Flexible Capacity Requirement – Reliability and RNG Portfolios**



# D. DISTRIBUTION SYSTEM OVERVIEW

## D.1. DISTRIBUTION SYSTEM

### D.1.1. Electric System Overview

APU delivers electricity to its approximately 350,000 residents and more than 15,000 businesses, including but not limited to the Anaheim Resort Area, Platinum Triangle, sports arena, Honda Center, City National Grove of Anaheim. APU serves about 120,000 electric meters throughout its 50 square mile service area.

The APU electric system is a carefully planned and robust system. It consists of a 69 kV radial network serving thirteen 69/12 kV distribution substations, where reliable power is transformed and distributed to homes and businesses, with a total combined historic peak demand of approximately 600 MW. APU has emergency procedures and redundancy built into its system to address the unlikely event of a catastrophic failure of a substation.

### D.1.2. Distribution System

APU's distribution system includes approximately 120 distribution circuits fed by fourteen distribution substations across 50 square miles. It provides high quality and reliable power service to its customers. The system is evaluated thoroughly on an annual basis to ensure it can meet forecasted peak demand in the five-year planning horizon, as well as maintain and improve its reliability performance under normal and emergency conditions. To achieve these goals, APU has upgraded and reinforced its electrical infrastructures with various on-going programs, and capital projects.

The new Harbor 69/12kV Substation was the latest electrical facility addition to the APU's electric system and was placed in service in the summer of 2019. This substation was needed to serve new hotels and residential/commercial units as well as planned future developments in the Platinum Triangle and Anaheim Resort areas. This project added needed transformer capacity in this fast-growing area and provide loading relief to the adjacent substations. It has also greatly improved system reliability in the area. Photo 1 below shows the Harbor Substation.

In addition, a new 69/12kV transformer bank was constructed and placed in service in 2019. Similarly, this project was needed to accommodate new industrial and commercial loads in the Eastern Anaheim area. It has provided loading relief to adjacent substations and improves system reliability in the area.

APU is currently in the planning stages of upgrading the 12kV switchgears to higher ampacity rating at two of the substations located in the northern and southwest areas of Anaheim. Each is expected to be completed in the 2023-2026 timeframe. These projects are considered infrastructure replacement projects as they are approaching their full life expectancies and are needed to serve increased load growth in the area. These facilities will also improve the system reliability and provide operational flexibility.

**Photo 1: Harbor 69/12kV Substation**

### D.1.3. Recent Reliability Projects

In 2008, APU upgraded its electrical infrastructure to increase system reliability by constructing the Vermont 220/69 kV Substation which is radially fed from Lewis Substation, normally opened at Lewis terminal. A major 69kV network in the affected area was reconfigured and about 4,500 circuit feet were also undergrounded. The new Vermont Substation was built to serve as a back-up source for Anaheim load in the event of a total loss of the Lewis 69/12 kV Substation. Photo 2 shows Vermont 220 kV GIS switchgear.

In 2006, APU accomplished a first-of-its-kind in the United States when it constructed an electric substation with gas insulated switchgear (GIS) and with the capacity to provide power to 25,000 residential customers underneath a park. This project also improves system reliability in the east of Anaheim system. Photo 3 below shows Park Substation underneath the park.

**Photo 2: Vermont 220kV GIS Switchgear**

**Photo 3: Park Substation**

In addition, Anaheim operates one gas-fired generating plant, Canyon Power Plant within its service territory with a total combined capacity of about 200 MW. This generating resource is used to offset power imported from outside resources during peak load periods and has black start capability to serve APU load independent of the Grid in the event of a sustained regional blackout. Canyon Power Plant was built in 2011. The facility received silver LEED certification by utilizing systems that limit environmental impacts; these systems are using 100% recycled water and powering the control room with solar energy. The plant produces enough energy to power 150,000 residential customers annually. Photo 4 shows Canyon Power Plant.

**Photo 4: Canyon Power Plant**

### D.1.4. Underground Conversion Program

In 1991, Anaheim City Council established the Underground Conversion Program to improve reliability and aesthetics along the City's major streets by removing overhead power, phone, and cable TV lines. Anaheim residents and businesses benefit from improved reliability of the electric system. As of today, APU has converted approximately 780 underground circuit miles or 65% of its existing overhead circuits. Photo 5 shows the before and after images of one of the underground projects.

**Photo 5: Before and After Underground Project**

### D.1.5. Distributed Generation

In 2014 APU completed, at the time of installation, the largest city-owned convention center roof-mounted system in North America. This 2.4 MW solar plant can generate enough energy to support approximately 600 homes a year. Photo 6 shows the 2.4 MW Anaheim Solar Energy Plant at the Convention Center.

**Photo 6: The 2.4 MW Anaheim Solar Energy Plant at Convention Center**

Approximately 47 MW of rooftop solar generation is installed throughout the Anaheim system. To date, there are little to no impacts to the distribution network resulting from these installations, which are relatively small in size and not concentrated in one area, but rather scattered throughout the system.

Similarly, APU has not experienced nor expects any significant impacts to the distribution network due to transportation electrification efforts since the Electric Vehicle Supply Equipment (EVSE) have not been concentrated in one area or on a specific circuit at this point in time.

APU continues to monitor potential impact from distributed generation and from electric vehicle charging stations and will make necessary infrastructure investments to maintain system reliability and resiliency. As an example, APU evaluates commercial customers' plans to install charging stations, and will upgrade local transformers when multiple charging stations are planned to be installed in a concentrated area.

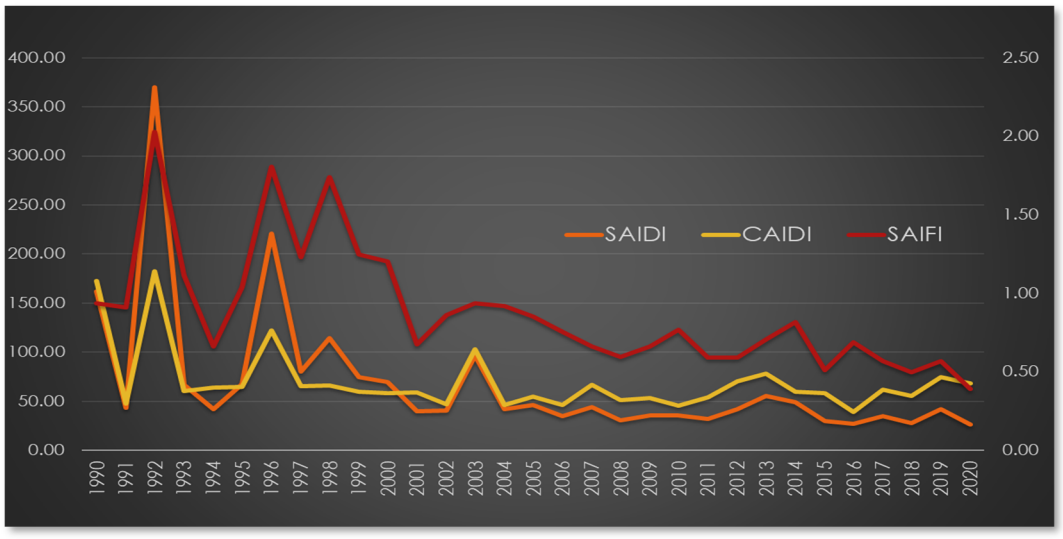

## D.2 SYSTEM RELIABILITY

APU provides high quality electric service to approximately 120,000 metered residential and business customers through a modern and well-maintained distribution network.

In 2019, the American Public Power Association recognized APU once again as a Reliable Public Power Provider (RP3). The RP3 designation lasts three years and recognizes utilities that demonstrate high proficiency in reliability, safety, work force development, and system improvement. Of the 2,000 public power utilities nation-wide, only 235 hold the RP3 designation.

Performance metrics are regularly utilized to measure outage duration, number and type of outage events, as well as restoration time. Electric reliability is measured by recording how many times service is interrupted (System Average Interruption Frequency Index or SAIFI), how long the average customer is interrupted (System Average Duration Index or SAIDI), and how long it takes to restore service once a customer is interrupted (Customer Average Interruption Duration Index or CAIDI). These three measures of reliability have been standardized and are recognized by the electric industry as best practices for comparing reliability performance among utilities. Below is a graph showing Anaheim's reliability performance in terms of SAIDI, SAIFI, and CAIDI since 1990.

**Graph 61: Anaheim's Reliability Performance in Terms of SAIDI, SAIFI, and CAIDI Since 1990**

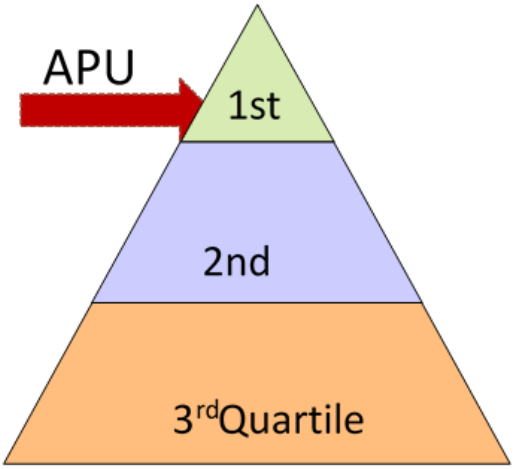


Many factors that affect service reliability are beyond APU's control, such as wind, vehicles hitting power poles, earthquakes, etc. However, other factors are controllable, such as maintaining equipment in good operating order by continually monitoring and inspecting the system, tightening connectors, cleaning dirt from insulators, detecting and replacing damaged or aging components before they fail, and systematically replacing equipment nearing the end of its useful life.

APU is continually working to improve its electric distribution system. For example, APU has installed a significant number of remotely controlled field switching to improve outage restoration times, in conjunction with a program to remove old direct-buried cable from the system and replacing it with cable encased in conduit. APU is also aggressively converting existing overhead lines along major streets to underground as a way of enhancing reliability and the visual appeal of streetscapes throughout the community.

APU is ranked in the top 25% (quartile) of utilities nationwide when it comes to electric system reliability, which means that APU customers have fewer and shorter power outages than the other 75% of utilities nationwide.

**Graph 62: APU at the Top Quartile of Utilities Nationwide for Reliability**




## D.3 SYSTEM RESILIENCY

The City of Anaheim has undertaken a comprehensive planning effort in developing its 2022 Local Hazard Mitigation Plan[35] by organizing resources, assessing risks, and developing and implementing a mitigation plan and monitoring process. On January 10, 2023, the Anaheim City Council adopted the 2022 Local Hazard Mitigation Plan, which was developed through City and community collaboration. It evaluates the risk of hazards and demonstrates how Anaheim will lower its risk and exposure to potential disasters including, but not limited to, earthquake, wildfire, and climate change.

Specifically, Chapter 3 of the 2022 Hazard Mitigation Plan details the risk factors of wildfire and preventative measures including fire mitigation education, vegetation management, routine inspections, fire resistant building material, and fire preventive building features. To ensure rapid response and adequate fire protection

[35] https://www.anaheim.net/DocumentCenter/View/43389/Draft-hazard-mitigation-plan-03312022?bidId=

in times of major fire events, Anaheim also participates in the Standardized Emergency Management System, which enhances multi-agency coordination for local and regional emergencies.

## D.4 SMART GRID

APU has always strived to enhance its system reliability, improve efficiency and power quality, and empower customers with real time knowledge of energy demand through implementation of new commercially available and proven technologies, including but not limited to distribution automation, smart grid applications, and advanced metering infrastructure programs.

### D.4.1 Distribution Automation

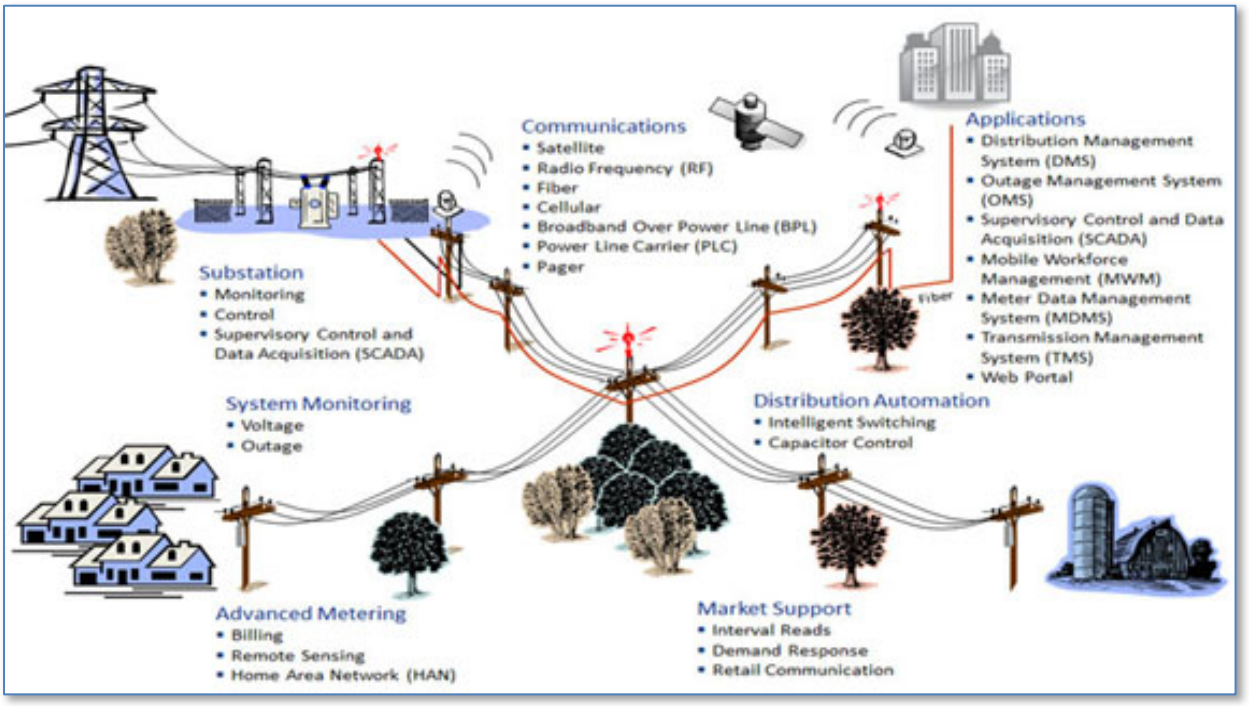
Smart Grid refers to modernization of the electricity delivery system primarily through automation. It allows for a more reliable, secure electrical service, and is characterized by a two-way flow of information, control systems, and computer processing to create an automated, widely distributed energy delivery network. These cutting-edge technologies include advanced sensors and relays that sense and recover from faults in the substation automatically, automated feeder switches that re-route power to other feeders, automatic re-closers with smart protective devices that quickly restore power following momentary outages, and automated feeder capacitors that switch on/off automatically as needed to maintain constant feeder voltages.

Some major advantages of implementing Smart Grid projects are 1) a self-healing power system which uses digital information and automated control to supply more reliable power with fewer, briefer outages, 2) the ability to immediately and/or remotely validate and manage outages and restoration work which reduces the time needed to restore service, 3) a reduction in the number of times employees are sent to a particular address to validate power supply to a meter, and 4) reductions in total energy use, peak demand, energy loss, as well as potential reduction in end-user consumption.

APU performed a Smart Grid study to assess each of the distribution circuits in the system and to identify which overhead and underground switches, field capacitor banks that need to be automated, and where branch line fuses should be installed. In addition, the study also identifies the potential locations to install automatic re-closers (AR).

Anaheim's electric system has continually been reinforced and enhanced to meet increasing load demand while maintaining system reliability. The use of computer-based remote control and communication equipment can help ensure that the distribution system communicates and works together to deliver electricity more reliably and efficiently. The automated infrastructure modernizes the Grid, making it more resilient. It further reduces the number of customers affected during power outages, the frequency and duration of power outages, and the impacts of naturally occurring events. In addition, APU also benefits from a modernized Grid, including improved security, reduced peak loads, increased integration of renewables, and improved operational efficiency.

**Graph 63: Basic Characteristics of Smart Grid**



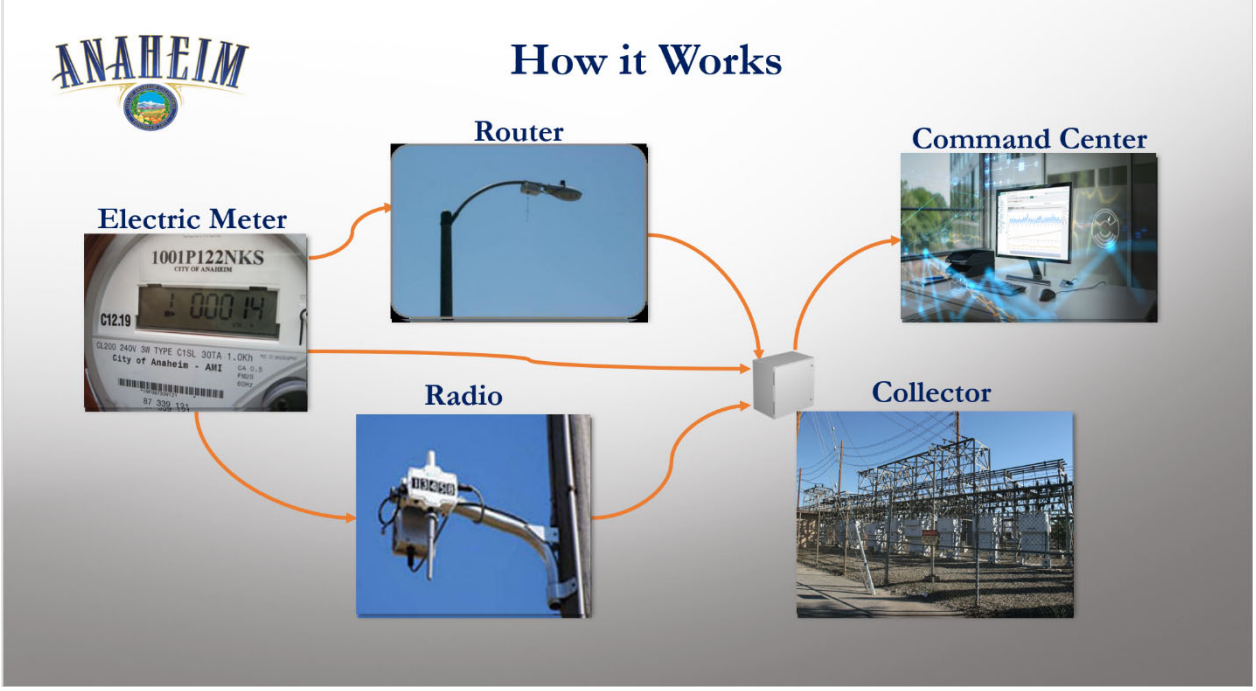

APU has actively promoted, implemented, and expanded Smart Grid projects for its electric system since 2010. To date, APU has spent several million dollars on Smart Grid projects and automatic devices system-wide including, but not limited to, automated re-closers, automated switches, automated capacitor banks, and SCADA linked fault indicators.

Future application of Smart Grid projects will evolve into more sophisticated and complex operations, such as predicting failing equipment and automatically isolating faulty equipment before a failure occurs, automatically restoring customers immediately after outages (self-healing) and integrating distributed energy resources and demand response programs.

### D.4.2 Advanced Metering Infrastructure

As a critical component of the Smart Grid, APU has deployed approximately 90,000 Advanced Metering Infrastructure (AMI) systems within its service territory. APU uses a radio frequency network communication for its electric distribution automation system for the 'last mile' communications from substations that utilize fiber optics for high-speed communications.

**Graph 64: Advanced Metering Infrastructure**




## D.5 PHYSICAL SECURITY PLAN

As an integral part of the planning and development process of its electric system, APU always strives to consider resiliency, enhanced reliability, and redundancy for its electric system.

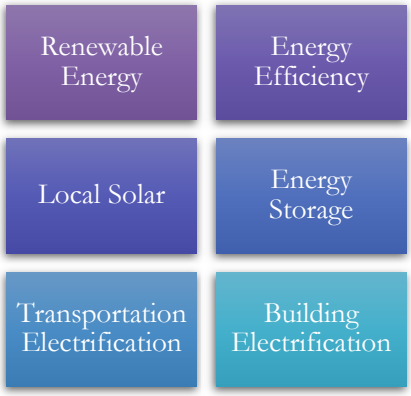
In 2021, APU completed a comprehensive review of its entire electric system that may be subject to physical security threats and developed a physical security plan to ensure protection of its electrical facilities from such threats. The APU Physical Security Plan was developed because of FERC directives and CPUC mandates that require electric utilities to identify vulnerable distribution assets such as substations that merit special protection and measures to reduce identified risks and consequences.

As the result of its assessment, APU concluded that all its critical electric facilities are equipped with security cameras, intrusion detection, alarm systems and 24/7 remote monitoring systems. The facilities were designed with two independent and redundant power sources, field equipment automation, and inventory of spare assets. APU expects to review and update its Physical Security Plan in five years from its initial plan.

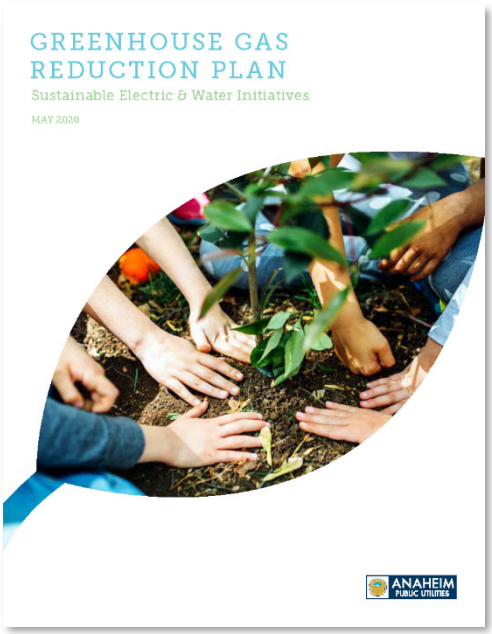
# IX. GREENHOUSE GAS EMISSION REDUCTION

## APU'S EMISSION REDUCTION EFFORTS

To meet the AB 32 and SB 32 goals, APU began reducing its reliance on generation resources that produce GHG emissions by transitioning from fossil fuel-fired generating resources to renewable resources. The most significant contribution that APU can make in reducing GHG is the reduction of energy resources that produce GHG emissions from its power supply. In addition to GHG emission reductions from APU's power supply, further GHG reductions will come from complementary efforts including continued energy efficiency measures, local solar, energy storage, electrification of homes from natural gas, and electrification of the transportation sector.




## 2020 GREENHOUSE GAS REDUCTION PLAN



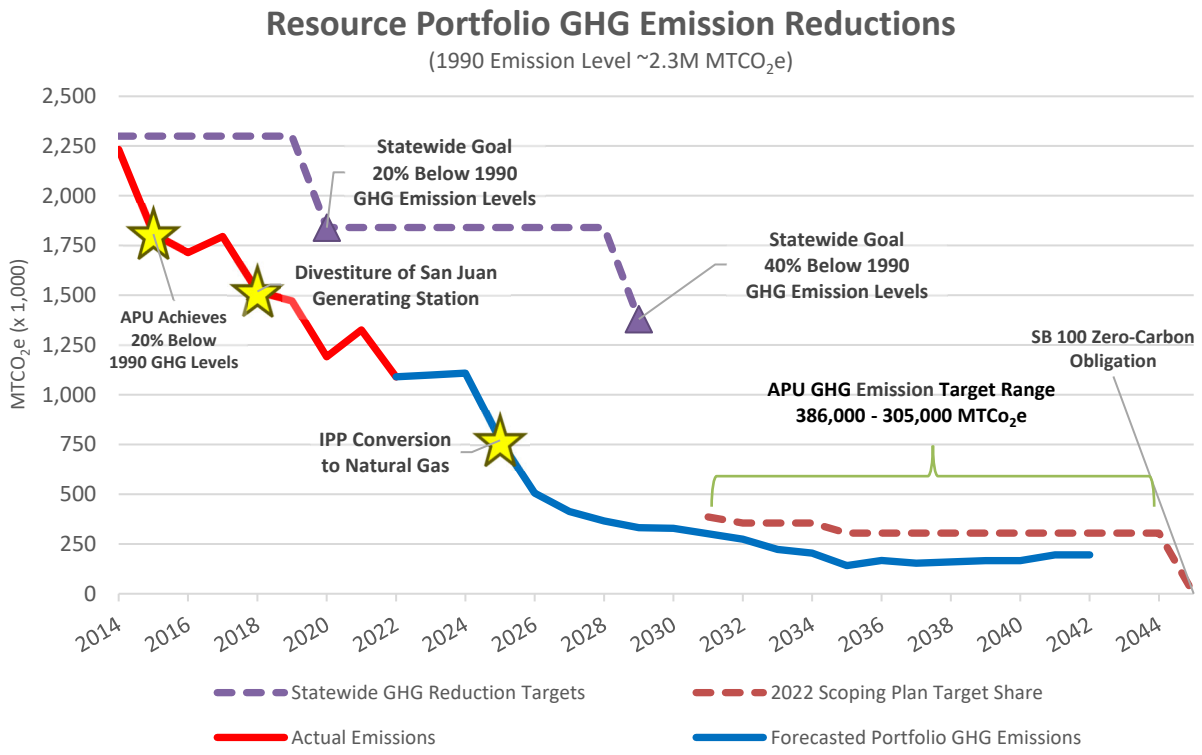

In May 2020, APU published its follow-up utility-specific Greenhouse Gas Reduction Plan [36] with the purpose of continuing its commitment to a clear and comprehensive long-term strategic framework to reduce GHG emissions. The Plan reviews how it doubled its 2020 goal to reduce GHG emissions by 20% below 1990 levels by 2020, as well as identifying goals for a minimum of 40% below 1990 levels by 2030 and zero-carbon by 2045. It is important to note that the 40% reduction below 1990 levels is a statewide goal; however, California utilities will likely be called upon to do more. This includes serving all retail load with zero-carbon resources by 2045 as prescribed in SB 100 passed in 2018.

APU doubled its goal of 20% below 1990 levels through the increased renewable generation from 11% in 2010 to 32.3% of overall sales in calendar year 2020. Further GHG emissions reductions were realized in 2018 due to the divesture of the San Juan Generating Station in 2017. Upon APU's exit from the Intermountain Power Project in 2027, APU's overall GHG emissions from its power supply portfolio are expected to reach or exceed 70% below its 1990 emissions by 2025. The GHG reduction targets established by CARB for POUs are currently 77% to 87% below 1990 levels by 2030. These targets are expected to be revised to align with CARB's 2022 Final Scoping Plan for Achieving Carbon Neutrality resulting in POU emission reduction targets of 83% to 87% below 1990 levels.

[36] https://www.anaheim.net/5507/Greenhouse-Gas-Reduction

In order to continue its downward emissions trajectory, APU will need to procure additional renewable energy to account for forecasted growth of transportation electrification demand. Procurement and/or development of bulk energy storage systems is another method that APU is actively pursuing to shift renewable over-generation from mid-day hours to evening demand periods where the CASIO grid managers currently depend on natural gas, and other high emitting resources, to meet peak demand. This has a direct impact on reducing system wide emissions but may not necessarily reduce APU's natural gas baseload or Canyon Power Project[37] resources. Significant emission reductions are observed in each of the portfolio scenarios analyzed and discussed in Section VII. Resource Portfolio Evaluation.

**Graph 65: APU GHG Reduction Targets**




## EMISSION REDUCTIONS ASSOCIATED WITH TRANSPORTATION ELECTRIFICATION

APU previously used the CEC's "2016 SB 350 Common Assumption Guidelines for Transportation Electrification Analysis 3.0" workbook published in April 2017 to estimate avoided GHG emissions associated with electric vehicle growth. In the absence of this report, APU used multiple publicly available resources, specifically the emissions saving equation associated with Low Carbon Fuel Standards (LCFS) regulation[38,]

[37] https://www.anaheim.net/DocumentCenter/View/21469/Canyon-Power-Project
[38] https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf

CPUC's 2022 Unified RA and IRP Modeling Datasets[39], and CEC's 2021 IEPR Energy Demand Forecast[40]. This process is discussed in additional detail in Section X. Transportation Electrification.

**Table 4: Anaheim EVs and Emission Savings per Vehicle**

| CY | APU Cumulative Annual EV Demand (MWh) | Annual Avoided GHG Emissions ($MTCO_2e$) |
|---|---|---|
| 2023 | 53,680 | 5,115 |
| 2024 | 70,355 | 7,122 |
| 2025 | 87,030 | 9,081 |
| 2026 | 103,705 | 11,924 |
| 2027 | 120,379 | 14,216 |
| 2028 | 137,054 | 16,958 |
| 2029 | 153,729 | 19,884 |
| 2030 | 170,404 | 22,996 |
| 2031 | 187,078 | 29,496 |
| 2032 | 203,753 | 36,753 |
| 2033 | 220,428 | 44,767 |
| 2034 | 237,103 | 53,540 |
| 2035 | 253,778 | 59,362 |
| 2036 | 270,953 | 64,700 |
| 2037 | 288,127 | 68,954 |
| 2038 | 305,302 | 73,226 |
| 2039 | 322,477 | 77,516 |
| 2040 | 339,652 | 81,824 |
| 2041 | 356,827 | 86,151 |
| 2042 | 374,002 | 90,495 |
| 2043 | 391,177 | 94,858 |
| 2044 | 408,352 | 99,239 |
| 2045 | 425,527 | 103,638 |

Based on these estimates, APU could avoid 18,046 MTCO2e of GHG annually associated with electric vehicle charging demand within the service territory by the year 2030. As APU's power supply portfolio integrates more renewable resources, the electricity used to serve EV charging demand will become cleaner, thus resulting in greater GHG emissions avoidance. Forecasted avoided GHG emissions are estimated to be 94,705 MTCO2e by 2045, or 425% greater than 2030, despite estimated EV demand only increasing 190% across the same time period.

[39] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/unified-ra-and-irp-modeling-datasets-2022
[40] https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report/2021-1

## EMISSION REDUCTION TARGET – SYSTEM ENERGY DEMAND

Senate Bill 350, the Clean Energy and Pollution Reduction Act of 2015 (Chapter 547, Statutes of 2015) (SB 350) requires the California Public Utilities Commission (CPUC) and the California Energy Commission (Energy Commission) to establish IRP processes to ensure that load-serving entities (LSEs) and qualifying publicly owned utilities (POUs) [41] meet the GHG emission reduction targets established by the California Air Resources Board (CARB) for the electricity sector and each LSE and POU for the year 2030.

CARB, in conjunction with CEC, developed utility-specific GHG reduction planning target ranges for California POUs as mandated through the passage of SB 350. Finalized utility-specific GHG reduction target ranges were most recently updated in March 2021.

While CARB is ultimately responsible for setting the GHG reduction target ranges for all utilities, the CEC released a memo titled "Energy Commission Staff Recommended Methodology for Setting POU-Specific GHG Emission Reduction Targets for Integrated Resource Planning" dated April 12, 2018. In this memo, the CEC provided guidance and recommended POU GHG reduction planning targets to inform and assist the CARB with establishing the official target planning ranges. At its July 2018 board meeting, the CARB Board approved the SB 350 GHG planning target ranges for all IRP utilities. As of the writing of the 2023 IRP, it is not expected that CARB will update the GHG reduction targets it established in March 2021 until a later date.

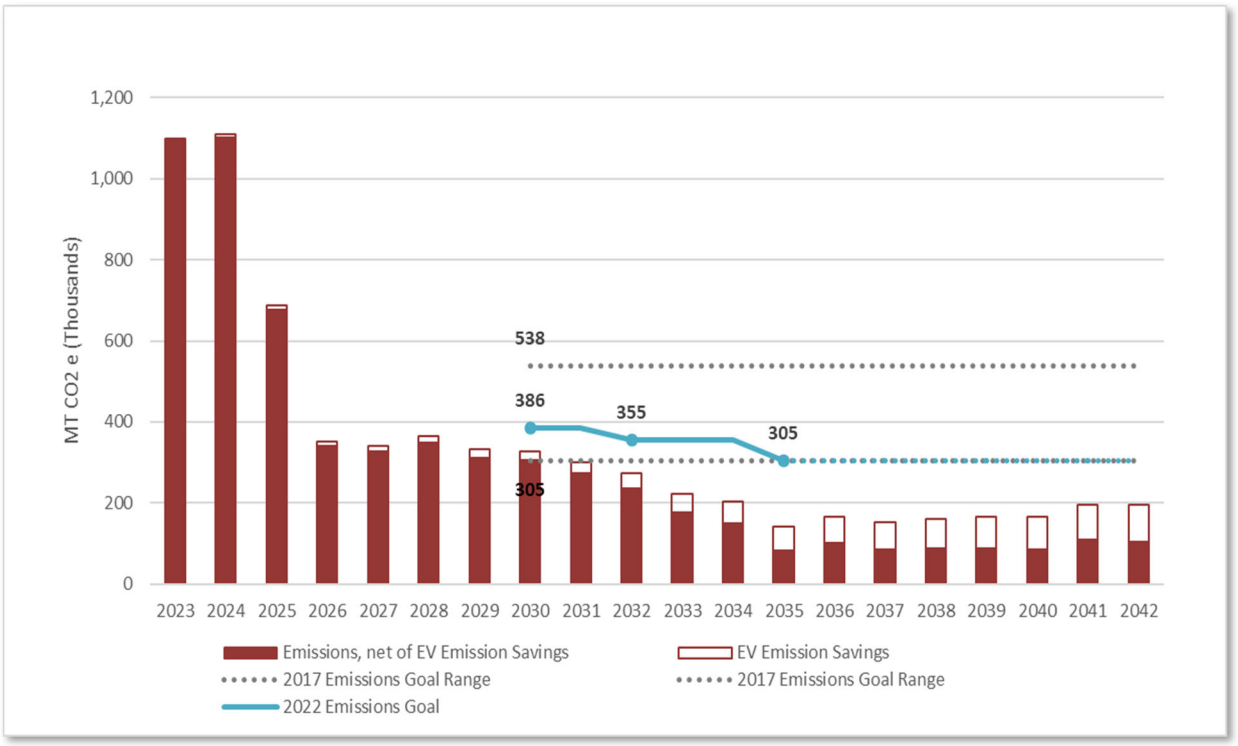
The CEC's methodology, subsequently established by CARB, range of GHG reduction targets for APU between 305,000 and 538,000 $MTCO_2e$. This proposed target range represents an approximate emission level between 77% - 87% below APU's 1990 emission levels. This GHG reduction range is significantly greater than the statewide targeted reduction of 40% below 1990 emission levels established by SB 32, and lower bound of the range would be difficult to achieve without significantly increasing APU power supply costs, while maintaining reliability.

***CARB's adopted target range represents an approximate emission level between 77% - 87% below APU's 1990 emission levels.***

However, the final 2022 Scoping Plan approved by CARB outlined that a decreasing range of electric utility sector emission targets needed to meet the state's GHG reduction goal of more than 80% below 1990 levels. The sector targets range from 38 million to 30 million $MTCO_2e$ and decrease closer to 2030. APU serves approximately 1% of the state's electrical demand and thus has a target of 386,000 $MTCO_2e$ beginning in 2023 and decreasing to a target of 305,000 $MTCO_2e$ by the state's 2030 goal date.

[41] The IRP requirement applies only to POUs with annual demand exceeding 700 GWh.

**Graph 66: APU GHG Emission for System Energy Demand**




APU's resource portfolio will be coal-free by mid-2025 and, at a minimum, 60% of APU's electricity deliveries will come from renewable energy resources. Based on current law and regulations, APU's Reliability Portfolio under the 2023 IRP will achieve the upper bound of the proposed GHG reduction target range (83%); however, the lower bound of the range (i.e., 87% GHG reduction) will not be achieved without cost impacts. This not an isolated issue facing APU and is outlined in the Joint Agency SB 100 report[42], published in 2021, which outlined the viability and difficulties in serving California demand with 100% zero-carbon resources. This report identified that achieving a 100% zero-carbon by 2045 was achievable but would require significant costs and unprecedented renewable resource build rates. Fulfilling the more stringent 87% GHG reduction target would cause a significant rate impact to APU customers as it would require the shutdown, fuel conversion, or "stranding," of a very reliable and efficient baseload natural gas resource Magnolia Power Plant, which has 20-years of unavoidable debt service costs that would still need to be paid by APU customers in addition to replacement renewable resources. APU is closely following relevant regulatory proceedings and will work with CARB and CEC to recommend sensible methodologies to further reduce APU carbon emissions, such as accounting for the effect of electric vehicle (EV) penetration on emission reduction.

[42] https://www.energy.ca.gov/publications/2021/2021-sb-100-joint-agency-report-achieving-100-percent-clean-electricity

# X. TRANSPORTATION ELECTRIFICATION

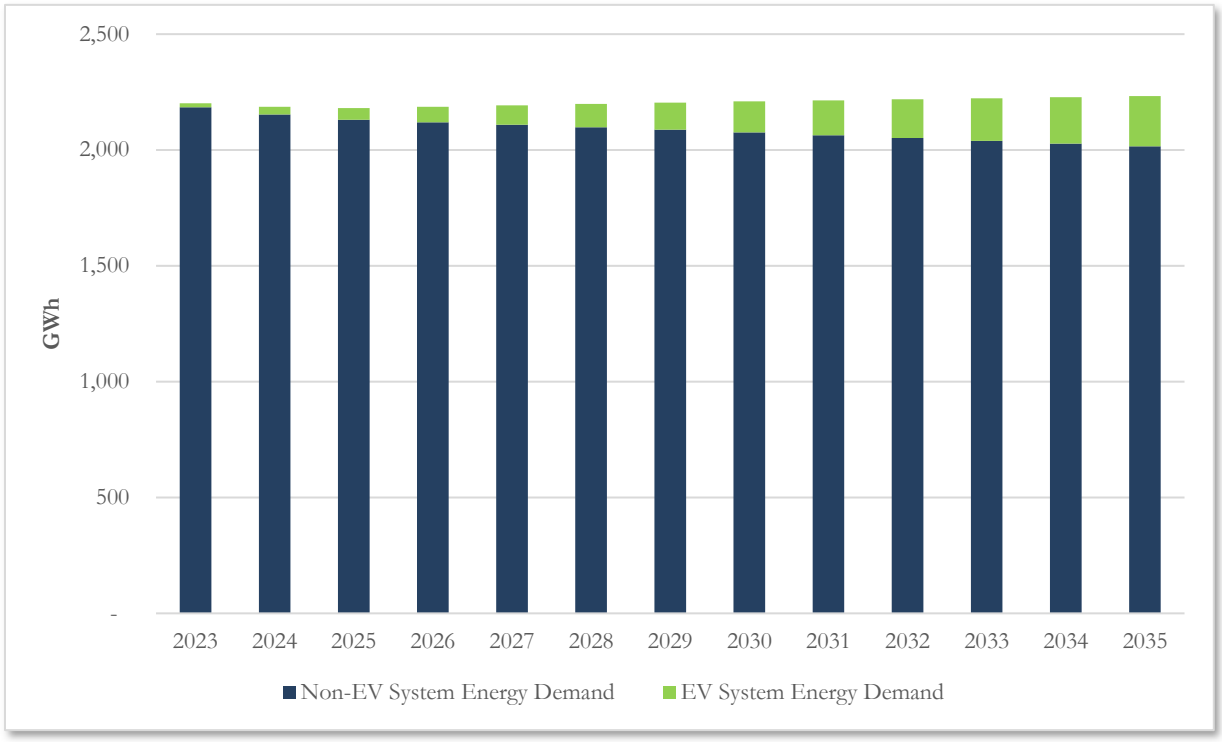
Transportation Electrification (TE) is the transition from fossil-fuel powered vehicles to vehicles powered by clean and sustainable electricity. This includes passenger and commercial automobiles as well as transit buses and medium to heavy-duty trucks. APU's holistic efforts related to TE date back to 2012, soon after modern EVs became commercially available. APU had a vision to facilitate customers' interests in EVs by addressing EV readiness, charging infrastructure plans, financial tools for customers, ease of permitting, and enhanced customer service. Since then, APU has developed various programs and continues to support TE while providing environmentally sustainable and competitively priced power.

## A. Quantification, Characterization, and Location

### LOAD IMPACT AND GHG EMISSION REDUCTIONS

APU's incremental EV load averages 17 GWh annually from 2023 to 2035. This results in a cumulative EV load of 134 GWh in 2030, which is more than double the 2018 IRP forecast of 63 GWh in 2030. By 2035, the estimated cumulative EV load reaches 217 GWh, or 9.7% of the total system load. The forecast is derived from the CEC 2021 Integrated Energy Policy Report (IEPR) Energy Demand Forecast and the CPUC 2022 Unified RA and IRP Modeling Datasets. More details can be found under VI. Energy Demand and Peak Forecasts.

**Graph 67: Estimated Electric Vehicle Energy Demand Growth**

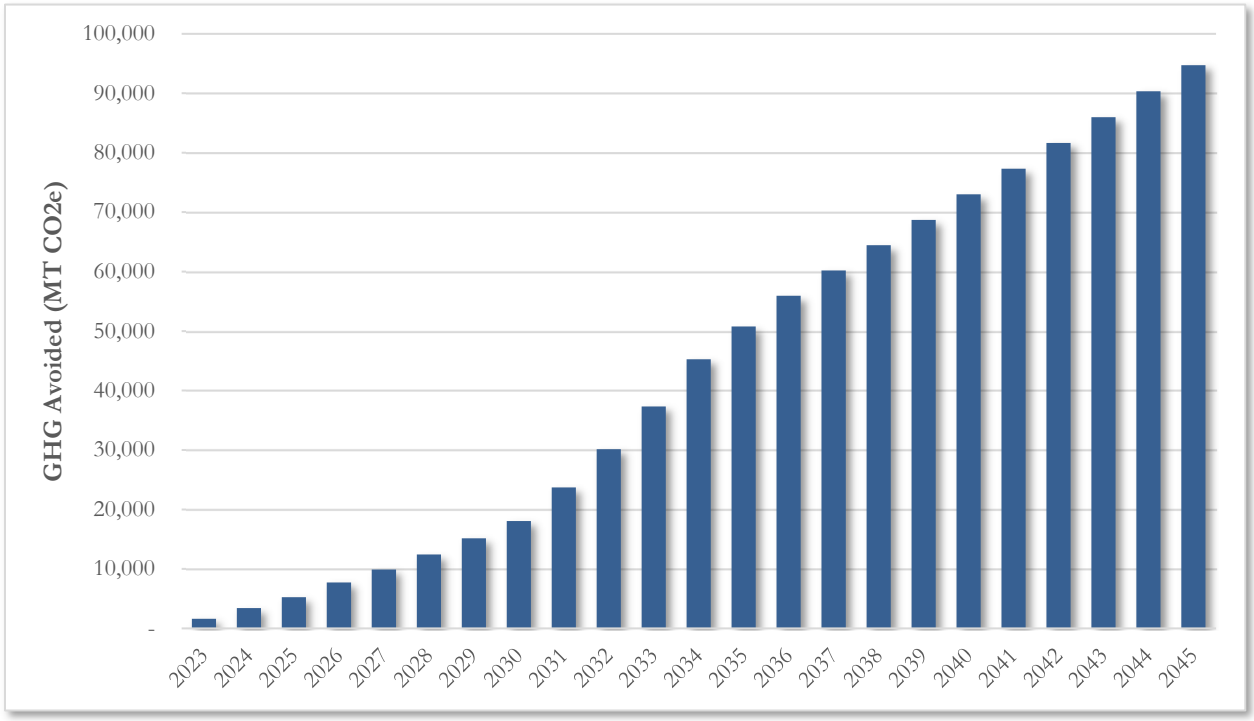



The CEC's Transportation Electrification Common Assumptions workbook is not available for the 2023 IRP.

To estimate GHG emission savings from transportation electrification, APU adopts the emissions savings or credit generation equation per section 95486.1(a) of the Low Carbon Fuel Standards (LCFS) regulation.[43]

GHG emission reductions is estimated to increase as a result of annual EV energy demand growth and grid supplied renewable resources. This is calculated by comparing APU's cumulative EV energy demand with the decrease of carbon intensity (CI) values of gasoline versus electricity, adjusted for the energy economy ratios. The CI values for gasoline and electricity are both estimated to decrease as a more stringent gasoline benchmark is introduced, and the State's RPS and zero emission targets increase. However, the electricity CI values are expected to decrease at a rate faster than the gasoline benchmark values, reaching zero electricity CI in 2045. Even with conservative assumptions beyond 2036 (assuming market saturation), it is estimated that by 2045, avoided emissions will be 94,705 MT CO2e due to EV conversion and the electricity sector reaching the State's 100% zero emissions goal.

**Graph 68: Estimated GHG Emission Reduction Summary**




[43] https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf

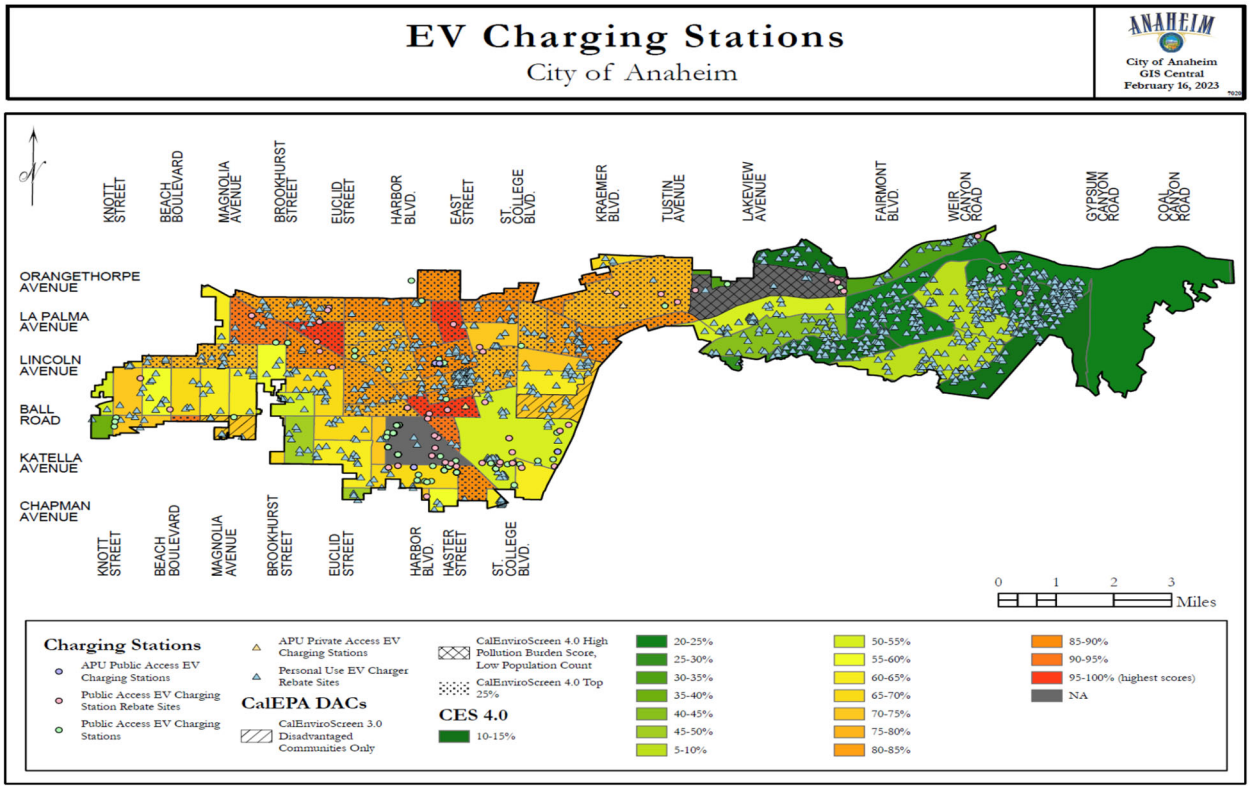
## EV CHARGING STATIONS

According to the Alternative Fuels Data Center[44] of the U.S. Department of Energy (DOE) and internal tracking data, within the City of Anaheim there are a total of 589 public access charging stations (507 Level 2 stations, and 82 DC Fast Charging stations) as of October 2022. These charging stations include both privately-owned charging stations and the above-mentioned public access charging stations under APU control.

**Photo 7: Charging Stations at Anaheim Regional Transportation Intermodal Center**

The 2018 IRP Customer Survey results indicated that residential customers who anticipated acquiring an EV within the next three years were spread evenly throughout APU's service territory. Additionally, about half of the customers surveyed lived in multi-family dwellings, signifying the potential need for public access EV charging stations. APU's public charging stations will provide EV owners geographical convenience for their fueling options.

**Graph 69: EV Charging Stations within APU Service Territory**




[44] U.S. Department of Energy's Alternative Fuels Data Center, http://www.afdc.energy.gov/data_download. February 2023

## Utilities Fleet

APU's Fleet consists of 174 vehicles and is broken down by class: light-duty vehicles, medium-duty vehicles, and heavy-duty vehicles. Below are the number of vehicles broken down by class:

| | LDV | MDV | HDV | Total |
|---|---|---|---|---|
| APU Fleet | 96 | 47 | 31 | 174 |

For light duty vehicles, there are 34 passenger vehicles of which 26 vehicles (76%) consist of EVs and hybrid EVs. It is APU's goal to replace 100% of its passenger vehicles with EVs or hybrid EVs by 2024. The other 62 LDVs consist of work vans and small pick-up trucks. These will be replaced as electric vans and trucks become available from vehicle manufacturers.


**Photo 8: Early Model Electric Toyota RAV-4 Used by APU for Fleet Testing**

APU operates a diverse range of medium and heavy-duty vehicles which serves both residential and commercial customers. South Coast Air Quality Management District (AQMD), California Air Resources Board (CARB), and Department of Energy (DOE) has a number of programs and regulations limiting APU purchases of light-duty, medium-duty, and heavy-duty vehicles with zero-emission vehicles (ZEV). Additionally, because of these limiting factors, vehicle manufacturers are forced to produce and sell ZEVs in California. The US market growth for medium-duty and heavy-duty EVs is projected to occur based on more models, a continued decline in battery prices, and increased support from policymakers. APU will continue to convert older and higher-polluting vehicles to EVs as they become available from vehicle manufacturers.

**Photo 9: Hybrid Electric Bucket Truck**

APU continues to operate a hybrid electric bucket truck. The performance of the hybrid bucket truck is less than average and is seeking other experiences with hybrid bucket trucks from surrounding Utilities. APU will continue to evaluate technological readiness for the electrification of hybrid bucket trucks.

It is worth mentioning that APU owns an electric forklift and an electric burden carrier used in the warehouse to transport heavy materials and equipment within the Utilities' complex.

## B. Transportation Electrification Programs

APU's transportation electrification programs including the following:

### B.1. EMPLOYEE WORKPLACE CHARGING PROGRAM

To the extent possible, APU offers its employees and the City's employees access to its EV charging stations located in employee and fleet parking facilities. APU is currently developing projects to expand the number of charging stations at high EV traffic City locations.

### B.2. EV RATES

APU offers residential customers an optional time-based rate schedule (Developmental Schedule D-EV of City of Anaheim's Electric Rates, Rules and Regulations, available online at http://www.anaheim.net/documentcenter/view/1248). The Customer Charge is $5.00 per month. From July 1 through October 31, the rates are $0.2634 per kWh and $0.1117 per kWh for energy used to charge electric vehicles during on-peak and off-peak hours, respectively. From November 1 through June 30, the rates are $0.2563 per kWh and $0.1056 per kWh for energy used to charge electric vehicles during on-peak and off-peak hours, respectively. On-peak hours are 3:00 p.m. to 10:00 p.m. everyday all year long, and all other hours are off-peak. APU recently suspended new customers from signing up for this rate schedule based on the shift towards virtual submetering. Once virtual submetering is readily available and integrated into APU's Customer Information System, this rate option will be modified and made available. A whole house TOU rate is still available to customers.


APU also offers commercial customers with electric vehicles an optional time-based rate schedule (Developmental Schedule D-EV-2 of City of Anaheim's Electric Rates, Rules and Regulations, available online at http://www.anaheim.net/documentcenter/view/20547), with two rate options. Both rate options include a Customer Charge and on-peak, mid-peak, and off-peak energy charges for the summer and winter seasons; one option does not include demand charges and the other includes demand charges with relatively low energy charges. The summer season runs from July 1 through October 31 and the winter season runs from November 1 through June 30. On-peak hours are 4:00 p.m. to 9:00 p.m. summer weekdays except holidays; mid-peak hours are 6:00 a.m. to 4:00 p.m. and 9:00 p.m. to 11:00 p.m. summer weekdays except holidays, and 6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 11:00 p.m. winter weekdays except holidays; and all other hours are off-peak.

## B.3. PUBLIC EV PROGRAMS FOR CUSTOMERS INCLUDING DISADVANTAGED COMMUNITIES

### B.3.1. Private Access EV Charger Rebate Program (2012 – Current)

This program offers rebates to residential, commercial, and industrial customers who install Level 2 or higher EV chargers at their home or business without being made available to the public. This program was initially implemented with a rebate of up to $1,500 per charger for early adopters and has reduced the rebate amount over time as participation has increased.

Previously, APU reimbursed customers for out-of-pocket expenses up to $400 per any Level 2 EV charging station or up to $1,000 per networked charger and also required the customer to sign up for APU's Time-of-Use Rate. A customer can receive a maximum of two EV charger rebates. Eligible expenses include the cost of the charger and the cost of installation. In addition to the rebate, APU pays the City's permitting fees for the EV charger.

To help expand access to EV adoption, APU increased reimbursement amounts for customers with out-of-pocket expenses to $1,500 for any level 2 charging station, and $3,000 per networked charger and enrollment in APU's Time-of-Use rate. Eligible expenses include the cost to upgrade the panel, the cost of the charger, and the cost of installation. In addition to the rebate, APU continues to pay the City's permitting fees for the customer's EV charger.

Since the program's inception in 2012, APU has issued rebates for a total of 364 EV chargers. Total rebates expenditures sum up to $350,138. Rebates paid between 2012 and 2018 were funded by APU's Business Development budget. Since 2019, funding for these rebates is dependent upon proceeds from the sale of Low Carbon Fuel Standard (LCFS) credits.

### B.3.2. Public Access EV Charging Station Rebate Program (2016 – Current)

**Commercial, Municipal and Multi-Unit Dwellings**

The Public Access EV Charging Station Rebate Program provides rebates of actual equipment and installation costs up to $5,000 per EV charging station and up to $10,000 per direct current (DC) fast charging stations at publicly accessible areas. This program also reimburses up to $5,000 for costs associated with the installation of a sub-meter, plan check fees (up to $1,500/installation) and pays for City of Anaheim building permit fees ($170/charger) in addition to the rebate.

**Disadvantaged Communities, Schools, and DC Fast Charging**

Charging locations serving Affordable Housing locations or schools and colleges will receive a rebate for actual equipment and installation costs up to $10,000 per EV charging station. This program also reimburses up to $5,000 for costs associated with the installation of a sub-meter, plan check fees (up

to $1,500/installation) and pays for City of Anaheim building permit fees ($170/charger) in addition to the rebate.

In 2017, APU revised the program design to extend the $10,000 allocation to customers installing direct current (DC) fast charging stations. APU recognizes the need for more publicly available EV charging station infrastructure and considers the typical charging duration of 4-8 hours on Level 2 chargers to be a barrier to EV adoption and ownership. The inclusion of DC fast charging stations is intended to alleviate charging anxiety and enhance Anaheim's EV-friendly environment. The funding for this program is from the proceeds from the sale of LCFS credits.

Since inception, the program has incentivized 188 public access charging stations. The additional $5,000 for locations serving Affordable Housing locations and personalized customer outreach (described more in detail under Education and Outreach Plans below) show APU's efforts in prioritizing disadvantaged communities.

APU intends to continue offering the rebates and working closely with customers to understand their specific needs and how to best assist them.

### B.3.3. Income Qualified EV Ride Sharing Pilot Program

The Income Qualified EV Ride Sharing Pilot Program provides access to EVs for residents who live in multi-family housing in disadvantaged or low income communities that are served by APU and who may not otherwise have access to EVs. This program provides rebates to property owners and property management companies who host EV ride sharing vehicles and make them available for use to their residents. Rebates include up to $24,000 per year for the lease of two (2) EVs, and up to $36,000 per year to cover the cost of licensed driver ridership, for up to three (3) years.

Since inception, the program has incentivized 2 multi-family apartment complexes, and each complex offers 2 EVs for resident use.

### B.3.4. EV Fleet Charger and Infrastructure Rebate

The EV Fleet Charger and Infrastructure Rebate offers commercial customers and K-12 school rebates for networked-Level 2 or greater EV chargers and associated EV charger infrastructure upgrades. Commercial business fleet customers receive $5,000 per EV Charger, up to $45,000 per site for associated EV charger infrastructure upgrades and up to $5,000 for associated sub-meter installation costs. Additionally, school customers receive $10,000 per EV charger, up to $95,000 per site for associated EV charger infrastructure upgrades and up to $5,000 for associated sub-meter installation costs. APU offers a maximum of ten (10) EV charger rebates per year and will pay, on a per reservation basis, the applicable City permit fees, and rebate City plan check fees up to $1,500 and electric service connection fees of up to $2,000. Since inception, the program has incentivized 36 fleet charging stations.

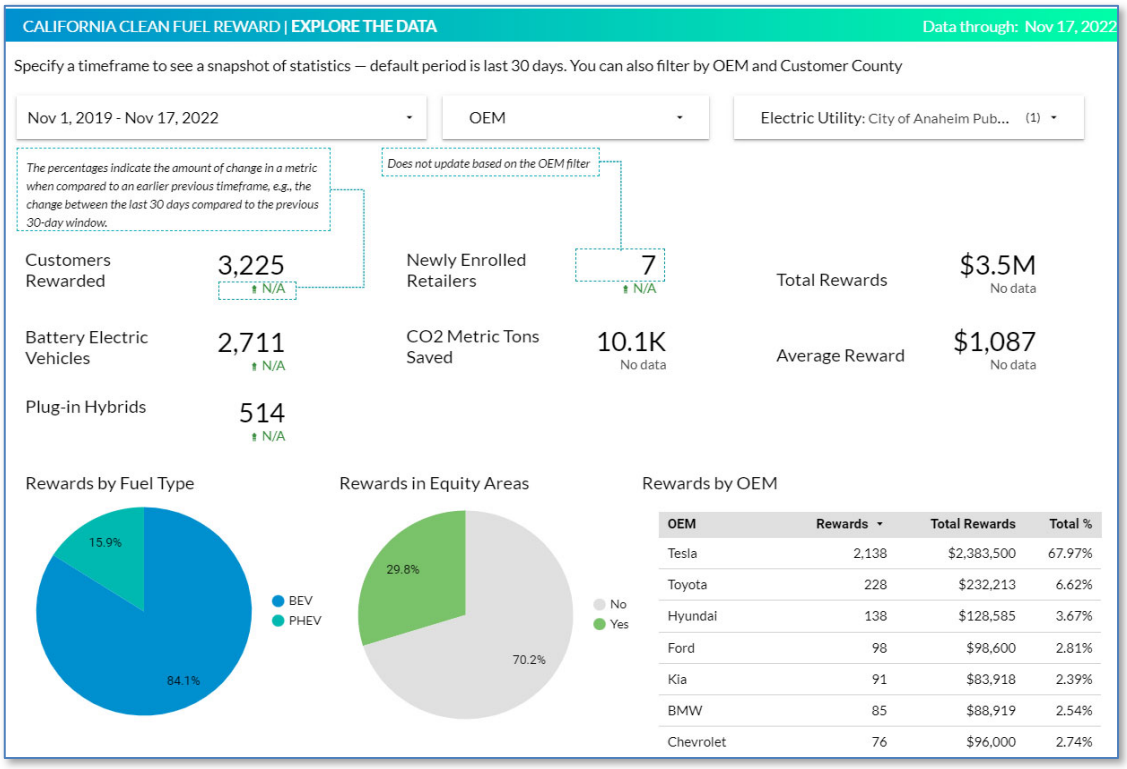
### B.3.5. DC Fast Charging Plaza

As previously discussed, APU believes DC fast charging stations can help enhance Anaheim's EV-friendly environment, and APU plans to facilitate DC fast charging plazas in Anaheim. The three major freeway corridors (Interstate 5 freeway, State Route 57, and State Route 91) give Anaheim a unique advantage to host a cluster of DC fast charging stations where EV drivers can quickly refuel their cars

and then get back on the road. In 2019, a DC Fast Charging Plaza at the Brookhurst Community Center became operational. Anaheim conducted a request for proposal to find a licensee that could lease parking spaces at the Brookhurst Community Center to operate and maintain four DC fast charging stations. EVgo was the successful bidder to install four 50kW DC fast charging stations in this disadvantaged community location.

### B.3.6. Clean Fuel Rewards Program

APU is a participant of the California Clean Fuel Rewards (CCFR) program and contributes a portion of the Low Carbon Fuel Standard (LCFS) credit proceeds to the point-of-sale rebate program. Since the program inception in November 2019, over 3,000 APU customers have taken advantage of the CCFR rebates. Nearly 30% of rebates were awarded to residents in low income and disadvantaged communities. To date, the program achieves over 10 MMT CO2 savings annually.




Note: COE Metric Tons Saved represents the estimated annual sum of the reduced carbon dioxide emissions for the program electric vehicles compared to internal combustion engine vehicles.

## B.4. FUTURE PROGRAMS

### B.4.1. Public Space Charging

APU is collaborating with other City departments including Public Works, Convention, Sports & Entertainment, Police, Economic Development, and Community Services to identify more locations to install City-owned EV charging stations. In neighborhoods with high concentrations of multi-unit dwellings, public spaces such as parks, community centers, and police stations are locations where residents can charge their EV's. APU developed a rebate program to help other departments deploys EV charging stations.

### B.4.2. Public Access EV Charger & Demand Response Direct Installation Program: Drive Green Anaheim

To help expand public access to EV chargers, APU developed a new program to provide EV charger direct installation services for commercial customers and multi-family property owners located in low income disadvantaged communities. The new Drive Green Anaheim program offers eligible commercial host sites a turnkey service with no upfront costs to design, procure, install, operate and maintain EV chargers for public use. The program will facilitate outreach to eligible commercial and multifamily property host sites, no-cost feasibility studies and master planning services for future EV charger infrastructure development, and no-cost design, procurement, and installation services for EV chargers.

With growing EV demands on the local grid, the Drive Green Anaheim program will implement demand response services to be able to curtail EV charging during peak hours (between 4-9 PM) or during grid emergencies. Smart EV chargers will be equipped with the capability to scale back charging through remote communications.

### B.4.3 Sustainability Education Center

APU is developing a Sustainability Education Center (SEC) to help customers reduce their carbon footprint. The SEC will provide sustainability-themed learning opportunities to residents, businesses, K-12 students, college students, non-profit youth organizations, and workforce development partners. The new facility will feature efficiency technologies, host seminars, provide STEM-related career pathways, and provide utility-related programming. The SEC will demonstrate sustainable resources, energy storage, electric vehicle charging, drought resilience, and how water and electricity get to Anaheim homes and businesses. It will feature Level 2 EV charging stations and information pertaining to transportation electrification.

### B.4.4 Electric Buses at Anaheim School Districts

Three school districts within APU's service territory – Savanna School District, Anaheim Elementary School District, and Anaheim Union High School District – each received a $536,000 grant ($496,000

to purchase two electric buses and $40,000 for charging infrastructure) from the South Coast Air Quality Management District [45]. APU supported the school districts' electrification efforts with EV charging station and infrastructure incentives, and is working with all school districts by offering master planning services for full build-out of EV charging for their respective fleets.

### B.5. MARKET BARRIERS AND SOLUTIONS

APU has observed three main market barriers related to TE:

1. Infrastructure capital costs of charging stations: More grants and incentives may be a solution.
2. Limited parking spaces and Americans with Disabilities Acts (ADA) requirements: Parking spaces are often scarce, especially in popular public areas, and the ADA requirements for disabled access parking spaces may deter the adoption of more charging stations. APU will continue to work with City of Anaheim's Planning Department in an effort to overcome these barriers.
3. Medium and heavy-duty vehicle availability: Most major automakers producing medium and heavy-duty vehicles have been challenged to electrify these vehicles because of their high energy requirements, vehicle parity and cost-effectiveness. Increased support from policymakers, grants, and incentives may be part of the solution.

## C. Prioritization and Funding Leverage

Where feasible, APU maximizes external funding sources to facilitate transportation electrification. Below is a summary of external grants and credits APU has utilized to enhance the EV charging infrastructure.

### INCENTIVES AND GRANTS

1. Mobile Source Air Pollution Reduction Review Committee (MSRC) Local Government Partnership Program (2017-2021):
    a. MSRC provided partial funding (totaling $147,883.27) to Anaheim for zero emission vehicles and EV charging infrastructure. APU used the funding to purchase 5 EV's for its fleet use and installed 16 fleet EV charging stations at Fleet Services Yard, Harbor Police Station, and City Hall.
2. Southern California Association of Governments (SCAG) EV Charging Station Study:
    a. Staff continues to work with SCAG on the regional study. No expenses were incurred by APU in 2021. APU is one of 18 cities partnering with SCAG on this study to help promote the development and deployment of EV charging infrastructure throughout the region. The study includes tailored policy guidance, a region wide Site Suitability Analysis that targets areas for future EV charging infrastructure, with a focus on increasing EV infrastructure in traditionally underserved and hard-to-reach communities including multi-unit dwellings (MUDs) and Disadvantaged Communities (DACs); EV site evaluations; and a Passenger Electric Vehicle (PEV) Infrastructure Plan that will provide a roadmap for cities to spur development of charging stations and support EV adoption. The study also prepares cities towards full

[45] South Coast Air Quality Management District, "SCAQMD Awards $8.8 Million for Electric School Buses," http://www.aqmd.gov/docs/default-source/news-archive/2017/scaqmd-awards-$8-8-million-for-electric-school-buses---june-2-2017.pdf

compliance with California Assembly Bill (AB) 1236, which requires cities to update and streamline their EV charging station permitting requirements as well as provides best practices recommended by California Governor's July 2019 Office of Business and Economic Development (GOBIZ) EV charging Station Permitting Guidebook. Additionally, SCAG attended outreach events at 12 of the participating cities to gather stakeholder input, raise project awareness and encourage EV adoption. SCAG hosted a booth at the Anaheim Night Market in Downtown Anaheim on March 25, 2022 and spoke with more than 50 attendees about their interest in EV's, with most people having positive feedback and encouraged by future EV growth.


**CREDITS**

1. Low Carbon Fuel Standard (LCFS) Credits:
    a. Under the CARB LCFS funding program, APU has reported energy usage and applied for the associated LCFS credits. The reported energy usages are generated from three categories: APU's public EV charging stations, residential EV charging data and the electric forklift data within the City of Anaheim. APU sells these LCFS credits through competitive solicitation to generate revenues , which are limited to the benefit of current and future EV customers in Anaheim.
2. Energy Policy Act (EPAct) Alternative Fuel Vehicle (AFV) Credits:
    a. Under the Department of Energy's State and Alternative Fuel Provider Fleet Program, APU filed reports to demonstrate its compliance with EPAct requirements to acquire alternative fuel vehicles. From Model Years 2015 and 2016, APU banked a total of 5 AFV credits. The credits may be sold to generate funding in the future.

## D. Education and Outreach Plans

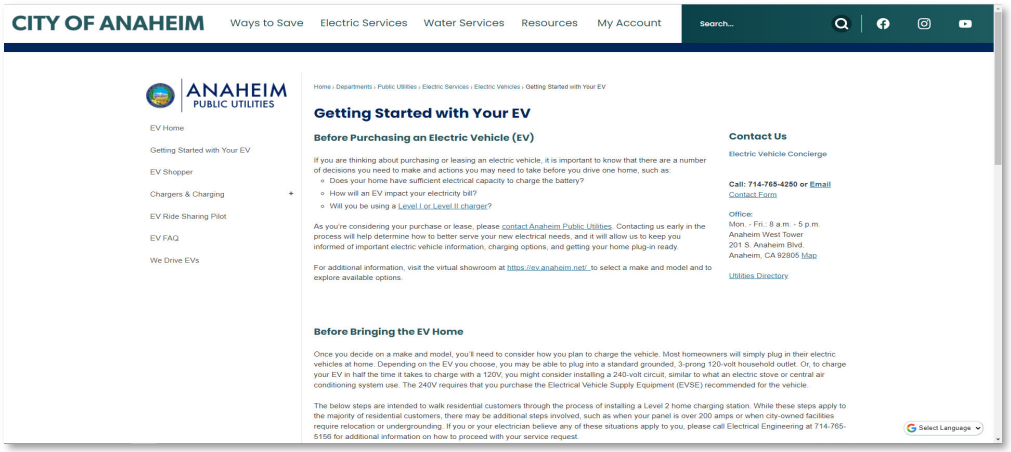
**CITY DEPARTMENT ENGAGEMENT EFFORTS**

The City of Anaheim's Planning & Building Department is following the California Green Building Standards Code to prepare for the City's EV readiness. APU provides advice and assistance related to EV charging infrastructure for development projects and works with other City departments regarding other feasible EV Charging projects.

**CUSTOMER ENGAGEMENT EFFORTS**

APU offers a suite of tools and helpful links on its public website (https://anaheim.net/578/Electric-Vehicles) to encourage customers to research their options prior to purchasing or leasing an EV. Interested customers

can browse the website to learn about topic areas including charger rebates, EV acronyms, EV shopper tool, FAQ, EV readiness guide, and types of plug-in EVs. Additionally, customers can contact APU's EV Concierge, a dedicated phone line and an online inquiry form, for further questions and assistance.




**EV Ride & Drive Community Events**

In 2021, APU hosted an online video competition asking Anaheim EV owners to submit a short video stating "The best part about going electric." Each participant received a gift card and the winner received an EV bike. The video was posted to Anaheim Public Utilities social media pages.

Throughout calendar year 2021, APU provided existing and prospective residential and non-residential EV customers with detailed information about plug-in EVs and APU's EV charger rebate programs on the City of Anaheim website and flyers.

APU's Plug-In Electric Vehicles webpage (http://www.anaheim.net/578/Plug-In-Electric-Vehicles) includes, but is not limited to the following information:

i. EV Charger Rebates offered by APU, including Public Access EV
ii. Federal and State EV Incentives
iii. Charging circuit requirements
iv. EV Acronyms
v. EV Buying Guide
vi. EV Frequently Asked Questions
vii. EV Readiness Guide for customers considering an EV Purchase
viii. Types of Plug-In Vehicles
ix. City of Anaheim Building Division's Installation Guidelines
x. Links to the US Department of Energy Charging Station Locations and PlugShare
xi. Link to the State of California's Drive Clean Buying Guide
xii. Rates and Load Management Techniques

In 2022, APU hosted free community EV Ride & Drive events to provide the public with the ability to test-drive a variety of EV's from local dealerships and opportunities to speak with EV owners about their experience. Recent events include APU's Beach Boulevard Sustainability Fair in April where approximately 60 participants drove an EV; OC Green Expo in June, where 145participants drove an EV; and the National Drive Electric Week Ride & Drive event in September, where 127 participants drove an EV. Through the events, the public had the opportunity to learn about the benefits of driving an EV, including fuel savings compared to utility usage, and how-to get their residence EV ready.

**Photo 10: EV Ride & Drive Community Event**

## E. Alignment with State Policy and Local Needs

### STATEWIDE GOALS AND POLICIES

**California Zero-Emission Vehicle Market Development Strategy**

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Equity in every decision. The people suffering the impacts of social, economic, and environmental burdens are also those closest to the solutions. Continual, meaningful engagement and capacity building within priority communities is key to ensuring that the ZEV market provides direct and assured benefits to those most impacted by poor air quality and lack of access to clean mobility and high-road jobs. We actively look for opportunities to implement community-led ideas and share decision-making power; each decision or action should incorporate priority communities' ideas and direct feedback. | • APU is one of 18 cities partnering with SCAG on this study to help promote the development and deployment of EV charging infrastructure throughout the region. The study includes tailored policy guidance, a region wide Site Suitability Analysis that targets areas for future EV charging infrastructure, with a focus on increasing EV infrastructure in traditionally underserved and hard-to-reach communities including multi-unit dwellings (MUDs) and Disadvantaged Communities (DACs); EV site evaluations; and a Passenger Electric Vehicle (PEV) Infrastructure Plan that will provide a roadmap for cities to spur development of charging stations and support EV adoption. The study also prepares cities towards full compliance with California Assembly Bill (AB) 1236, which requires cities to update and streamline their EV charging station permitting requirements as well as provides best practices recommended by California Governor's July 2019 Office of Business and Economic Development (GOBIZ) EV charging Station Permitting Guidebook. Additionally, SCAG will |

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| | host 22 listening sessions, a virtual meeting room, and 15 community events to engage with city stakeholders, industry experts, and local communities to raise project awareness, encourage EV adoption and gather community stakeholder input. |
| • California embraces all zero-emission pathways. We are technology neutral and actively embrace and support all viable pathways to zero emissions through policymaking, funding, and other state decisions/actions. This includes but is not limited to new and used battery-electric, hydrogen fuel-cell electric, and directly connected electric systems, such as catenary bus lines, and electrified rail including high-speed rail, across all vehicle sizes and classes, and connections to zero-emission transit or other mobility options. | • APU programs are agnostic and encourages customers to install any brand of EV charging station that can fuel all types of EVs. The focus and goal of APU rebate programs are to encourage EV adoption by incentivizing any brand of EV infrastructure. |
| • Collective problem-solving. Success depends on active engagement and collaboration between all levels of government, industry, non-governmental organizations (NGOs), communities, and other engaged stakeholders (e.g., end users). | • APU is one of 18 cities partnering with SCAG on this study to help promote the development and deployment of EV charging infrastructure throughout the region. The study includes tailored policy guidance, a region wide Site Suitability Analysis that targets areas for future EV charging infrastructure, with a focus on increasing EV infrastructure in traditionally underserved and hard-to-reach communities including multi-unit dwellings (MUDs) and Disadvantaged Communities (DACs); EV site evaluations; and a Passenger Electric Vehicle (PEV) Infrastructure Plan that will provide a roadmap for cities to spur development of charging stations and support EV adoption. The study also prepares cities towards full compliance with California Assembly Bill (AB) 1236, which requires cities to update and streamline their EV charging station permitting requirements as well as provides best practices recommended by California Governor's July 2019 Office of Business and Economic Development (GOBIZ) EV charging Station Permitting Guidebook. Additionally, SCAG will host 22 listening sessions, a virtual meeting room, and 15 community events to engage with city stakeholders, industry experts, and local communities to raise project awareness, encourage EV adoption and gather community stakeholder input. SCAG study has community focus group data. |

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| | • APU's website offers customers information about Federal and State incentives in additional to those offered by the City. Such incentives include Federal Tax Credits through the US Department of Energy and the Statewide Clean Fuel Rewards Program. Below is the link to APU's site directing customers to these sites: https://anaheim.net/578/Electric-Vehicles<br>• APU actively participates in the EV Working Group of Southern California Public Power Authority (SCPPA) to coordinate efforts and share experiences with other publicly owned utilities |
| • Public actions drive greater private investment to scale investable markets. Public and private sector actors have unique, complementary roles to play in scaling the ZEV market. Public policies and actions should help limit market exposure and ensure fair and equal access and activate market-based mechanisms; private actions drive scale and provide innovative solutions. | • APU offers a suite of tools and helpful links on its public website to encourage customers to research their options prior to purchasing or leasing an EV. Customers can also contact APU's EV Concierge, a dedicated phone line and an online inquiry form, for further questions and assistance.<br>• APU's public programs offer rebates to both private use and publicly accessible EV charging stations.<br>• APU's website offers customers information about Federal and State incentives in additional to those offered by the City. Such incentives include Federal Tax Credits through the US Department of Energy and the Statewide Clean Fuel Rewards Program. Below is the link to APU's site directing customers to these sites: https://anaheim.net/578/Electric-Vehicles |
| • Design for resilience and adaptation. We are developing the ZEV system holistically, with resilience and adaptation front of mind. ZEVs enable opportunities to stabilize and support our energy system for the benefit of all, including increasing reliability, resilience, and renewable energy penetration. | • APU has a master plan to expand public EV charging stations in the downtown Anaheim area.<br>• *APU's Sustainability Education Center has a demonstration component that educates the community about how EV charging can be developed in a holistic manner.* |

### *2020 CARB Mobile Source Strategy (Draft)*

| **Applicable Goals/Policies** | **APU's Investments** |
|---|---|
| For on-road light-duty vehicles, these concepts include:<br>• manufacturer requirements to foster clean technology production and sales, | • APU offers a suite of tools and helpful links on its public website to encourage customers to research their options prior to purchasing or leasing an EV. Customers can also contact APU's EV Concierge, a dedicated phone line |

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|---|---|
| • in-use requirements to accelerate penetration of newer technology,<br>• incentive programs to promote and accelerate the use of advanced clean technologies,<br>• outreach and education to increase consumer awareness and acceptance of advanced vehicle and equipment technologies; and<br>• infrastructure planning and development to support the transition to cleaner technologies.<br><br>For on-road medium- and heavy-duty vehicles, concepts include:<br>• manufacturer requirements to foster clean technology production and sales,<br>• in-use requirements to accelerate penetration of newer technology,<br>• incentive programs to promote and accelerate the use of advanced clean technologies,<br>• enhanced enforcement strategies to ensure programs are achieving their anticipated benefits,<br>• outreach and education to increase consumer awareness and acceptance of advanced vehicle and equipment technologies; and<br>• infrastructure planning and development to support the transition to cleaner technologies.<br><br>For off-road vehicles and equipment, concepts include:<br>• manufacturer requirements to foster clean technology production and sales,<br>• in-use requirements to accelerate penetration of newer technology,<br>• incentive programs to promote and accelerate the use of advanced clean technologies,<br>• outreach and education to and increase consumer awareness and acceptance of advanced vehicle and equipment technologies; and<br>• infrastructure planning and development to support the transition to cleaner technologies. | and an online inquiry form, for further questions and assistance.<br>• Information on federal and state incentives is provided as relevant links on APU's public website.<br>• APU has installed publicly accessible EV charging stations at key public venues or transportation hubs. APU also performs routine inspections on these chargers.<br>• Under its Public Access EV Charging Station Rebate Program, APU requires the rebate recipients to make the charging stations publicly accessible.<br>• APU is actively participating in the LCFS funding program to use those proceeds to fund its Public Access EV Charging Station Rebate Program.<br>• APU continues to convert the older and higher-polluting vehicles to EVs and hybrid EVs to meet South Coast Air Quality Management District (SCAQMD) and DOE requirements for fleets.<br>• APU also invests in EV charging infrastructure for its and City of Anaheim's EV fleet.<br>• APU provides EV demonstration and education events, community video contests about the benefits of EVs, curriculum introducing EVs into high school Science, Technology, Engineering and Mathematics (STEM) classrooms and hosting EV-related student competitions in partnership with local schools. |

### *California Sustainable Freight Action Plan (California Department of Transportation, CARB, CEC, and Governor's Office of Business and Economic Development)*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Invest strategically to accelerate the transition to zero and near-zero emission equipment powered by renewable energy sources, including supportive infrastructure. | • APU's Renewables Energy Procurement Plan and Enforcement Program governs its progress and compliance with the 60% renewable generation by 2030 and carbon-free electricity deliveries to retail customers by 2045, as required by Senate Bill 350 and SB 100. |

### *Vehicle-Grid Integration Roadmap (California Independent System Operator)*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Confirm VGI electrical system impacts: assess VGI physical impacts to the electrical system for each use case | • Under its Public Access EV Charging Station Rebate Program, APU has a "right to interrupt service" condition to remotely or manual interrupt electric service to the EV charging station in the event of a generation capacity shortage or a transmission or distribution system emergency. |
| • 2020 Roadmap adds a new track Customers – Expand equitable access to VGI, simplifying smart charging "for all" | • APU offers an additional rebate incentive from $1,500 to $3,000 if customers install a networked charger and sign up for the time-of-use rate.<br>• APU offers two EV rate options for residential and non-residential customers to help customers take advantage of reduced energy chargers during off-peak time periods. APU also offers several other TOU rate options for both residential and non-residential customers. |

### *CEC 2020 INTEGRATED ENERGY POLICY REPORT UPDATE, VOLUME I: Blue Skies, Clean Transportation*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • The CEC, California Public Utilities Commission, utilities, and electric service providers should support market opportunities, incentives, and other mechanisms to better align charging with increasing renewable generation. | • APU offers an additional rebate incentive from $1,500 to $3,000 if customers install a networked charger and sign up for the time-of-use rate.<br>• APU offers two EV rate options for residential and non-residential customers to help customers take advantage of reduced energy chargers during off-peak time periods. APU also offers several other TOU rate options for both residential and non-residential customers. |
| • The California Energy Commission (CEC), California Public Utilities Commission (CPUC), and California Independent System Operator should continue to work together to ensure that | • Under its Public Access EV Charging Station Rebate Program, APU has a "right to interrupt service" condition to remotely or manual interrupt electric service to the EV charging |

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|---|---|
| zero-emission vehicles (ZEVs) support energy resiliency in California, including vehicle-grid integration. | station in the event of a generation capacity shortage or a transmission or distribution system emergency.<br>• APU offers an additional rebate incentive from $1,500 to $3,000 if customers install a networked charger and sign up for the time-of-use rate.<br>• APU offers two EV rate options for residential and non-residential customers to help customers take advantage of reduced energy chargers during off-peak time periods. APU also offers several other TOU rate options for both residential and non-residential customers. |

### *CEC: Electric Vehicle Charging Infrastructure Assessment - AB 2127*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Continue public support for charger deployment, using public funds to leverage private funds, and eventually transition to a self-sustaining private market. | • APU is actively participating in the LCFS funding program to use those proceeds to fund EV programs that benefit current and future EV customers in Anaheim. |
| • Continue quantitative modeling efforts to project the quantities, locations, and load curves of chargers needed to meet statewide travel demand. | • IRP modeling |
| • Support innovative charging solutions and financing mechanisms. | • Anaheim's first DC Fast Charging Plaza at its Brookhurst Community Center was made possible through a request for proposal to find a licensee that could lease parking spaces at the Brookhurst Community Center to operate and maintain DC fast charging stations. |
| • Ensure equitable distribution of charger deployment throughout the state. | • APU offers rebate incentives and programs to support EV adoption within LIDAC communities including an Income Qualified EV Ride Share Pilot Program and is currently in the process of developing an EV Charger Direct Installation Program for commercial and multi-family property owners located in a LIDAC. |
| • Align charging with renewable generation and grid needs. | • Under its Public Access EV Charging Station Rebate Program, APU has a "right to interrupt service" condition to remotely or manual interrupt electric service to the EV charging station in the event of a generation capacity shortage or a transmission or distribution system emergency.<br>• APU offers an additional rebate incentive from $1,500 to $3,000 if customers install a networked charger and sign up for the time-of-use rate.<br>• APU offers two EV rate options for residential and non-residential customers to help customers |

| | |
|---|---|
| | take advantage of reduced energy chargers during off-peak time periods. APU also offers several other TOU rate options for both residential and non-residential customers. |
| • Prioritize standardized charger connectors and communications protocols. | • Under its Public Access EV Charging Station Rebate Program, APU requires that "EV charging units must utilize the standard J1772 charging port, the standard J1772 combo charging port, the CHAdeMO charging port, or an approved equivalent as determined by the City to be eligible for the Program Rebate." |

### *CalEPA: Carbon Neutrality Studies*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Equity and environmental justice: Transportation has a significant historical role in creating and exacerbating inequities. Depending on their implementation, the clean transportation policies discussed in this report have the potential to reverse this. | • APU offers rebate incentives and programs to support EV adoption within LIDAC communities including an Income Qualified EV Ride Share Pilot Program and is currently in the process of developing an EV Charger Direct Installation Program for commercial and multi-family property owners located in a LIDAC. |
| • Workforce and jobs impacts: Transportation is a major employer and supports the economy. A clean transportation system could have significant effects on the workforce, both creating and disrupting whole sectors. | • APU continues to convert the older and higher-polluting vehicles to EVs and hybrid EVs to meet South Coast Air Quality Management District (SCAQMD) and DOE requirements for fleets.<br>• APU also invests in EV charging infrastructure for its and City of Anaheim's EV fleet. |

### *2018 California Air Resources Board Barrier Report*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Some of the fundamental barriers to clean transportation access for low income residents, as described in Chapter 2, include: 1) barriers low income residents face within a community, (e.g., access, convenience, safety, etc.), 2) barriers in affordability, 3) barriers in funding for clean transportation investments, and 4) barriers in residents' awareness of clean transportation and mobility options. | • APU offers rebate incentives and programs to support EV adoption within LIDAC communities including an Income Qualified EV Ride Share Pilot Program and is currently in the process of developing an EV Charger Direct Installation Program for multifamily property owners located in a LIDAC. |

### *SB 1000, Chapter 368 Electric Vehicle Charging Infrastructure*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Requires the CEC to assess of whether charging infrastructure is disproportionately deployed by population density, geographical area, or population income level, including low-, middle, and high-income levels. This includes evaluating whether direct-current fast charging stations are disproportionately distributed and whether access to these charging stations is disproportionately available. | • APU offers rebate incentives and programs to support EV adoption within LIDAC communities including an Income Qualified EV Ride Share Pilot Program and is currently in the process of developing an EV Charger Direct Installation Program for multifamily property owners located in a LIDAC. |

### *Executive Order N-79-20 & B-32-15*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Established goal for all in-state sales of new passenger vehicles to be zero-emission by 2035; 100% medium- and heavy-duty vehicles be zero-emission by 2045; for all operations where feasible, and by for drayage trucks; and 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible. | • APU is actively participating in the LCFS funding program to use those proceeds to fund its Private and Public Access EV Charging Station Rebate Programs. |

### *Executive Order B-16-2012*

| Applicable Goals/Policies | APU's Investments |
|---|---|
| • Established target of one million ZEVs on the road by 2025 | • APU is actively participating in the LCFS funding program to use those proceeds to fund its Private and Public Access EV Charging Station Rebate Programs. |

## COORDINATION WITH OTHER UTILITIES

APU actively participates in the EV Working Group of Southern California Public Power Authority (SCPPA) to coordinate efforts and share experiences with other publicly owned utilities.

# XI. DISTRIBUTED GENERATION AND STORAGE

## A. Customer Owned Solar PV

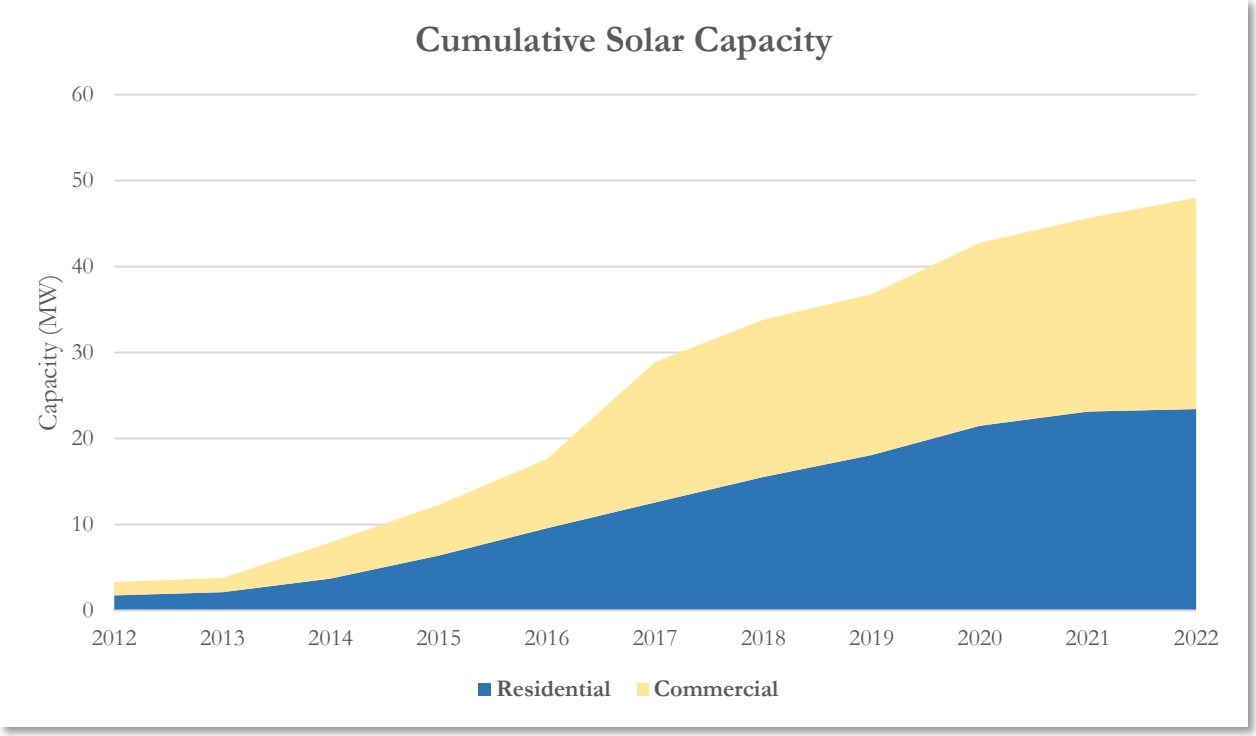
Customer owned solar systems are evenly spread throughout Anaheim. Customers have installed solar on their property with the help of local rebates and income tax credits over the years. Some customers have elected to install solar to reduce their monthly energy expenses, and others have elected to install solar for environmental sustainability reasons and/or reduce their carbon footprint.

### RESIDENTIAL AND COMMERCIAL SOLAR GROWTH

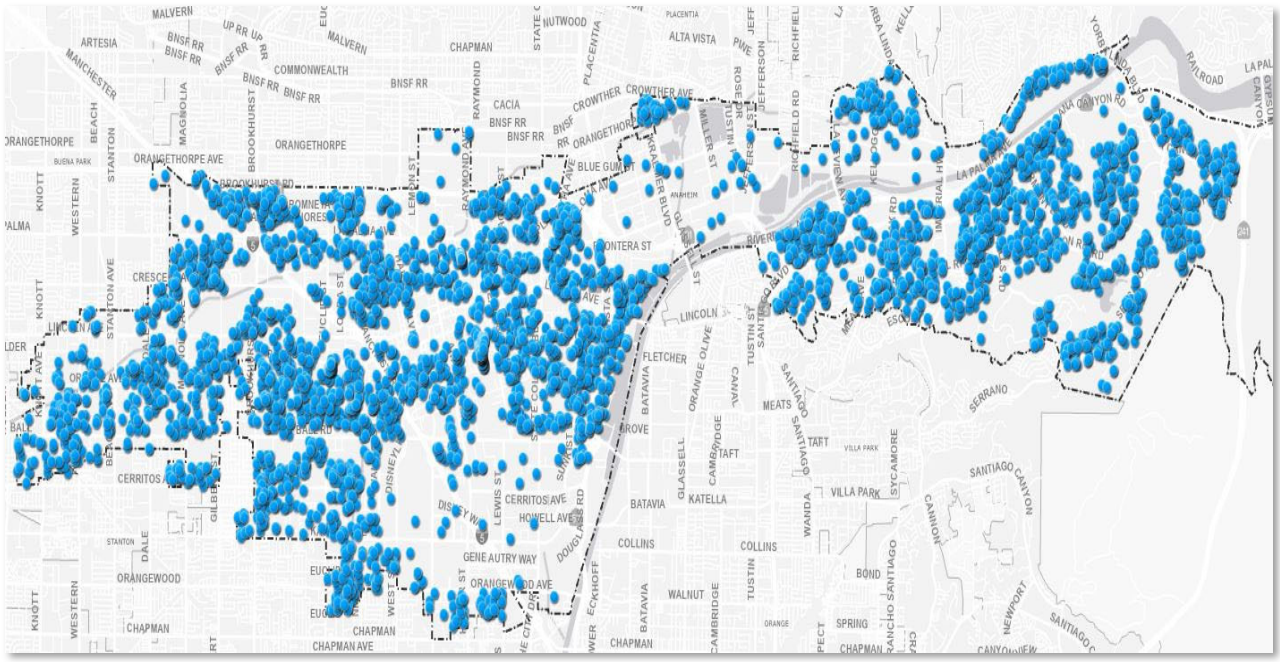
Solar system installations continue to grow at a steady rate throughout Anaheim. In the most recent calendar years, about 450 new solar systems were installed annually totaling around 4.5 MW in capacity. This equates to 7,400 megawatt-hours of new behind-the-meter renewable energy production annually. It is expected that solar will continue to grow further with the signing of the Federal Inflation Reduction Act of 2022, which increases the income tax credit to 30% for solar system installations, solar plus energy storage, and energy storage.

Over the past two decades, APU's commercial and residential customers have installed over 47 MW of solar. The graphs below show the rapid growth of solar in Anaheim resulting from adoption of renewable energy over the past decade and where those systems are located within Anaheim.

**Graph 70: Cumulative Solar Capacity Installed - Customer Owned Solar Systems**



**Graph 71: Location of Customer Owned Solar in Anaheim**




## Net Energy Metering

Net energy metering (NEM) is a special billing arrangement that provides a credit to customers with solar systems that return excess energy they do not use back to the Grid for compensation by APU. NEM 1.0 was available for all customers that installed a solar PV system on or prior to December 31, 2020. Customers that install a solar PV system after January 1, 2021, are automatically enrolled in the NEM 2.0 program. The differences between the two rate structures are described below.

### NEM 1.0

State law requires that APU offer customers retail NEM until the total generated capacity of eligible customer-generators exceeds 5% of APU's all-time peak aggregate load of 593 MW, which equates to 29.6 MW. APU met this requirement in May 2019 but did not take action to discontinue allowing customers to be enrolled into NEM 1.0 program until the end of 2020. Customers enrolled prior to the end of 2020 are grandfathered under the NEM 1.0 program structure so long as they remain the account holder and do not modify their current solar PV system.

### NEM 2.0

APU's NEM 2.0 program took effect on January 1, 2021. For all systems installed or modified after this date, NEM 2.0 offers compensation for excess energy returned to the Grid during the day based on the time the energy was returned to the energy grid. This type of program structure encourages customers to install storage systems paired with their solar PV system. Under this program customers benefit by storing their excess energy in the battery system on their property during the day and pulls from the storage system when the sun goes down. This program allows customers to have similar bill amounts to those customers grandfathered into APU's NEM 1.0 program.

## B. Solar for Schools

In 2017, APU created a pilot program named Solar for Schools that builds solar carport facilities and/or lunch shelters on school properties throughout Anaheim and compensates the school for the use of the property. This program solicited local school districts to submit an application for two schools of their choosing to be evaluated to be a host solar site for APU. The program was well received by the school districts, and APU received seven applications for a total of fourteen host solar sites for evaluation. Ultimately, nine schools were selected to be host solar sites. The total capacity of all nine schools is rated at 1.5 MW. The construction costs for all Solar for Schools projects cost $6 million and was completed in 2018.

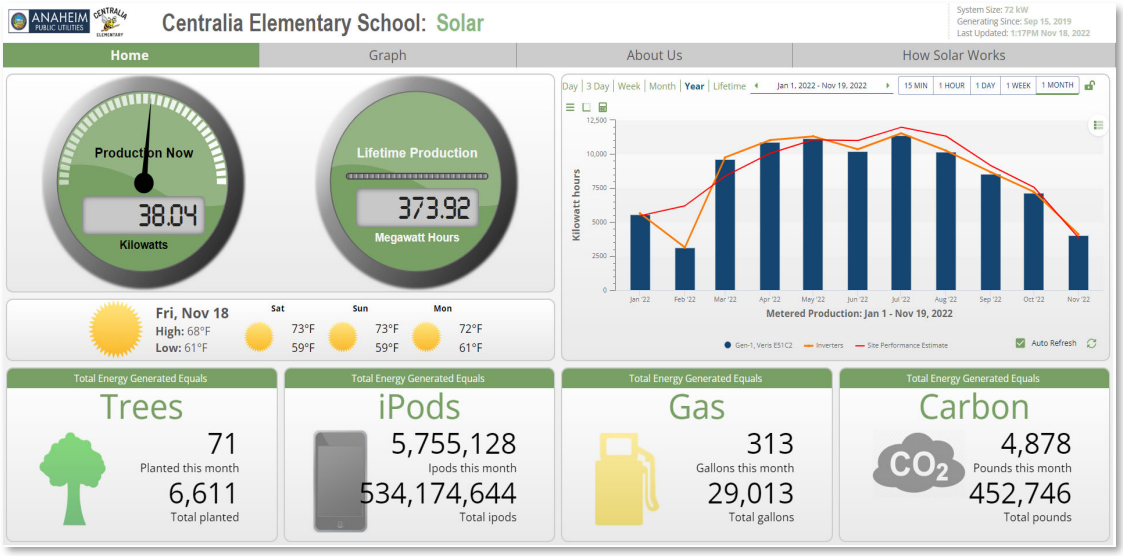
In return for licensing their property to the City, the school districts receive a fixed annual license payment without the risk of intermittent solar production. These projects are owned and operated by APU and all energy produced is included in APU's renewable energy portfolio.

**Photo 11: Solar PV Lunch Shelter**

Along with supporting local school districts and the new Solar Power Program, the projects themselves will provide real-life examples to support students pursuing an education in science, technology, engineering, and mathematics (STEM) fields.

An interactive webpage is available on APU's website to demonstrate the solar output, energy equivalent, and environmental attributes of all the Solar for Schools sites, below is showing Centralia Elementary School's site.

**Photo 12: Centralia Elementary School's Interactive Webpage**




## C. Anaheim Solar Energy Plant at the Convention Center

In 2013, APU partnered with the Anaheim Convention Center to install a 2.4 MW solar system on the roof of the Anaheim Convention Center. Completed in August 2014, the installation includes 7,902 panels, produces 3,500 MWh annually, and supplies about 17% of the Anaheim Convention Center's annual electricity needs. The solar PV system allowed the Convention Center to attain LEED Gold certification.

**Photo 13: Solar PV System on the Roof of the Anaheim Convention Center**

An interactive webpage is available on APU's website to demonstrate the solar output, energy equivalent, and environmental attributes of the Anaheim Solar Energy Plant at the Convention Center.

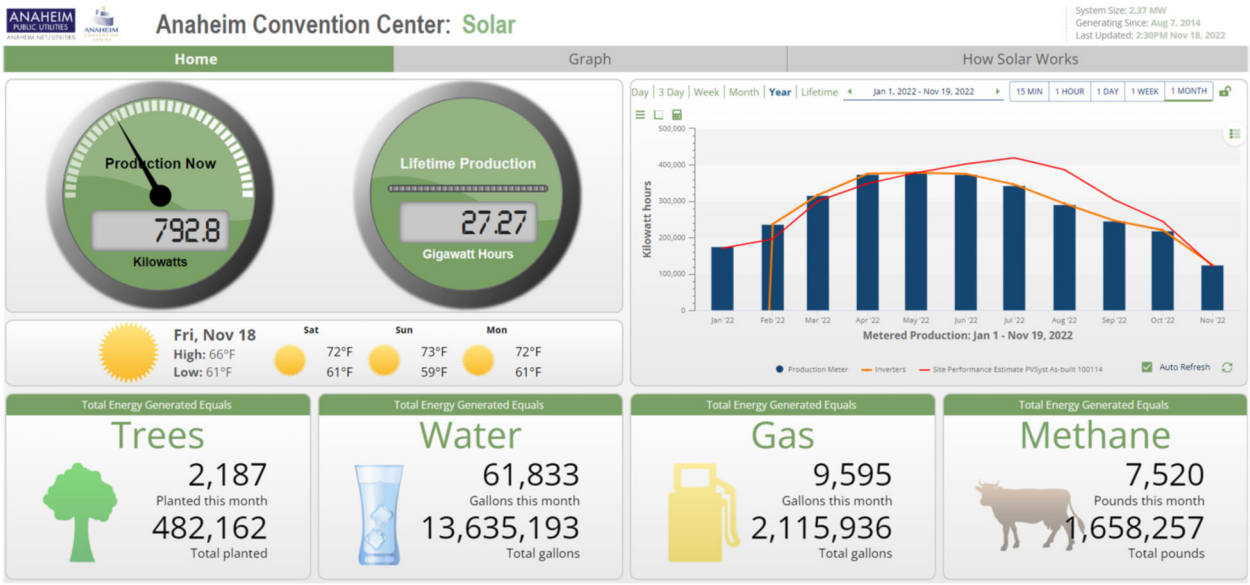



**Photo 14: Anaheim Convention Center Interactive Webpage**

## D. Non-Solar Distributed Generation

APU's services include assisting those customers who wish to develop distributed generation facilities within its service territory and interconnect with its electric system. The interconnection process is governed by Rule No. 22 of City of Anaheim's *Electric Rates, Rules and Regulations* and Generation Interconnection Standards and Guidelines (available online at Electric-Utility-Rules[46]).

While there has not been a significant impact of non-solar distributed generation and energy storage (ES) on system load, APU is closely monitoring the development of these technologies.

### Anaheim Owned Distributed Generation

At this time, solar generation is the only type of distributed generation that is owned by APU. APU owns and operates solar facilities on City-owned buildings, such as the Anaheim Convention Center, and locations licensed from nine (9) public schools located in Anaheim.

### Behind the Meter - Customer Side

APU reports distributed generation and internal generation above 100 kW semi-annually to the California Energy Commission in the 1306(c) Report. APU currently has 2.46 MW of installed capacity of fuel cell technology, and 0.13 MW of installed capacity of micro-turbine technology.

The impact of these types of installations is considered as part of APU's load forecasting process and analyses.

[46] http://www.anaheim.net/883/Electric-Utility-Rules

## E. Energy Storage

In mid-2022, APU solicited proposals from Battery Energy Storage System (BESS) Design-Build developers for the design and construction of a 50, 40, or 30 megawatt (MW) BESS Project (Project) located in Anaheim, California. The Project will help meet electric load constraints exasperated by the intermittency issues caused by variable renewable energy systems and will likely be operated at the direction of the California Independent System Operator (CAISO).

Anaheim will integrate this BESS within its portfolio to be a hedge to solar and wind generation volatility resulting in lower cost excess electric energy during certain times of the day. The BESS will allow the CAISO to ramp up resources during the evening hours as solar generation drops off to augment electrical peak demand reliability on the grid.

At the time of writing of the 2023 IRP, the design-build proposals received through the RFP process were being reviewed for consideration and evaluation against other BESS proposals for systems within the LA Basin Area.

# XII. ENERGY EFFICIENCY AND DEMAND RESPONSE PROGRAMS

## A. Program History

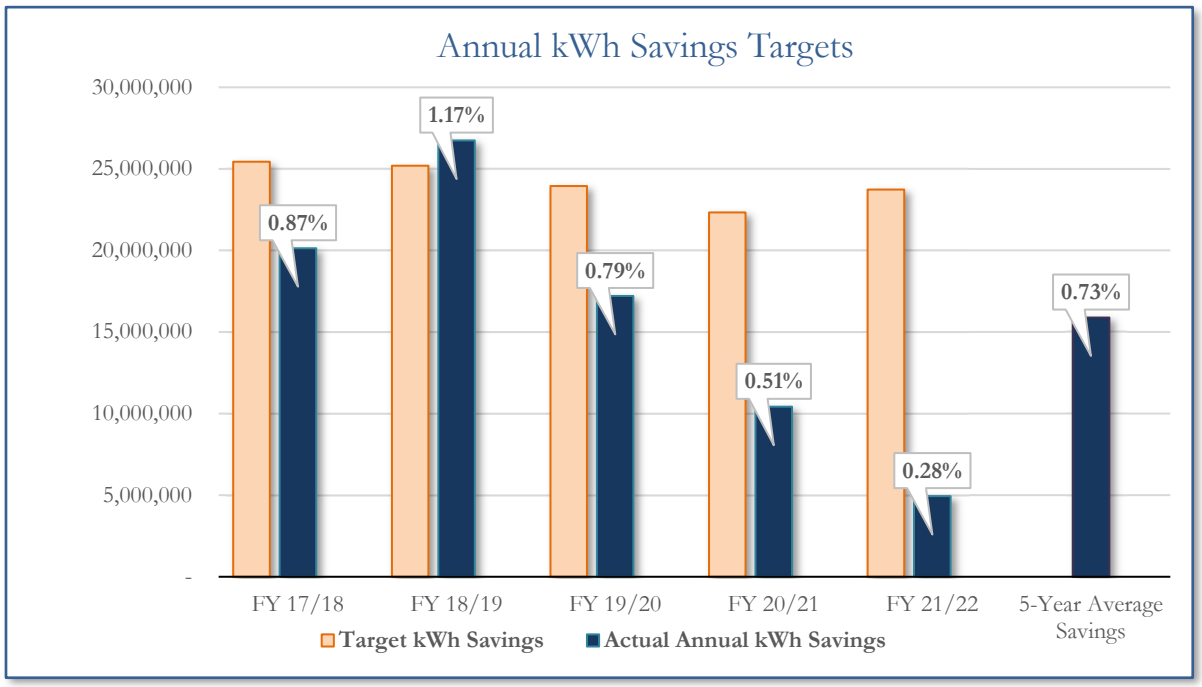
APU has historically provided energy efficiency (EE) programs to its customers, even prior to *The Electric Utility Industry Restructuring Act* (Assembly Bill 1890). Since the passage of AB 1890, APU has set aside 2.85% of electric retail sales revenues for the implementation of Public Benefit programs. The funds are allocated to the following four program categories:

1. Cost-effective energy efficiency and conservation activities;
2. Research, development, and demonstration programs to advance science or technology that are not adequately provided by competitive and regulated markets;
3. In-state operation and development of existing, new, and emerging renewable resource technologies; and
4. Programs and rate discounts for low income electricity customers.

Currently, there are over 45 energy and water efficiency programs to help Anaheim customers reduce their utility bills and operating costs. From FY 17/18 to FY 21/22, APU expended $15.5 million for residential and commercial Public Benefit programs supporting energy efficiency, with an additional $6.2 million expended for income-qualified programs. Over the past five years, APU reported savings of 80,480,075 kWh between FY17/18 and FY21/22. The following chart illustrates APU's FY energy savings over the past five years.

During FY19/20, the global pandemic of COVID-19 significantly affected energy and water efficiency programs and continues to impact progress in achieving kWh savings targets today. More information about the impacts of the global pandemic is included in Section F. Challenges and Future Program Development.

**Graph 72: Annual kWh Savings Targets**



## B. Target Setting

SB 350 (2015) directed POUs to develop energy efficiency targets consistent with the statewide energy efficiency targets adopted by the California Energy Commission (CEC).

APU, in conjunction with other members within the California Municipal Utilities Association (CMUA), contracted with Navigant Consulting, Inc. (Navigant) to identify all potentially achievable cost-effective electricity efficiency savings and establish annual targets for energy efficiency savings for 2018-2027. The purpose of the study was not only to look back on the success of the past years, but also to look ahead and inform discussions on how to achieve additional energy savings in the future.

The final report "Energy Efficiency in California's Public Power Sector" was published and submitted to the CEC in 2017. Based on the Navigant report, APU presented its ten-year goals (required by AB 2021 every four years) to the City Council in 2016 to achieve an average annual energy savings equal to 1.1% of retail electric sales.

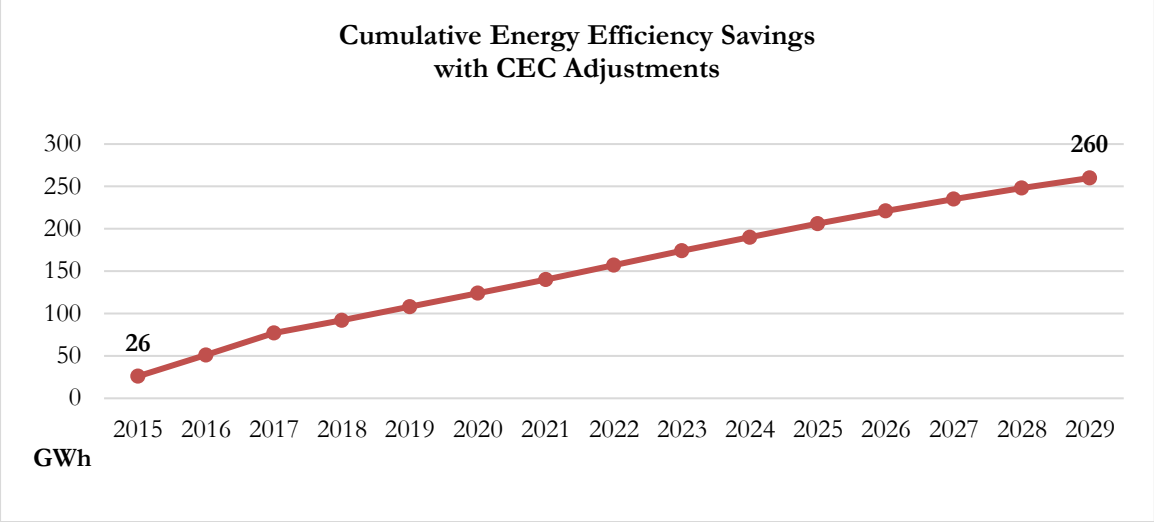
**Table 2: APU Energy Efficiency Targets including Codes & Standards (GDS Associates, Inc.)**

| Targets w/ C&S | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 * | 2029 * | 2030 * | Avg. 10 Yr. |
| kWh | 1.15% | 1.15% | 1.09% | 1.06% | 1.04% | 1.00% | 0.95% | 0.91% | 0.86% | 0.80% | 0.80% | 0.80% | 0.80% | 1.00% |
| kW | 1.11% | 1.12% | 1.13% | 1.15% | 1.19% | 1.14% | 1.15% | 1.13% | 1.09% | 1.04% | 1.04% | 1.04% | 1.04% | 1.13% |

* 2028-2030 are projections based on 2027 targets. 10-Yr Average Calculated for 2018-2027.

The CEC relied on the Navigant study, adjusted with building Codes and Standards and gross-to-net ratio, and concluded an APU-specific energy efficiency target as below:

**Graph 73: Cumulative Energy Efficiency Saving Goals with CEC Adjustments**




*Source: Table A-10 of CEC Final Commission Report: "Senate Bill 350: Doubling Energy Efficiency Savings by 2030", 10/26/2017

The energy efficiency targets are incorporated into APU's demand forecast.

APU will continue to leverage internal and external resources to achieve the energy efficiency targets. This includes the continuation of existing programs, the recognition of challenges and the development of new programs, as detailed in the sections below.

**Future Energy Efficiency Targets Updated**

In 2020, APU and other publicly owned utility (POU) members within the California Municipal Utilities Association (CMUA), contracted with GDS Associates, Inc (GDS) to identify all potentially achievable cost-effective electricity efficiency savings and establish annual targets for energy efficiency savings for 2022-2031. The purpose of the study was not only to look back on the success of the past years, but also to look ahead and inform discussions on how to achieve additional energy savings in the future.

The final GDS study titled "CMUA 2020 Energy Efficiency Potential Forecast" was published and submitted to the CEC in 2021. Based on the GDS study, APU's forecasted ten-year goals (required by AB 2021 every four years) averages an annual energy savings target equal to .49% of retail electric sales.

| 10 Year Energy Goals (Incremental Gross MWh) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ALL Sectors (MWh) | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
| Total Market Potential | 17,825 | 17,277 | 15,621 | 11,732 | 7,636 | 7,346 | 7,363 | 7,435 | 7,222 | 7,264 |
| Res Market Potential | 3,710 | 3,340 | 2,603 | 2,506 | 2,582 | 2,721 | 2,792 | 2,991 | 3,226 | 3,411 |
| Non-Res Market Potential | 14,115 | 13,936 | 13,018 | 9,226 | 5,054 | 4,624 | 4,571 | 4,445 | 3,996 | 3,853 |
| Total Potential as a % of Total Sales | 0.82% | 0.79% | 0.72% | 0.54% | 0.36% | 0.34% | 0.34% | 0.35% | 0.33% | 0.34% |
| Res Potential as a % of Res Sales | 0.62% | 0.56% | 0.44% | 0.43% | 0.44% | 0.47% | 0.48% | 0.51% | 0.55% | 0.58% |
| Non-Res Potential as a % of Non-Res Sales | 0.90% | 0.87% | 0.82% | 0.59% | 0.32% | 0.30% | 0.29% | 0.28% | 0.25% | 0.24% |

| 10 Year Demand Goals (Incremental kW) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ALL Sectors (kW) | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
| Total Market Potential | 3,467 | 3,236 | 2,828 | 2,265 | 1,668 | 1,604 | 1,384 | 1,212 | 1,185 | 1,197 |
| Res Market Potential | 1,478 | 1,287 | 1,016 | 958 | 932 | 947 | 736 | 580 | 623 | 660 |
| Non-Res Market Potential | 1,989 | 1,949 | 1,812 | 1,306 | 736 | 656 | 647 | 631 | 561 | 538 |

| 10 Year Energy Goals (Incremental Gross MWh) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ALL Sectors (MWh) | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
| Base Market Potential | 17,825 | 17,277 | 15,621 | 11,732 | 7,636 | 7,346 | 7,363 | 7,435 | 7,222 | 7,264 |
| Codes & Standards Advocacy | 18,026 | 18,589 | 17,879 | 17,374 | 16,350 | 15,347 | 13,929 | 12,092 | 10,349 | 8,901 |

## C. Program Highlights

**Collaboration with External Parties**

The collaborative nature of the public power community allows for the development of joint resources and sharing of best practices. CMUA, NCPA (Northern California Power Agency), and SCPPA serve as forums for discussing and pursuing projects that benefit varying groups of all POUs. Anaheim is joint powers member of SCPPA, which allows collaboration among other publicly owned utilities which helps encourage volumetric discounts.

In addition to collaboration with other POUs, APU also partners with additional stakeholders to promote and encourage sustainable resource use. Since 1999, Anaheim has offered no-cost direct-installation of weatherization measures to its income-qualified residential customer base. In 2013, an inter-utility partnership was established with the Southern California Gas Company (SoCal Gas) to include the addition of gas saving measures to Anaheim's electric and water Weatherization Program measure mix. This inter-utility program utilizes a one-stop approach to provide gas, electric, and water efficiency improvements to Anaheim's income-qualified residential customers who are also serviced by the SoCal Gas Company. Through this program, Anaheim residents receive conservation measures by way of a single point of contact, streamlining energy, water, and gas efficiency home enhancements through a single contractor and single customer touch point. In 2018, premium high-efficiency toilets were added to the Weatherization Program measure mix, resulting in 539 toilet replacements to date and over 1.84 million gallons of water conserved. High-efficiency clothes washers were also added to the measure mix in 2018, with a total of 184 clothes washers replaced through fiscal year 2022 and resulting annual energy and water savings of 29,256 kWh and 1.97 million gallons, respectively. Recently, weather-based irrigation controllers were added to the array of measures provided through the Weatherization Program, to further support our income-qualified customer base.

Anaheim also contracts with third party vendors to promote and provide services associated with our school education initiatives, residential energy and water saving programs, and commercial program offerings. Contracting with 3rd party vendors enables enhancement to both scale and scope of APU's initiatives, resulting in more robust program marketing, program participation, and resulting energy and water savings.

**Creative Synergy with Other City Departments**

APU works closely with other City departments, including Community Services, Community and Economic Development, Planning, and Public Works. Collaborating with other departments helps APU learn new ideas and find out ways to engage more customers in its various programs.

Inter-departmental collaboration also enables greater understanding of community needs, which results in better program design and participation. For example, Community Services interacts directly with seniors and income-qualified customers and assists with promoting the Income-Qualified Energy Discount and Emergency Assistance programs, including referrals to APU for other programs that help customers manage their utility bills.

Throughout 2021, APU partnered with the Neighborhood & Human Services Division of Anaheim's Community Services Department in a newly launched Mobile Family Resource Center initiative, whereby various City Departments and non-profit organizations work collectively to visit neighborhoods throughout the City of Anaheim and provide essential services and information to key residential communities. Launched as a pilot project in 2021, the Mobile Family Resource Center made over 3,700 significant contacts with

residents through 64 total events held at 20 Anaheim neighborhoods. The pilot project resulted in 776 food and/or produce boxes distributed to families, 162 COVID-19 vaccinations administered to residents 12 years of age and older, and 138 families being qualified to receive up to $500 in emergency financial assistance to help pay for food, transportation, groceries, medical, and utility expenses, among others. APU has continued to support this project throughout 2022.

**Community Outreach and Student Engagement**

Anaheim holds 40 community outreach events annually throughout the City to promote the energy and water savings programs offered to residential customers. These events are held at City parks, Anaheim schools, local neighborhoods, home improvement stores, and on the Center Street Promenade near Anaheim City Hall and Anaheim West Tower during Farmer's Market days. Each event brings in numerous customers that visit APU booths to ask questions and receive information about the programs and services provided by APU. Community outreach remains a vital activity to keep customers informed and to help APU meet its energy and water savings goals.


**Photo 15: Community Outreach Event at Farmer's Market**

APU also provides multiple student engagement events throughout the year for high school, junior high, and elementary school students. Students get to learn how and where APU procures its water and power. They learn about the water cycle and greenhouse gas emissions, so they can incorporate the energy efficiency and water conservation lessons into personal actions at home and on campus.

Through APU's school education contract with the Inside the Outdoors, a non-profit organization, schools throughout Anaheim are provided with on-site energy and water education sessions, and also provided with the tools and know-how to perform student-led in-home energy and water efficiency assessments. Anaheim students are also provided education on renewable energy, electric vehicles, and greenhouse gas curtailment. Through this partnership with Inside the Outdoors, school gardens are also constructed/rehabilitated at two school sites per year. Additionally, students are provided field trips to various nature centers and outdoor venues, allowing for hands-on engagement with natural systems, with embedded Next Generation Science Standards education built into these outings. Students at all levels are taught how they can be leaders in their

communities by incorporating sustainability into their personal lifestyles. APU also sponsors student engagement activities that include mentorships and career exploration opportunities within the utility industry.

APU holds an annual "Water is Life" Poster Contest, whereby 1st through 8th graders are invited to submit artwork associated with water conservation, giving students the opportunity to help raise water awareness through the art they display. At the culmination of the contest, winning artwork is printed on APU branded water bottle labels and an artist recognition is held at a City Council meeting.

**Photo 16: Various Student Engagement Activities**

## D. Existing Programs

In order to meet Anaheim's annual energy efficiency goal, it is important to reach both its residential and commercial customers. Anaheim residential customers make up 85% of APU's total customers; however, almost 75% of total load is consumed by commercial and industrial customers. A brief description and end use overview of Anaheim's existing EE programs are shown in the following section.

**Residential Programs**

**Residential Income-Qualified Programs**

- **Weatherization** - Income-qualified program that provides plug load occupancy sensors in smart power strips, up to 10 LED bulbs, duct sealing, AC tune-ups with refrigerant charge testing, Energy Star room air conditioners, and additional water and gas saving measures.
- **Income-Qualified Utility Discount** - Provides a 10% reduction on the electric and/or water portions of utility bills to seniors, military veterans, or long- term disabled customers at or below 80% of the Orange County median income.
- **Dusk to Dawn Income-Qualified Assistance** - In addition to receiving up to two free outdoor security lights, income-qualified residents may also have the light installed by one of Anaheim's approved and licensed electrical contractors free of charge.
- **Emergency Assistance** - Provides annual electric and/or water utility payment assistance for income-qualified customers experiencing financial hardship.
- **Community Solar Discount Program** – Income-qualified customers are eligible to receive a $10 monthly discount on the electric portion of their utility bill for a 6-month period, with annual re-enrollment eligibility.

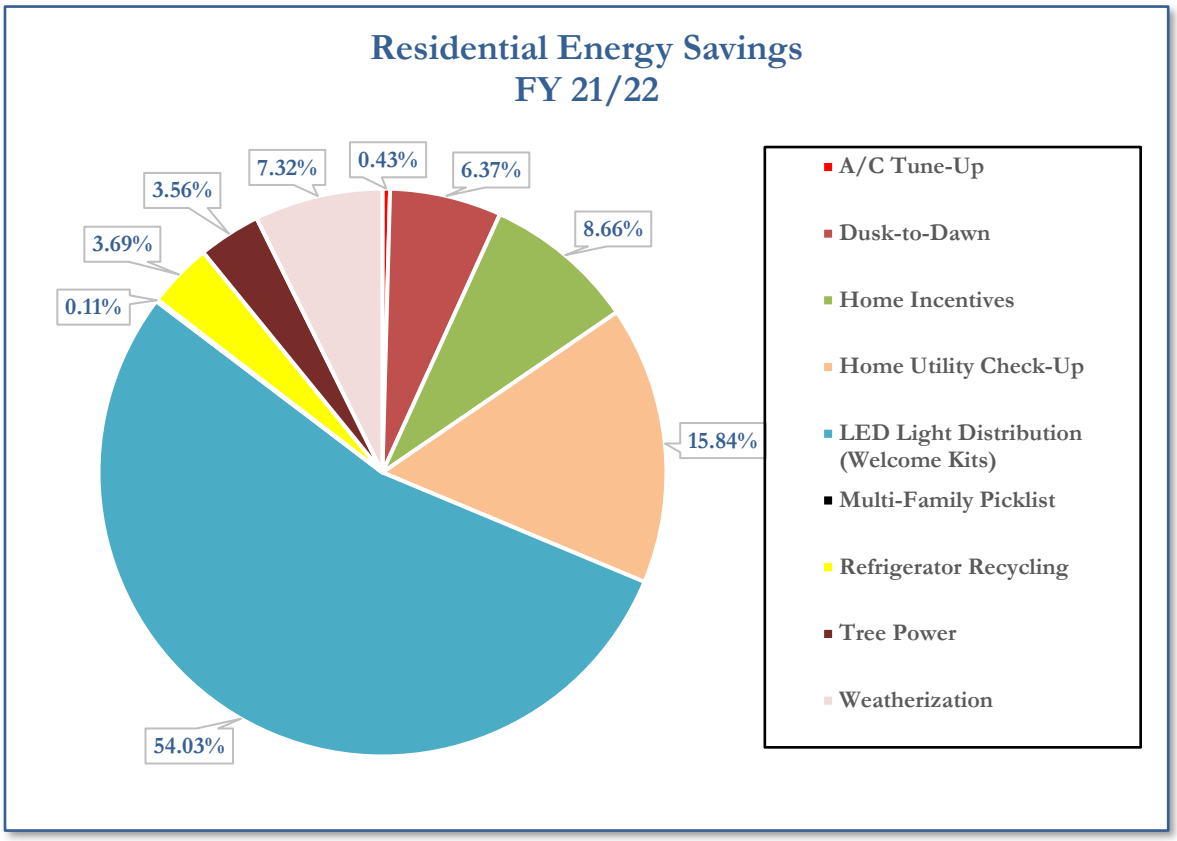
**Residential Programs**

- **Dusk-to-Dawn** - Free outdoor security light distribution. Customers can pick up lights from the program contractor's office in Anaheim or receive during Home Utility Check-Up and Weatherization Program service.

- **A/C Tune Up** - Provides incentives to residential customers who have a licensed HVAC contractor perform an A/C tune up, with an enhanced incentive for income-qualified customers.
- **TreePower** - Provides up to 6 complimentary shade trees and incentives for residential customers.
- **Home Utility Check-Up** - No cost home assessment of electric (plug loads) and water usage/demand, customized audit report with efficiency recommendations, outdoor water audit and irrigation scheduling/programming, direct-installation of LEDs, low-flow shower heads, aerators, toilet leak/dye tab test, etc.
- **LED Distribution (Welcome Kits)** - New electric utility customers direct-mailed LED Welcome Kits, inclusive of 4 LED bulbs and welcome brochure with City information and resources.
- **Holiday Lights Exchange** - Provides free LED holiday lights to residents who turn in old incandescent holiday lights.
- **Home Incentives** - Provides rebates for the purchase and installation of high efficiency ENERGY STAR® rated appliances and high-efficiency conservation measures.
- **Refrigerator Recycling Program** - Provides a rebate to customers who recycle an old, operational refrigerator or freezer and replace it with a new ENERGY STAR® rated model.
- **Multi-Family Picklist Program** – Financial incentives provided for new construction and rehabilitation of multi-family dwellings to promote sustainability, decrease tenant utility costs, and lower Greenhouse Gas (GHG) emissions.
- **Water Smart Landscaping Workshops (OC Master Gardeners)** – Partnership with OC Master Gardeners Speakers Bureau to provide free gardening/landscaping workshops on various topics at venues throughout Anaheim.

The following graphic illustrates FY 21/22 energy savings achieved through APU's residential programs.

**Graph 74: FY 21/22 Residential Program Energy Savings**



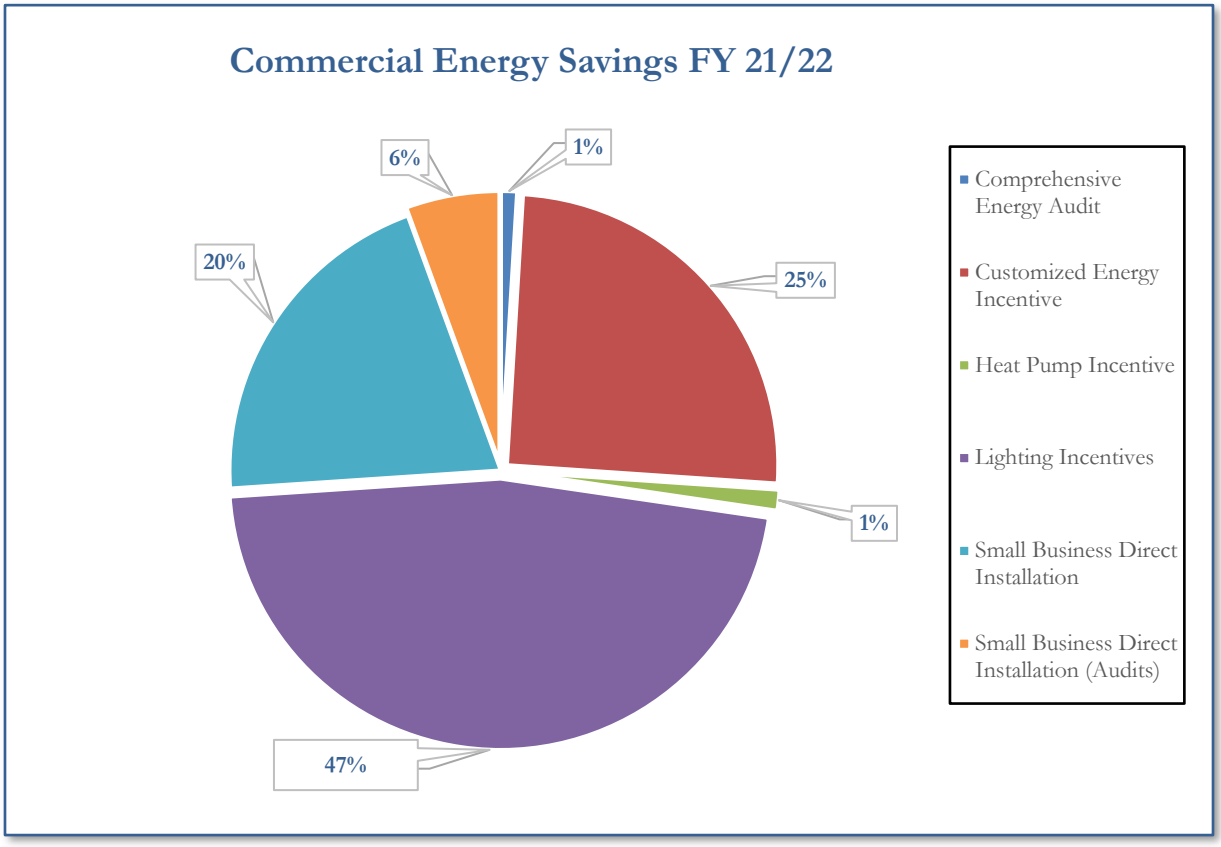

**Commercial Programs**

- **Customized Energy Incentives Program** - Customized financial incentives for installation of high-efficiency air conditioning, motor controls, and other production related equipment.
- **Comprehensive Energy Audits** - Customized on-site audits and recommendations designed to improve operating efficiencies and help customers reduce costs.
- **System Operations Enhancements** - Produces energy savings by increasing system performance through replacement of electrical infrastructure and by disabling large transformers that are not actively serving customers' loads.
- **Codes and Standards** - Savings are drawn from the statewide allocation of energy savings credits due to (building) Codes and Standards and based on Anaheim's percent share of statewide load.
- **Upstream HVAC** - Provides rebates to the sales channel that most influences the stocking and selling of qualifying high efficiency equipment; the goal is to facilitate the purchase of the high efficiency equipment by the end-use customer. End of contract and program participation was April 2019.
- **Heat Pump Incentives Program** – Provides rebates for installation of high-efficiency heat pumps.

- **Lighting Incentives** - Provides incentives to improve energy efficiency for a variety of lighting applications.
- **Small Business Energy Management Assistance Program** - Provides customers of less than 50-kilowatt demand with energy use evaluations, retrofit funding, and installation services; focus is on LED lighting upgrades and lighting controls, programmable/smart thermostats, high efficiency refrigeration measures, refrigeration and air conditioning tune- ups.
- **Feasibility Studies Program** - Provides comprehensive metering and verification for industrial applications with specialized technology and complex operations, and to award energy incentives for installing high efficiency components to improve and operate efficiently.
- **Uninterruptible Power Supply Incentives- Part of the Customized Incentive Program** Provides incentives for uninterruptible power supply (UPS) devices rated "Energy Star", or also known as battery backup. A UPS provides emergency power to allow for the safe and orderly shutdown of connected equipment (e.g., computers) and other critical devices during an unforeseen power outage.
- **New Construction Program** – Provides incentives for business customers who exceed Title 24 in their new construction projects and large-scale retrofits.

The following graphic illustrates FY21/22 energy savings achieved through APU's commercial programs.

**Graph 75: FY 21/22 Commercial Program Energy Savings**



## E. COVID-19 Assistance Programs

**Residential Programs**

- **COVID-19 Emergency Assistance Program** – Anaheim Public Utilities COVID-19 Emergency Assistance Program provided financial assistance to residential customers facing a temporary financial hardship. Eligible customers who are unable to pay the electric and/or water portion of their utility bill due to COVID-19 may receive a one-time lifetime bill credit of up to $250 in electric utility assistance and $100 in water utility assistance per household as a COVID-19 related emergency payment assistance.

- **Internet Access Rebate Program** - The City of Anaheim offered income-qualified residents who had been impacted by COVID-19 financial assistance towards their home internet costs, understanding that many customers transitioned to working from home or have children who are distance learning. This program was funded through the Federal Coronavirus Aid, Relief, and Economic Security (CARES) Act. The City of Anaheim does not provide internet services but wanted to support students and residents who are struggling with connectivity on a temporary basis. Prior to seeking this rebate, residents were required to enroll in at least one of Anaheim Public Utilities' income-qualified programs. The program rebate amount is determined by the total number of internet users living in the household. Program participants were eligible to receive a rebate of up to $60-$120 per household, depending on the number of internet users per household.

- **Air Purifier Rebate** – Anaheim Public Utilities Air Purifier Rebate Program incentivized the purchase of ENERGY STAR® certified air purifiers, with a rebate amount of $30 per air purifier (maximum quantity of 2) and $50 per air purifier with UV light (maximum quantity of 2).

**Commercial Programs**

- **Air purifiers Incentives** - Offers business customers' incentives for room air cleaners, also known as air purifier. Air purifiers are portable appliances that remove fine particles, such as pollen, dust, and unpleasant odors from the air. Using ENERGY STAR® portable air purifiers is a great way to improve indoor air quality in a single room or area while using energy efficiently.

- **Air purifiers for School Incentives** - Offers K-12 public and private school incentives for room air cleaners, also known as air purifier. Air purifiers are portable appliances that remove fine particles, such as pollen, dust, and unpleasant odors from the air. Using ENERGY STAR® portable air purifiers is a great way to improve indoor air quality in a single room or area while using energy efficiently.

- **Small Business Emergency Assistance Program** – Provided financial assistance to small businesses and non-profit customers facing a temporary financial hardship due to COVID-19 pandemic. Eligible customers who were unable to pay the electric portion of their bill received a one-time $1,000 bill credit for electric utility assistance.

## F. Challenges and Future Program Development

### Address Impacts of the COVID-19 Pandemic

During FY19/20, the global pandemic of COVID-19 significantly affected energy and water efficiency programs, and continues to impact progress in achieving kWh savings targets today. The impacts of the COVID-19 pandemic include business closures, causing the decline of business's participation in energy efficiency programs. Similarly, residential participation in home energy and water efficiency assessments, such as the Home Utility Check-Up program and Weatherization program, declined due to statewide emergency quarantine orders. APU will continue to develop programs that respond to the evolving needs of a post-pandemic society as businesses and residents acclimate to a post-pandemic world.

### Address Diminishing Return by Embracing Emerging Technologies

The unit costs of implementing energy efficiency programs will decline with increases in scale, but at some point the unit costs for the first year savings will increase due to diminishing returns. To achieve cost effectiveness, APU must identify programs and technologies that have not been impacted by the diminishing returns.

APU is dedicated to research and investment in new and emerging energy efficient technologies, such as lighting, HVAC and plug loads. Through these efforts, APU is looking into opportunities to enhance existing energy programs and expand customer participation in multi-family developments, Commercial/Industrial/Institutional (C/I/I) upgrades, new construction projects, and residential and business customer equipment rebates.

### Address Evolving Communication Preference by Expanded Methods of Communication

Customers today are requesting information in a variety of ways, languages, and with an expectation of 24/7 accessibility. APU is continually adapting its methods of communication with customers through social media and all forms of electronic communication.

The Latino population in Anaheim increased from 46.8% to 54.8% in 2016. Anaheim has always offered its communication materials in both English and Spanish. Most community outreach events have Spanish-speaking staff to assist Spanish speaking customers with questions and program details. APU strives to keep pace with current technologies and be responsive to the best mechanisms to communicate with customers and offer its programs and services throughout a diverse community.

APU will continue to provide outreach events throughout the community to bring awareness and promote new programs and services. APU will also continue to expand its methods of communication through various social media outlets.

### Approach Disadvantaged Communities with Targeted Outreach

One of the challenges that APU faces in meeting its energy efficiency target is being able to serve the income-qualified community in the rental housing market. According to APU's latest residential survey, 40.6% of respondents indicated they rent, and not own, their residence. However, due to the nature of some programs, consent is required from the property owners in order for income-qualified renters to participate in the programs.

Many of APU's incentive programs are designed to provide rebates directly to the customer account holder. However, if a renter would like to upgrade to new windows or HVAC system but does not have the homeowner's permission, or the homeowner is not willing to pay for the improvements, the efficiency upgrades are not implemented.

APU is making a concerted effort to design and promote programs to customers in low income and disadvantaged communities within Anaheim. Please see APU's full efforts in Section XIII. Programs for Low Income and Disadvantaged Communities.

Two of the key assistance programs APU will promote and market moving forward will be the 1) free Home Utility Check Up program where customers receive energy and water savings measures, as well as a customized report on applicable programs and behavioral recommendations and 2) the Weatherization Program that provides free electric, gas, and water measures installed at customers' homes at no cost. Critical to all these efforts is APU's collaborative efforts with third parties, other utilities, other City departments, and community-based organizations to provide the most comprehensive and targeted energy efficiency program and services.

## G. DEMAND RESPONSE PROGRAMS

### G.1. VOLUNTARY LOAD REDUCTION PROGRAM

The Voluntary Load Reduction Program is designed for large commercial, industrial, institutional, and municipal customers who can curtail a minimum of 200 kW of their load within 30 minutes of being notified APU. These eligible customers are capable of assisting APU to comply with a CAISO order to curtail system load during a Flex Alert and/or Energy Emergency Alert (EEA).

An Energy Emergency Alert 3 is called when CAISO is unable to meet minimum Contingency Reserve requirements and controlled power curtailments are imminent or in progress leading to maximum conservation by consumers. In order to prevent widespread outages, the CAISO will take certain actions to ensure the stability and reliability of the State's electric power Grid. During an EEA3, the CAISO may institute mandatory load curtailment throughout the State for typically one to four hours to maintain system reliability when electricity usage is at its peak. APU may be ordered to participate in load curtailment if sustained high electric loads threaten blackouts throughout the State.

This voluntary program does not offer financial incentives to participants and does not include any financial penalties for not curtailing load when requested or not sustaining load curtailment during the duration of the CAISO EEA3. Participating customers receive the benefit of eliminating the risk of unplanned total electric service outages that result from CAISO orders to curtail firm load during an EEA3, in exchange for voluntary load reduction during the entire duration of a CAISO EEA3.

The economic benefits to participating customers are a function of the savings realized from a coordinated interruption of individual business processes and the expected risk of a CAISO ordered load curtailment event. For those customers that maintain continued participation in this program, APU bypasses, where feasible, that customer's circuit from mandatory rotating outages during an order by the CAISO to curtail load.

Currently APU has 10,688 kW of load in the Voluntary Load Reduction Program that includes business customers, City properties, and water pump stations.

## G.2. MYPOWER SAVINGS PROGRAM

APU currently has a residential demand response program called myPower Savings Program. It is based on behavioral demand response, and APU calls events and sends dispatch signals to enrolled customers based on criteria such as CAISO Flex Alert or EEA notices and system emergencies. Events are limited to non-holiday weekdays, and the total number of events is capped during the program duration.


Eligible customers can receive a one-time bill credit for enrolling in the program. When a program event is called, APU notifies enrolled customers of the upcoming event by email or text message based on customers' preferences. Enrolled customers have the freedom to reduce energy consumption however they wish during the event hours, and they can also earn bill credits based on the kilowatt-hour (kWh) they reduce.

Since the program launch in 2017, the average annual total kWh reduction is approximately 3,450 kWh. The expected peak and load impact from the program is deemed negligible. APU does not include the impacts of demand response programs in its peak load and energy forecast at this time.

For the peak load in 2019 (9/4/2019 HE16 at 530 MW), APU did not have an event during that time.

For the peak load in 2020 (8/18/2020 HE 16 at 559 MW), APU had an event, and the energy consumption reduction for that hour from participating customers was 63 kWh.

For the peak load in 2021 (9/22/2021 HE16 at 486 MW), APU did not have an event during that time.

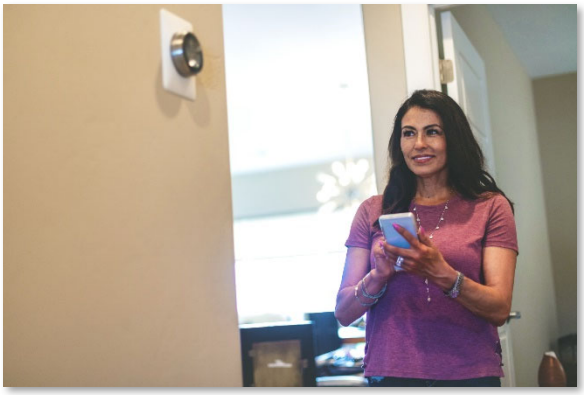
For the peak load in 2022 (9/8/2022 HE16 at 566 MW), APU did not have an event during that time.

## G.3 DRIVE GREEN ANAHEIM

APU is planning to launch several dispatchable demand response programs in the upcoming years. By summer 2023, APU will implement an electric vehicle charging station and demand response program, titled "Drive Green Anaheim". The program aims to increase the proliferation of EVs in underserved locations by installing, operating, and maintaining charging stations and providing no-cost charging to local users. Through the program, commercial properties and multifamily dwellings in low income and disadvantaged communities will have the opportunity to become a public EV charger station host site and receive a turn-key EV charger program inclusive of design, procurement, installation, operation and maintenance. With growing EV demands on the local grid, EV charging stations will be equipped with demand response capabilities to be able to curtail EV charging during peak hours (between 4-9 PM) or during grid emergencies.

## G.4. FUTURE CUSTOMER DEMAND RESPONSE PROGRAMS

In 2024, APU will launch an expanded demand response program that provides customers with energy saving tools, incentives, and a user-friendly notification system that prompts participating customers to curtail usage during times of high demand, or when APU calls for a load curtailment event. As part of the expanded demand response program, new software management technology will be implemented that provides a one-stop-shop of services including customer enrollment tracking, customer participation in curtailing load, device registration, load impact, dispatch notifications, optimization with CAISO alerts, incentive processing, and behavioral analysis. A variety of energy saving tools and incentives will be available to customers, including smart thermostats, heat pumps, HVAC, pool pumps, small business equipment, commercial equipment, industrial equipment, energy management systems, electric vehicle supply equipment, electric school buses, and batteries for storing energy.



# XIII. PROGRAMS FOR LOW INCOME AND DISADVANTAGED COMMUNITIES

## A. DEFINITION OF LOW INCOME AND DISADVANTAGED COMMUNITIES

***Anaheim's disadvantaged and low income communities include areas greater than the CalEnviroScreen-defined DAC areas.***

Pursuant to Senate Bill 535, disadvantaged communities (DACs) are communities designated by CalEPA, using the California Communities Environmental Health Screening Tool ("CalEnviroScreen").

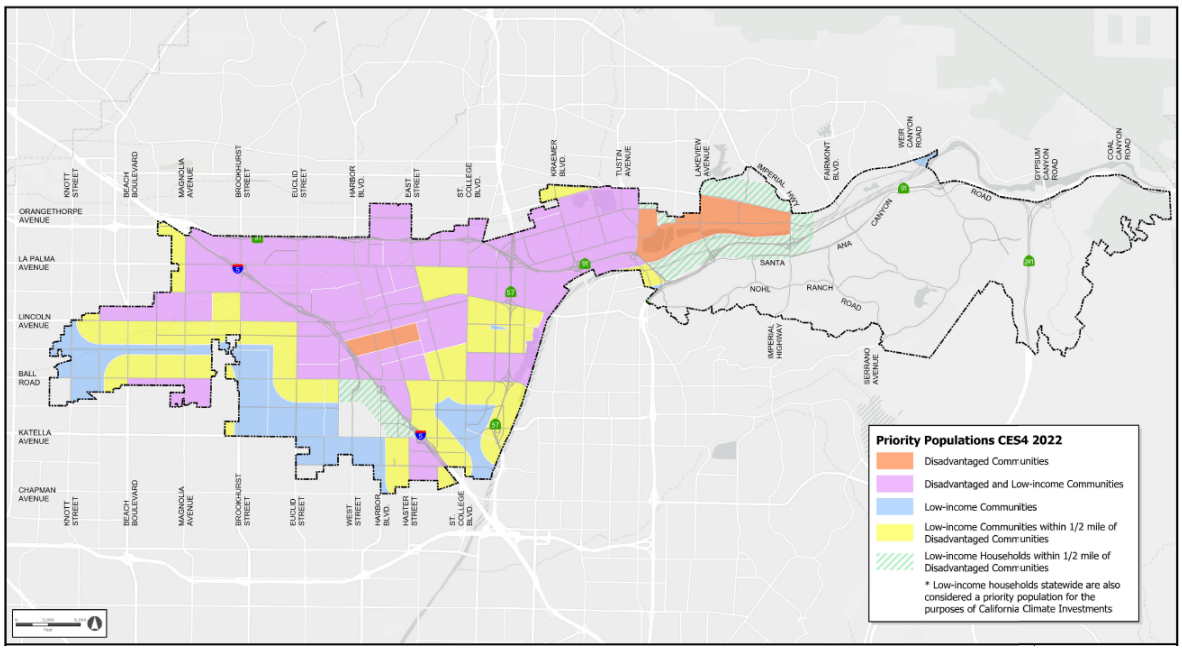
Beyond the CalEnviroScreen defined DACs, Anaheim maintains information about the different types of neighborhoods of concern within the City. The areas that Anaheim provides assistance to include:

- Disadvantaged Communities as defined by Proposition 84 Integrated Regional Water Management (IRWM) Guidelines (2015), and
- Community Development Block Grant (CDBG)[47] areas as defined by the Department of Housing and Urban Development.

The CalEnviroScreen 4.0 (CES 4.0) map was updated in May 2022 to reflect low income community designations, also known as "priority populations". At least 35 percent of California Climate Investments must benefit these populations. This updated map considers environmental, health, and socioeconomic information, and score California census tracts, enabling comparison and identification of disproportionately burdened and low income communities. Locations with higher scores experience greater burden, compared to areas with lower scores. Low income communities and households are defined as the census tracts and households, respectively, that are at or below the threshold designated as low income by the California Department of Housing and Community.[48] The graph below provides an overview of CalEnviroScreen 4.0 designations for Anaheim census tracts.

[47] CDBG funds activities that benefit low- and moderate-income (LMI) persons, the prevention or elimination of slums or blight, or other community development activities that address an urgent threat to health or safety.
[48] https://webmaps.arb.ca.gov/PriorityPopulations/

**Graph 76: Map of Anaheim's Priority Populations as defined by CalEnviroScreen4.0**




Anaheim has developed two primary strategies to assist communities of concern:

- Interdepartmental Strategies
- APU Strategies

## B. INTERDEPARTMENTAL STRATEGIES

**Interdepartmental Collaboration Examples**

- Affordable Housing Developments
- Private Development Opportunities
- Street Replacement Projects
- Residential Rehabilitation
- Public Access Electric Vehicle Charging Stations
- Expanded Customer Education
- Expanded Customer Outreach

The City of Anaheim has strong interdepartmental ties and APU works closely with Housing & Community Development, Economic Development, Public Works, Planning and Building, and Community Services (which includes Parks and Libraries).

APU participates in a monthly Interdepartmental Review Committee that examines all new proposed and rehabilitation projects. APU assists the other departments with their respective environmental and community health goals in particular, as it pertains to disadvantaged communities.

Below are examples of inter-departmental collaboration to ensure that investments are made in the City's most vulnerable communities.

## AFFORDABLE HOUSING DEVELOPMENT

APU forecasts that approximately 400 new affordable housing units will be developed over the course of 3 to 5 years. Additionally, in partnership with the Salvation Army, the Center of Hope will provide homelessness services that will be equipped to provide 325 beds of emergency shelter, 72-bed permanent supportive housing, onsite medical and dental care, alongside a drug and alcohol rehabilitation center. APU supports these efforts by offering complimentary design assistance review, and new construction and electric vehicle charging incentives. These additionally requested elements improve emissions reduction and promote transportation electrification within LI-DACs.

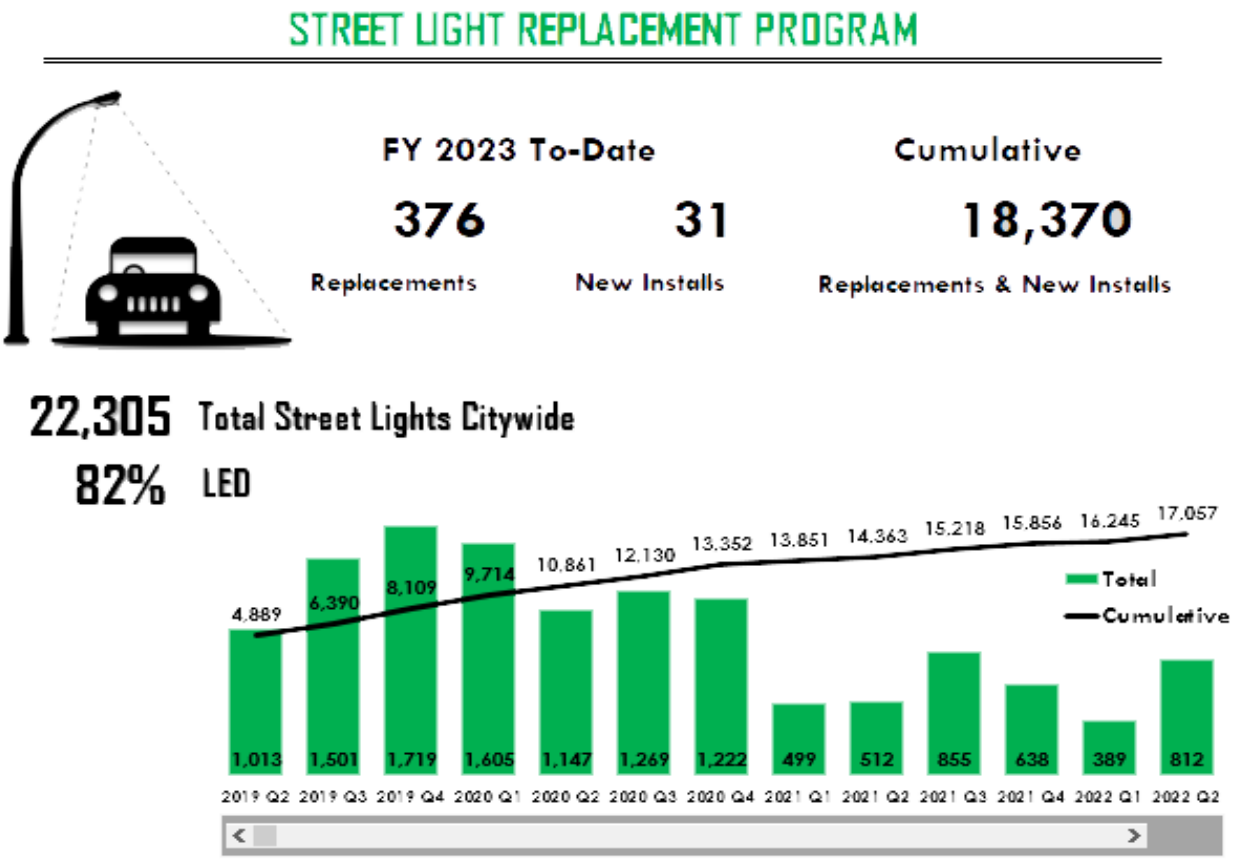
## PRIVATE DEVELOPMENT OPPORTUNITIES

APU works with the Planning & Building Department, and Housing & Community Development Department on new, private developments to identify and leverage opportunities to improve the quality of life within LI-DACs. APU provides funding for eligible project elements such as weatherization, shade trees, and electric vehicle charging and tracks the following projects closely:

- Transitional housing shelters
- Homeless advocacy networks
- Multi-family private developments that are in low income or disadvantaged communities
- Multi-family private developments that are requesting density bonuses and require low income units
- Residential projects near freeways for shade tree opportunities that simultaneously improve air quality
- Commercial, industrial, and institutional projects in disadvantaged communities
- Commercial, industrial, and institutional projects near freeways for vehicle electrification opportunities

## LED STREET LIGHT REPLACEMENT PROGRAM

Currently there are about 22,305 streetlights owned by APU, and LED upgrade projects and new streetlights requested by Anaheim residents are prioritized with input from Neighborhood Services, Anaheim Police Department, and Code Enforcement. Since 2018, approximately 82% of Anaheim streetlights have been replaced with energy efficiency LED lights, totaling 18,370 lights citywide.




## INCOME-QUALIFIED RESIDENTIAL REHABILITATION

APU coordinates with Housing & Community Development on an income-qualified Residential Rehabilitation Program that provides forgivable loans to homeowners for major home improvements or repairs. APU funds the weatherization portion of the rehabilitation, including roof repairs, siding repairs, window repairs, and insulation.

## ELECTRIC VEHICLE CHARGING STATIONS AT CITY SITES

APU has collaborated with the Community Services Department to identify two community center sites as a pilot project to install two Level 2 vehicle chargers at each. If proven successful, the pilot will expand into an annual program to install chargers at City sites with first priority within the disadvantaged or low income communities. In addition to community center and park sites, other public spaces are also examined for possible electric vehicle charging stations, such as libraries, police stations, and fire stations.

## EXPANDED CUSTOMER EDUCATION

APU hosts a number of educational courses that can be used for both professional development and home improvement. These classes include energy efficiency for facilities managers and energy managers, water efficient landscaping to improve greenhouse gas reduction, and other climate and energy related classes that teach best practices.

## EXPANDED CUSTOMER OUTREACH

APU participates in Community Services hosted neighborhood events, such as mobile family resource fairs, neighborhood cleanup and other activities in the neighborhoods of concerns. This allows APU to reach out to communities that may not have the means to obtain information on APU's programs.

Research has shown that associating programs with public libraries increases trust that utility efficiency programs are legitimate in low income and immigrant communities.

In addition, APU is working with the Planning & Building and Housing & Community Development Departments to develop training programs for the Code Enforcement officers and Section 8 inspectors regarding incentives and assistance programs available to qualified residents and property owners. The officers and inspectors are often at the front lines when working with customers in the City's neighborhoods of concern. After equipping the officers and inspectors with program information, APU can reach more customers going forward.

## C. APU STRATEGIES

**APU Strategies**

- Enhanced Data Analytics
- Targeted Communications
- Low Income Discount & Bill Assistance
- Transportation Electrification

In addition to all energy efficiency programs and rebates offered to all customers, APU has programs available to specifically assist residents in the neighborhoods of concern.

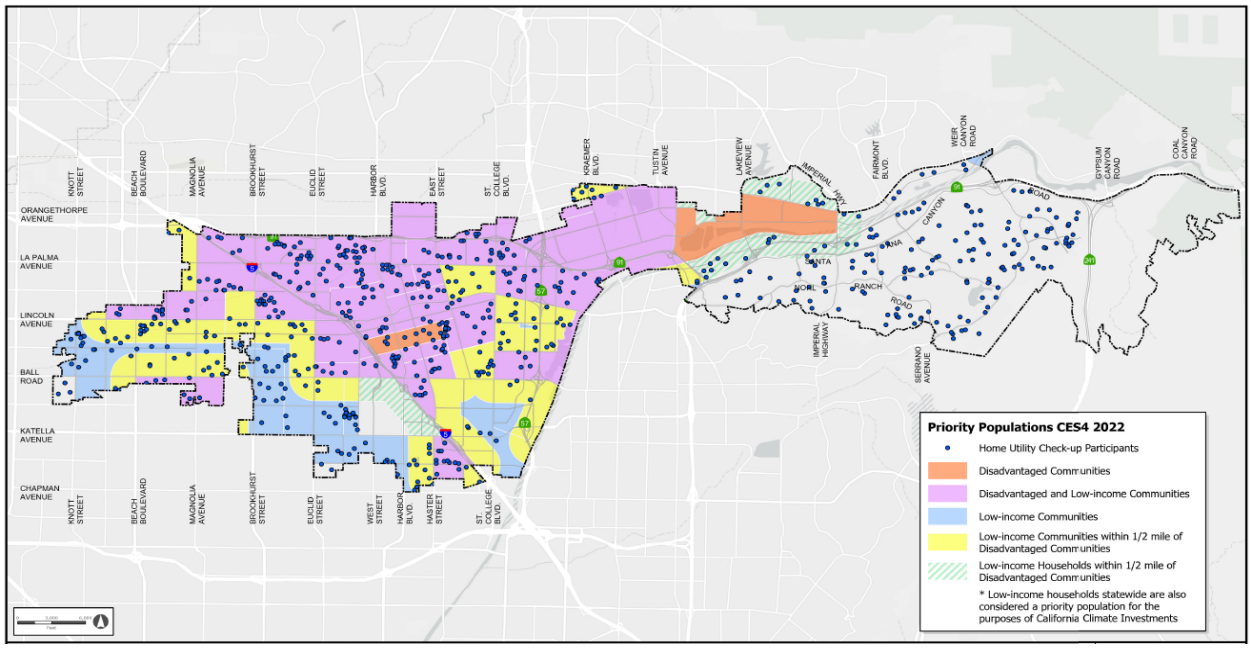
### ENHANCED DATA ANALYTICS

Enhanced data analytics are used to maximize disadvantaged residents' participation in energy and water efficiency programs. Through data analytics, APU found that a significant portion of the customers who participated in the Home Utility Check-Up Program, Dusk-to-Dawn Lighting Program, and Weatherization Program resided within disproportionately burdened census tracts, as identified by CalEnviroScreen scores. In addition, many participants were simply having trouble paying bills and wanted to reduce energy consumption for financial reasons.

With this knowledge, the Home Utility Check-Up, Dusk-to-Dawn, and Weatherization Programs are now enhanced to include one-stop education opportunities on how energy and water use efficiency can be managed, along with cross-promotion and enrollment into other programs that customers may be eligible for.

The graphs below show CalEnviroScreen 4.0 layered maps detailing APU's Home Utility Check-Up Program, Dusk-to-Dawn Lighting Program, and income-qualified Weatherization Program participation for Fiscal Year 21/22, considering CalEnviroScreen census tract data and associated score.

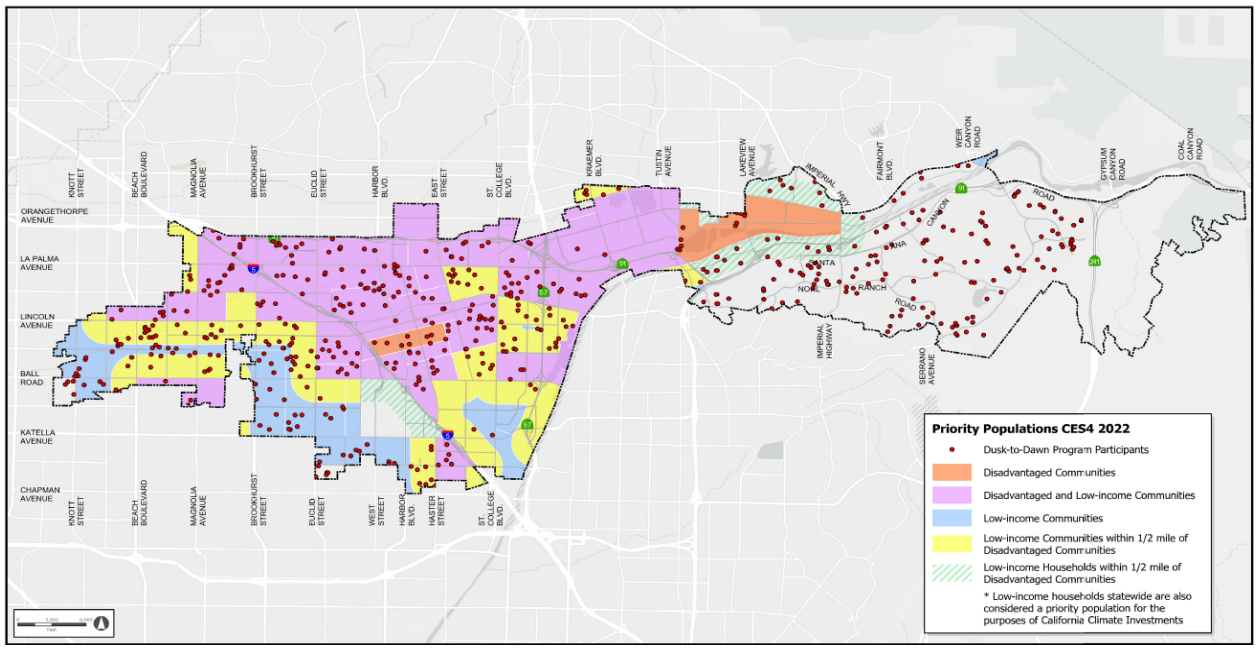
**Graph 77: Map of FY21/22 Home Utility Check-Up Program Participation, Layered with CalEnviroScreen 4.0 Census Tract Score**



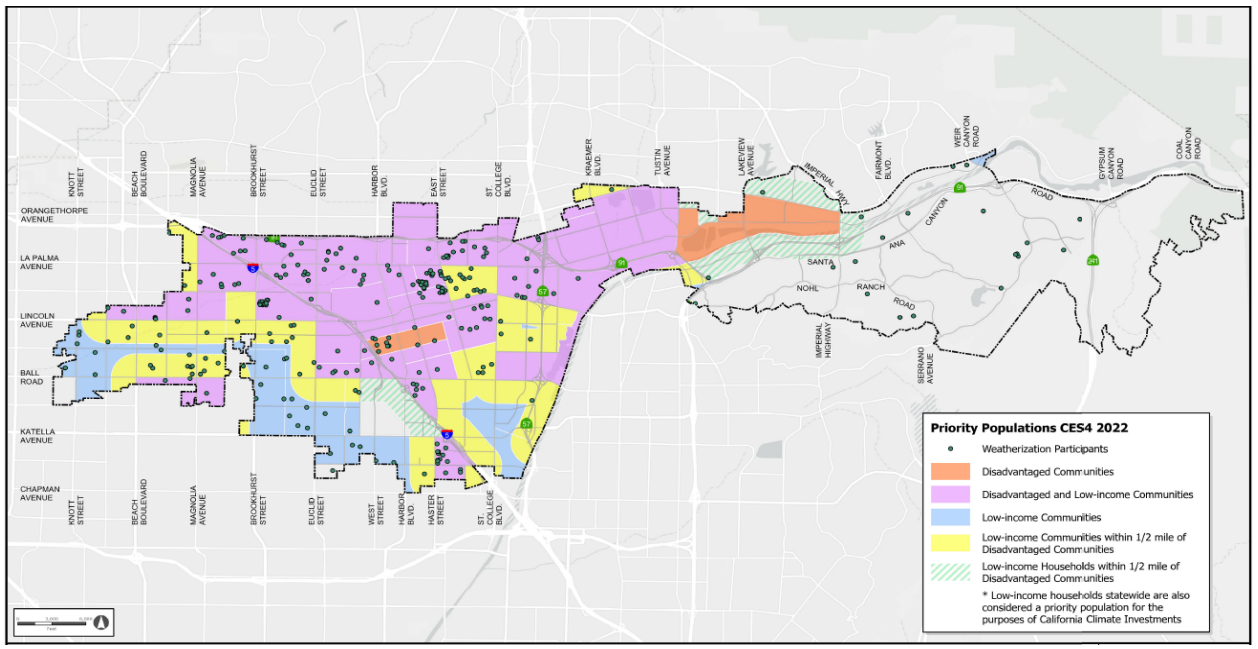

With this knowledge, the Home Utility Check-Up, Dusk-to-Dawn, and Weatherization Programs are now enhanced to include one-stop education opportunities on how energy and water use efficiency can be managed, along with cross-promotion and enrollment into other programs that customers may be eligible for.

The below CalEnviroScreen 4.0 layered maps detail Home Utility Check-Up Program, Dusk-to-Dawn Lighting Program, and income-qualified Weatherization Program participation for Fiscal Year 21/22, considering CalEnviroScreen census tract data and associated score.

**Graph 78: Map of FY21/22 Dusk-to-Dawn Program Participation, Layered with CalEnviroScreen 4.0 Census Tract Score**




**Graph 79: Map of FY21/22 Weatherization Program Participation, Layered with CalEnviroScreen 4.0 Census Tract Score**




## TARGETED COMMUNICATIONS

APU routinely conducts customer feedback surveys. Methods of reaching out and improving APU's service for low income customers are part of the surveys. With customer feedback, APU's outreach team targets the LI-DAC neighborhoods with fliers in Spanish and English and information designed for broader reach within these communities.

## INCOME-QUALIFIED DISCOUNT AND BILL ASSISTANCE

In addition to payment plan options, APU offers multiple bill assistance programs and rate discounts for customers in need.

The Utility Discount Program for income-qualified seniors, long-term disabled, and military veteran customers provides a 10% discount on residential electric and/or water utility charges. A medical lifeline allowance, which provides additional energy at the lowest tiered rate, is also offered to customers who rely on medical equipment powered by electricity.

The Community Solar Discount Program for income-qualified customers provides a $20 monthly discount for electric utility costs for a 6-month period, with annual re-enrollment eligibility up to three years.

APU's Emergency Assistance Program provides annual electric and/or water utility payment assistance of up to $350 for income-qualified customers experiencing financial hardship.

Administered by the Community Action Partnership of OC in partnership with APU, the Low Income Home Energy Assistance Program (LIHEAP) and Low Income Home Water Assistance Program (LIHWAP) helps income-qualified residents receive annual financial assistance for their utility services.

## TRANSPORTATION ELECTRIFICATION

APU's disadvantaged communities are primarily along freeway corridors. The air quality associated with freeway corridors is a major contributor to health concerns. Through its transportation electrification programs, APU reduces area pollutants along freeway corridors and improves quality of life within the disadvantaged communities. Please see the Transportation Electrification section for more information.

# APPENDIX A – RENEWABLE PROCUREMENT PLAN

## RENEWABLE RESOURCE PROCUREMENT PLAN
## 2023 Update

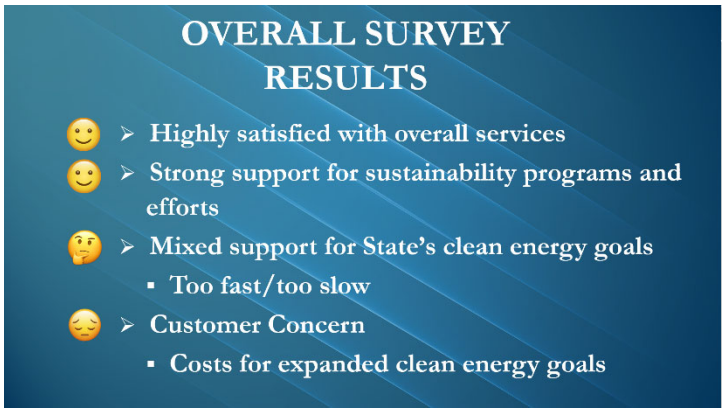
| Compliance Period (CP) | | | | | | CP 1 | CP 2 | CP 3 | CP 4 | CP 5 | CP 6 | CP 7 | CP 8 | CP 9 | CP 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calendar Year (CY) | | | | | | CY 2011-2013 | CY 2014-2016 | CY 2017-2020 | CY 2021-2024 | CY 2025-2027 | CY 2028-2030 | CY 2031-2033 | CY 2034-2036 | CY 2037-2039 | CY 2040-2042 |
| Estimated APU Retail Sales (GWh) | | | | | | 7,085 | 7,074 | 9,317 | 8,536 | 6,440 | 6,485 | 6,524 | 6,566 | 6,615 | 6,666 |
| **Grandfathered Projects** | Technology Type | Location | Online Year | Contract Term (Years) | PCC | CP 1 (GWh) | CP 2 (GWh) | CP 3 (GWh) | CP 4 (GWh) | CP 5 (GWh) | CP 6 (GWh) | CP 7 (GWh) | CP 8 (GWh) | CP 9 (GWh) | CP 10 (GWh) |
| Iberdrola (High Winds) | Wind | CA | 2003 | 20 | 0 | 42 | 37 | 47 | 44 | - | - | - | - | - | - |
| Iberdrola (Pleasant Valley) | Wind | WY | 2005 | 20 | 0 | 239 | 223 | 305 | 309 | 42 | - | - | - | - | - |
| Ormat (Heber South) | Geothermal | CA | 2005 | 15 | 0 | 194 | 179 | 276 | 65 | - | - | - | - | - | - |
| Cryq (Thermo No. 1) | Geothermal | UT | 2009 | 24 | 0 | 90 | 186 | 255 | 257 | 202 | 176 | 176 | - | - | - |
| Broadrock (Ridgewood) | Landfill Gas | CA | 2007 | 36 | 0 | 254 | 623 | 866 | 893 | 680 | 681 | 681 | 681 | 680 | 681 |
| MWD (Various Small Hydro) | Small Hydro | CA | 2008 | 20 | 0 | 47 | 41 | 36 | 16 | - | - | - | - | - | - |
| **Total Grandfathered Resources** | | | | | | 866 | 1,288 | 1,786 | 1,585 | 924 | 857 | 857 | 681 | 680 | 681 |
| **Contracted Projects** | Type | Location | Contract Year | Contract Term (Years) | PCC | CP 1 (GWh) | CP 2 (GWh) | CP 3 (GWh) | CP 4 (GWh) | CP 5 (GWh) | CP 6 (GWh) | CP 7 (GWh) | CP 8 (GWh) | CP 9 (GWh) | CP 10 (GWh) |
| San Gorgonio Wind Farm | Wind | CA | 2012 | 10 | 1 | 142 | 243 | 354 | 275 | 203 | 203 | 169 | - | - | - |
| Noble | Municipal Solid Waste | CA | 2013 | 2 | 1 | - | 459 | - | - | - | - | - | - | - | - |
| Anaheim Solar Energy Plant (Convention Center Roof) | Solar | CA | 2014 | Utility-owned | 1 | - | - | 11 | 13 | 10 | 10 | 10 | 10 | 10 | 10 |
| Solar for Schools | Solar | CA | 2018 | Utility-owned | 1 | | | 4 | 10 | 7 | 7 | 7 | 7 | 7 | 7 |
| Westlands | Solar | CA | 2015 | 25 | 1 | - | 4 | 13 | 13 | 15 | 13 | 13 | 13 | 12 | 5 |
| Bowerman | Biogas | CA | 2015 | 20 | 1 | - | 116 | 613 | 619 | 465 | 465 | 465 | 361 | - | - |
| Loyalton | Biomass | CA | 2018 | 5 | 1 | - | - | 3 | - | - | - | - | - | - | - |
| EDF Sapphire Solar Hybrid | Solar | CA | 2023 | 20 | 1 | - | - | - | - | 201 | 285 | 271 | 269 | 255 | 239 |
| EDF Desert Harvest Solar | Solar | CA | 2020 | 25 | 1 | - | - | 9 | 400 | 293 | 280 | 268 | 255 | 242 | 229 |
| Generic Bucket 1 Contracts | N/A | CA | N/A | >10 year | 1 | - | - | - | - | 764 | 1,577 | 2,322 | 3,502 | 3,967 | 3,992 |
| Short-Term WSPP (CPP 1) | Various | WECC Region | N/A | <1 year | 1 | 216 | - | - | - | - | - | - | - | 219 | 548 |
| Short-Term WSPP (CPP 2) | Various | WECC Region | N/A | <1 year | 2 | 169 | 171 | 106 | - | - | - | - | - | - | - |
| Unbundled RECS | N/A | WECC Region | 2011 | <1 year | 3 | 136 | - | - | - | - | - | - | - | - | - |
| Unbundled RECS | N/A | WECC Region | N/A | <1 year | 3 | - | 132 | 118 | 219 | 258 | 303 | 381 | 471 | 500 | 520 |
| APU Small Solar Program (SB1) | Solar | CA | 2012 | N/A | 3 | 3 | - | - | - | - | - | - | - | - | - |
| **Total Contracted Resources** | | | | | | 666 | 1,125 | 1,231 | 1,548 | 2,216 | 3,143 | 3,906 | 4,888 | 5,211 | 5,549 |
| Banked Procurement* | | | | | | 0.00 | 110 | 1,333 | 1,064 | 1,026 | 1,328 | 1,393 | 1,162 | 901 | 733 |
| RPS TARGET | | | | | | 20% | 25% | 33% | 44% | 52% | 60% | 78% | 91% | 94% | 97% |
| **ESTIMATED APU RPS%** | | | | | | **20%** | **25%** | **33%** | **44%** | **52%** | **60%** | **78%** | **91%** | **94%** | **97%** |
| ESTIMATED APU RPS (GWh) | | | | | | 1,532 | 2,413 | 3,016.976 | 3,133 | 3,139 | 4,001 | 4,763 | 5,569 | 5,892 | 6,230 |
| ESTIMATED APU RPS COST | | | | | | $95,611,405 | $159,692,302 | $245,621,464 | $235,543,697 | $211,596,879 | $263,617,579 | $313,976,444 | $358,657,336 | $370,939,627 | $408,071,668 |

* Expected procurement generated in previous compliance year, to use in the proceeding compliance year.
**Per Section V.C.2., Appendix A may be revised, with the approval of the General Manager, with out further City Council approval.

# APPENDIX B – PUBLIC ENGAGEMENT

## A. CUSTOMER SURVEY SUMMARY

In late 2016, APU retained a market research and consulting firm to gain a better understanding of customers' thoughts and preferences regarding APU's plans to increase renewable power to 50% by 2030, reduce coal power to zero as contracts expire, and doing so over a 10-year period to help keep the impact on electric rates to a minimum.



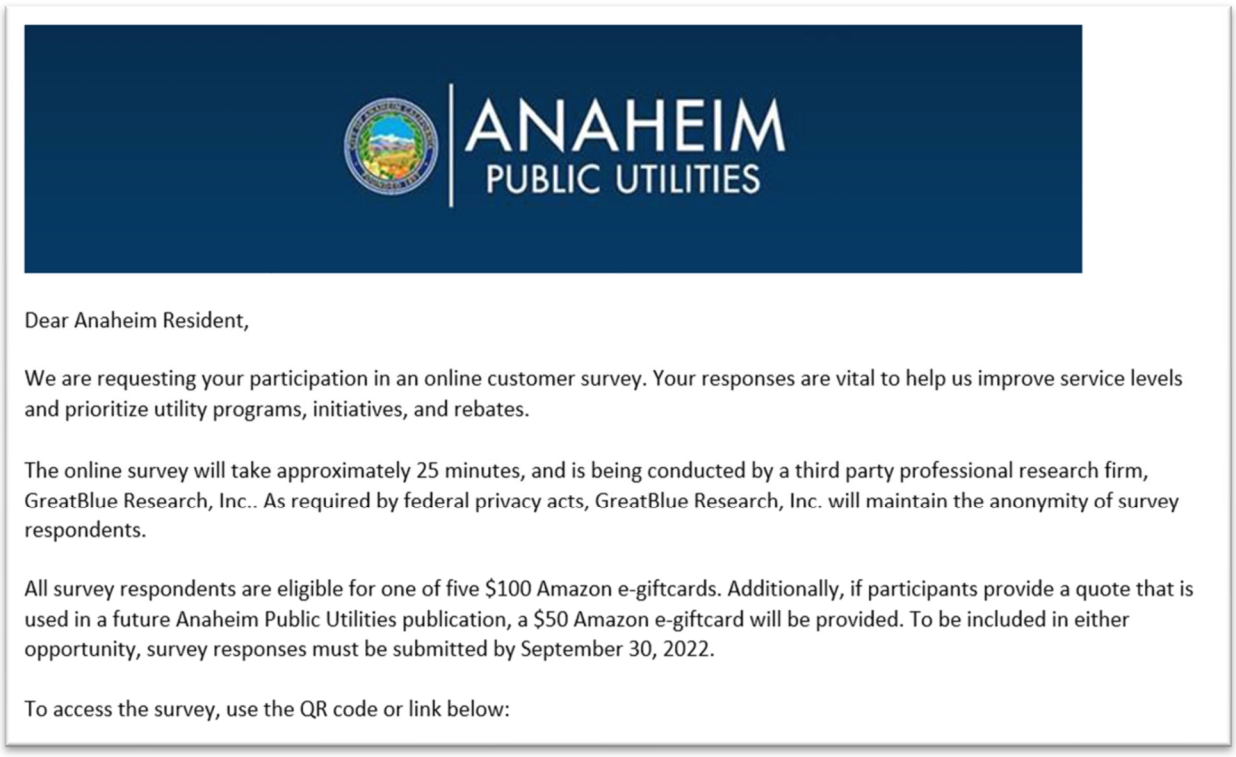

For the 2023 IRP , APU commissioned a residential satisfaction survey to compare with and build upon the feedback received from the 2018 IRP customer survey. The primary goals of this research study were to assess the effectiveness of APU's ability to serve its customers, identify areas for improvement, and isolate areas that may increase engagement.

The survey results again show **high satisfaction with APU's overall services, with high marks for reliability, safety, and value**. Customers also expressed **support and satisfaction with APU's sustainability programs and initiatives**, with **mixed support for the State's pace for renewable and carbon-free energy goals.** In line with the 2018 IRP customer responses, customers **remain concerned with potential cost increases related to increased renewable and carbon-free energy goals**.

## B. CUSTOMER SURVEY TYPES

### DIGITAL AND OPEN SURVEY – RESIDENTIAL CUSTOMERS

The digital surveys were conducted by email invite among a random sampling of APU's residential customers. In addition to the digital surveys, APU further extended an open survey which was available to all APU customers. Social media and website announcements were used to encourage customer participation over a one-month period.



ANAHEIM
PUBLIC UTILITIES

Dear Anaheim Resident,

We are requesting your participation in an online customer survey. Your responses are vital to help us improve service levels and prioritize utility programs, initiatives, and rebates.

The online survey will take approximately 25 minutes, and is being conducted by a third party professional research firm, GreatBlue Research, Inc.. As required by federal privacy acts, GreatBlue Research, Inc. will maintain the anonymity of survey respondents.

All survey respondents are eligible for one of five $100 Amazon e-giftcards. Additionally, if participants provide a quote that is used in a future Anaheim Public Utilities publication, a $50 Amazon e-giftcard will be provided. To be included in either opportunity, survey responses must be submitted by September 30, 2022.

To access the survey, use the QR code or link below:

* APU announcement for 2022 residential customer satisfaction survey

## C. SURVEY TOPICS AND SUMMARY RESULTS

APU sought customer input on the following topics: customer satisfaction, perceived value of services, clean energy goals, perceived air quality, solar energy initiatives, electric transportation, and APU rebate programs. The survey results are summarized below:

### CUSTOMER SATISFACTION AND PERCEIVED VALUE OF SERVICES

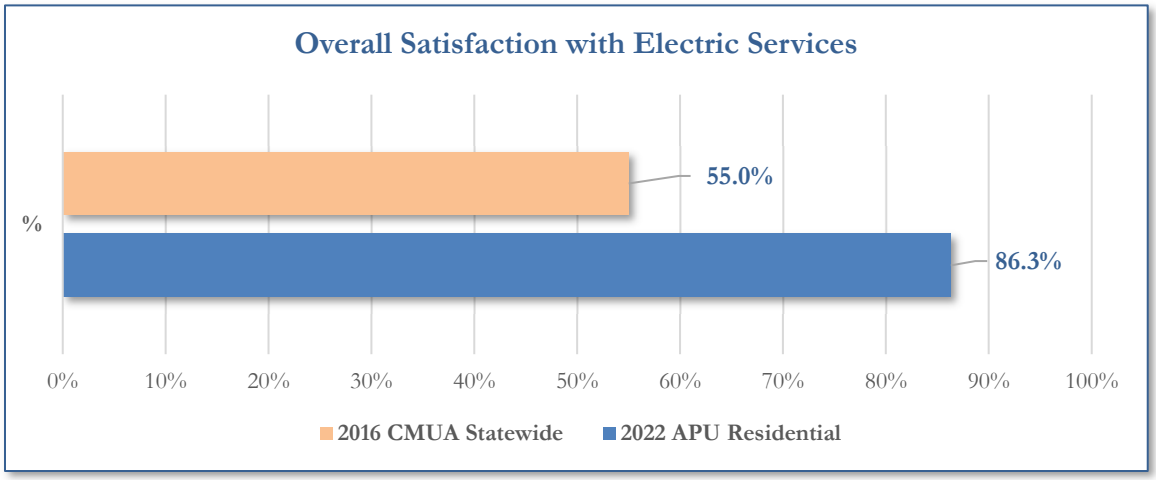
Customer satisfaction sets the tone of the survey. When customers are satisfied with APU, they tend to agree with APU's approach to planning for the future. This set of questions was intended to assess customer satisfaction with APU services and their perceived value of APU services for the price they pay.

**Customer Quote:**

"I'm so happy to live in a community with a reliable, cost-effective municipal utility. These services add value to my property and make Anaheim a desirable place to live, work and raise a family." - Jane O.

Customers from all surveys overwhelmingly expressed their high satisfaction with APU electric services. Nine-out-of-ten customers, or 90.4% reported positive ratings (7, 8, 9, and 10 on 0-10 scale) for the reliability of electric services from APU. Similarly, 89.7% of customers provided positive ratings regarding the safety of electric services they receive, and 74.2% of customers reported positive ratings for value of services. More than four-fifths of customers, or 86.3% indicated positive ratings for overall satisfaction with electric services. As a point of reference, the California Municipal Utilities Association's (CMUA) 2016 Statewide Residential Survey showed municipal customers as having a 55% "very satisfied" score.

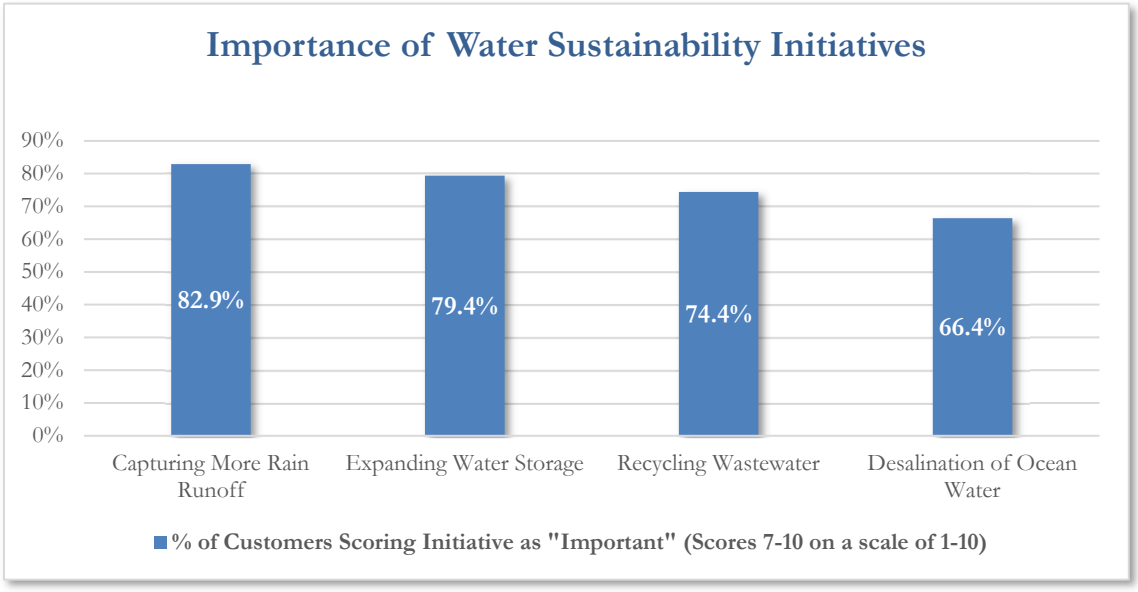
**Graph 80: Residential Customer Satisfaction Rating: APU vs. CMUA**




## IMPORTANCE OF ENVIRONMENTAL SUSTAINABILITY INITIATIVES

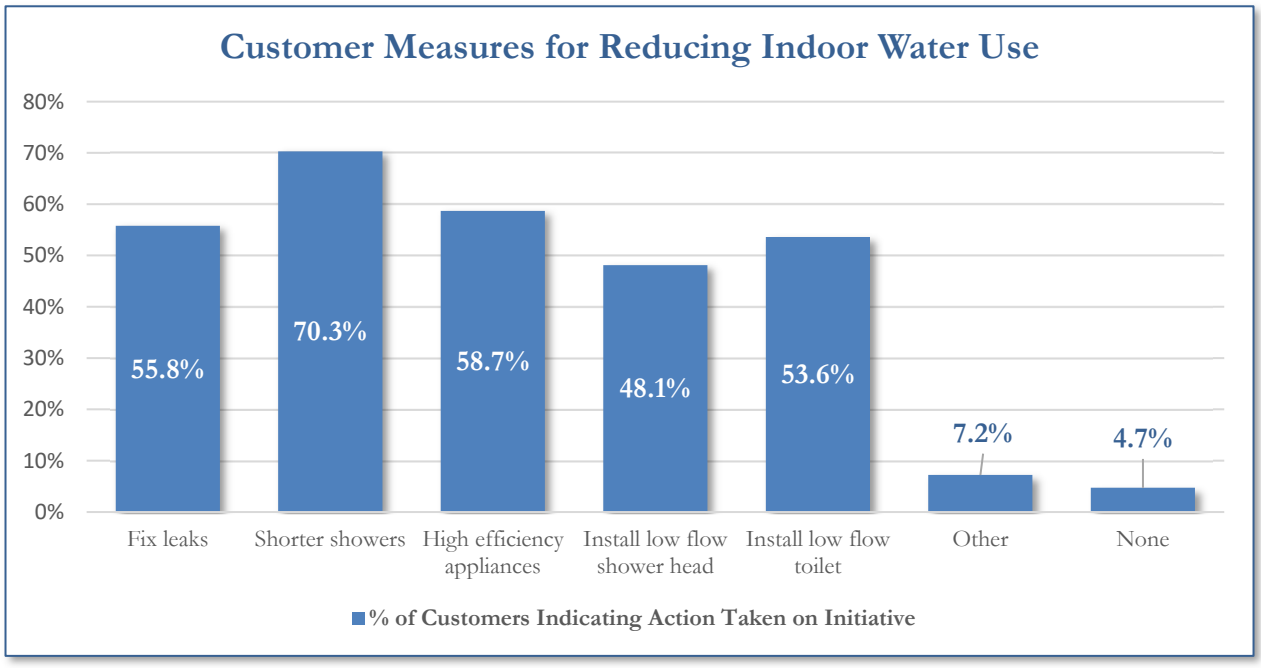
In this section, customers were asked about their thoughts on the importance of and experiences with environmental sustainability initiatives. When asked about drought conditions in California, more than half (52.5%) of APU's customers rated the seriousness of the ongoing drought as being "dire". As a utility that provides both water and electric services to its customers, APU solicited input on a series of questions pertaining to water and electricity sustainability initiatives, considering that water and energy systems are interdependent.

**Graph 81: Customer Survey - Importance of Water Sustainability Initiatives**



Over 95% of APU's residential customers indicated that they have taken one or more measures to reduce indoor water use. Examples include fixing leaks, taking shorter showers, installing high efficiency appliances and low flow shower heads and toilets.

**Graph 82: Customer Survey - Measures for Reducing Indoor Water Use**

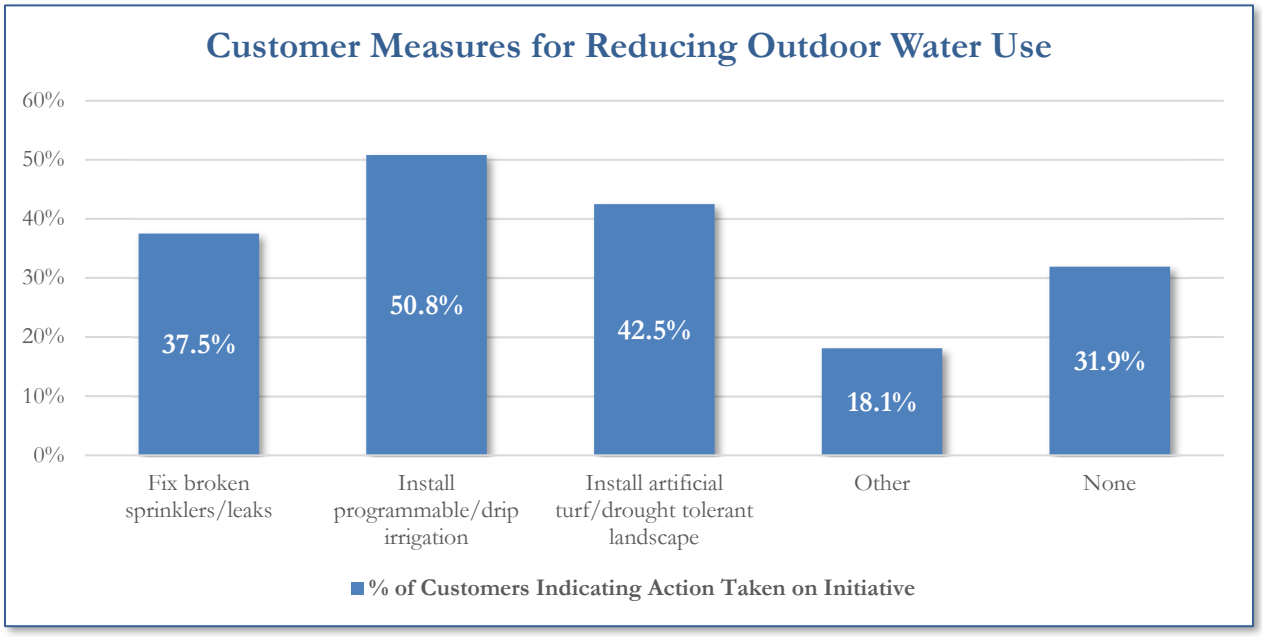



Approximately 68% of APU's residential customers indicated they have taken one or more measures to reduce outdoor water use. Some examples include replacing or fixing broken sprinklers, installing programmable irrigation controller, drip irrigation, artificial turf, or drought tolerant landscape.

**Customer Quotes:**

"APU is an amazing organization that is doing its best to help us drive safely towards the future and reduce our impact on the environment." -Erica W.

**Graph 83: Customer Survey - Measures for Reducing Outdoor Water Use**

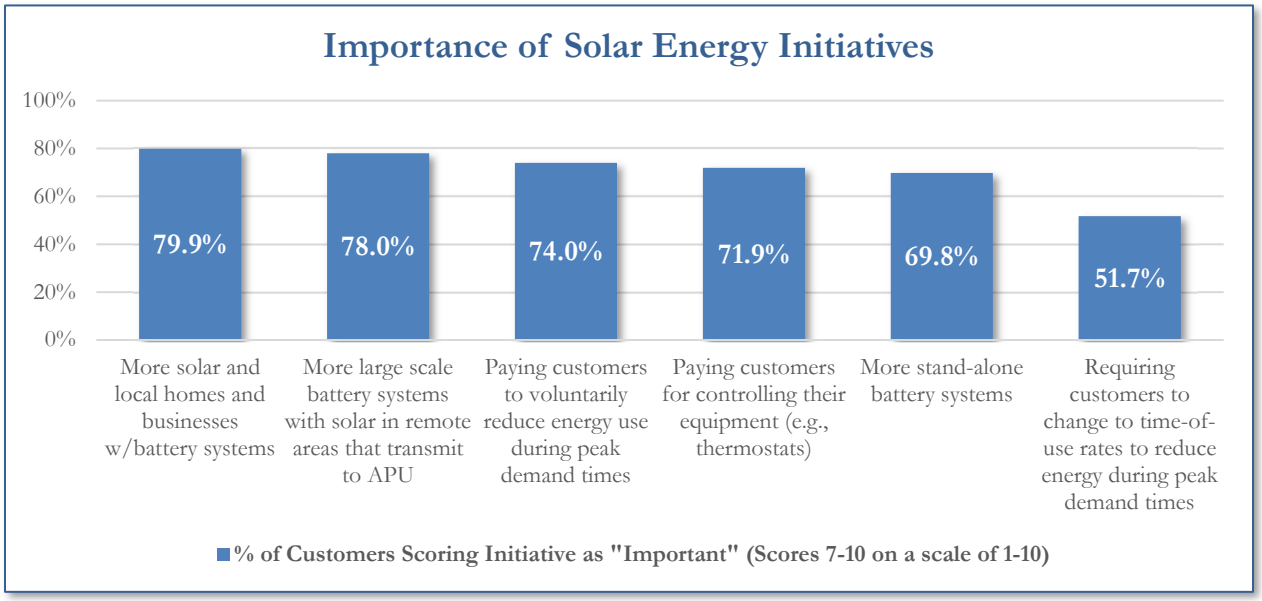



APU customers were also asked about their thoughts on solar energy initiatives and their importance. Nearly four-fifths (79.9%) of customers responded that the "more solar at local homes and businesses with battery systems" initiative is an important sustainability initiative. Similarly, APU customers indicated that "more large-scale solar with batteries in remote areas that transmit into APU" as important. Nearly three-quarters of APU's customers believe that initiatives that provide compensation for customers that voluntarily reduce energy usage during peak times or allow APU to control customer equipment (such as air conditioners) are important to them. Only 51.7% of APU's customers feel that requiring time-of-use rates to reduce energy demand during peak times is an important initiative.

**Customer Quotes:**

"I believe APU is trying to meet its customers' needs and has a progressive outlook for the future. I appreciate their forward thinking. With climate change upon us we all have to conserve and respond correctly. I think APU will help us towards that goal." – John D.

**Graph 84: Customer Survey – Importance of Solar Energy Initiatives**



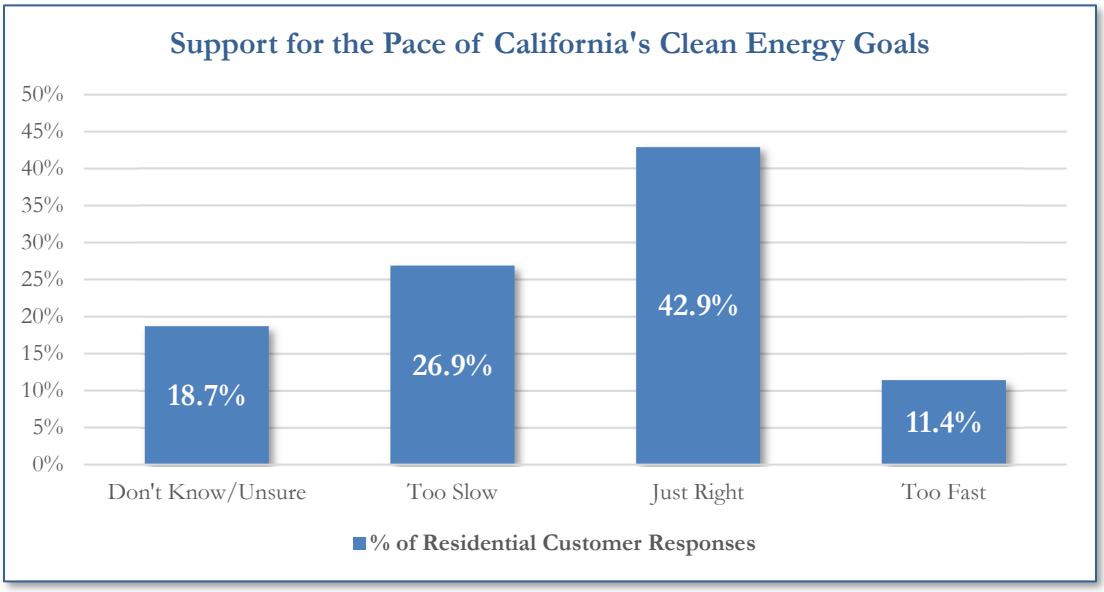

## EXPANSION OF THE STATE'S CLEAN ENERGY GOALS

### 1. Support for the Pace of California's Clean Energy Goals

In its 2018 IRP, APU outlined its plans to increase renewable power to 50% by 2030, reduce coal power to zero as contracts expire, and doing this over a 10-year period to keep the impact on electric rates to a minimum. Customers were asked to rate how strongly they support or oppose this approach, and approximately 65% of APU's residential customers supported that plan.

For the 2023 IRP, customers were asked for their thoughts on the timing of California's 60% RPS and the additional goal to provide 100% carbon-free energy to all retail customers by the year 2045. Customer responses indicate moderate support for the timing of the State's clean energy goals with 42.9% of customers indicating the timing is "just right" while 26.9% indicate they are "too slow".

**Graph 85: Customer Survey – Support for the Pace of California's Clean Energy Goals**

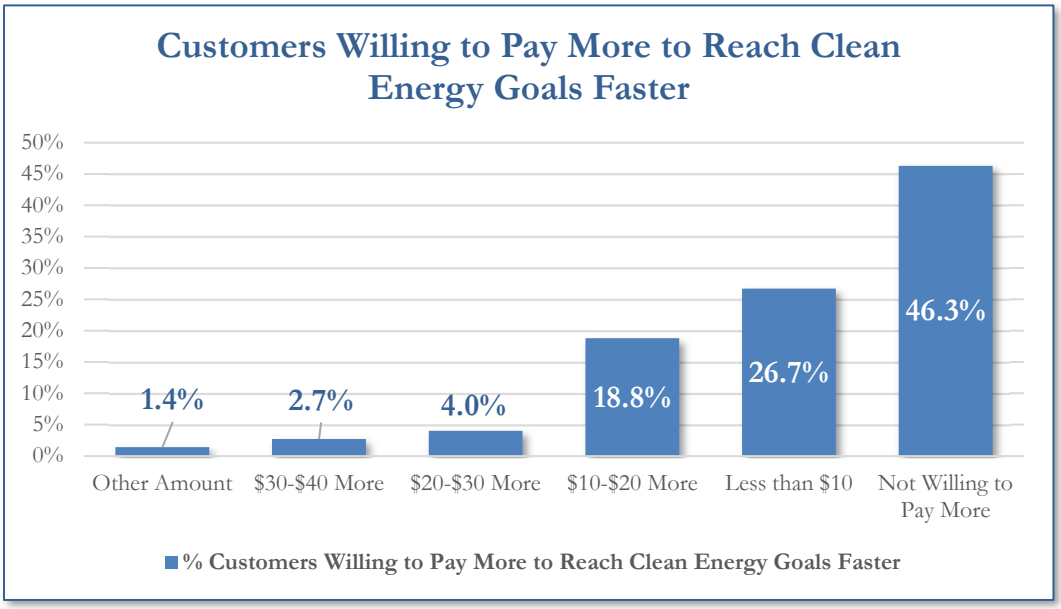



## 2. Support for California's Expanded Clean Energy Goals

As explained in APU's 2018 IRP, it was expected that moving beyond the 50% RPS in place at the time would cause upward pressure on customer rates due to the costs associated with existing long-term contracts, owned generation assets, and the integration of renewable energy resources to the energy grid. All customers were asked how strongly they support or oppose going above a 50% RPS and any associated impact on rates. At the time of the 2018 IRP, less than one third of customers in all customer categories expressed strong support of APU going above 50% renewables when facing rate increases, indicating most APU customers were sensitive to any potential rate increase associated with a higher renewable goal. When asked how much more they might be willing to pay for renewable energy beyond the 50% RPS, 20% indicated they would pay $10 or less on a bi-monthly bill to go beyond 50% and 36% indicated they would not be willing to pay extra at all.

Since the 2018 IRP, the passage of SB 100 expanded California's RPS to 60% by 2030 and added the carbon-free policy goal by 2045. For this IRP, APU asked customers if they would be willing to pay more to reach higher clean energy percentages faster than state law requires. Customer responses to the 2023 IRP survey are consistent with the customer responses from the 2018 IRP.

**Graph 86: Customer Survey – Customers Willing to Pay More to Accelerate Clean Energy Goals**

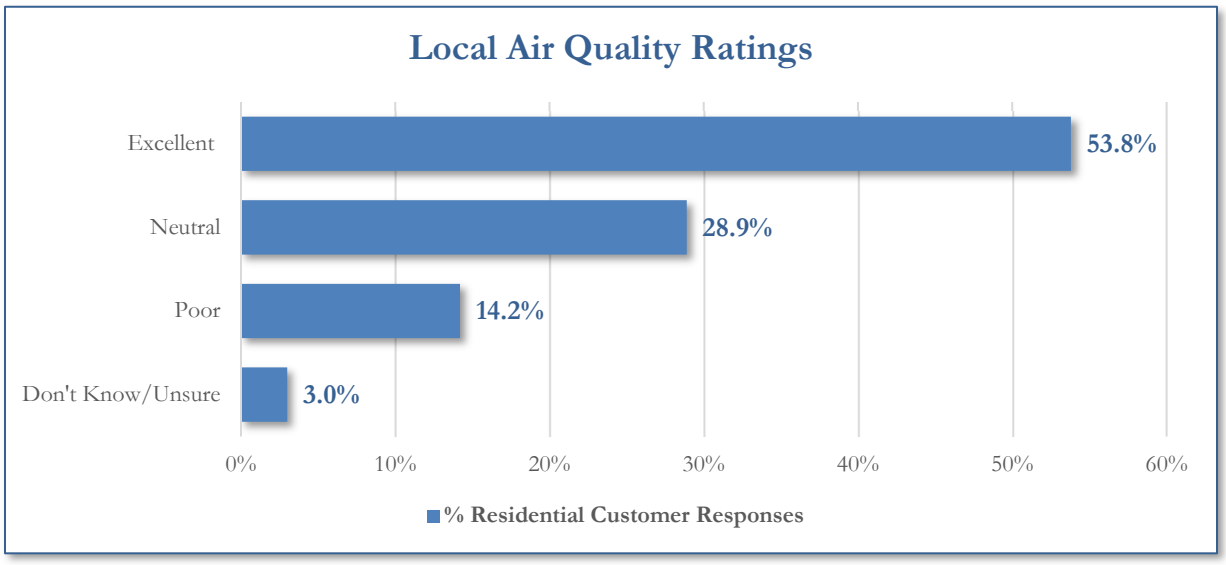



The results indicate that a noticeable percentage of customers were hesitant or unwilling to incur additional rate increases due to the State's increased or accelerated Clean Energy goals.

## AIR QUALITY

These questions were intended to collect information regarding customers' thoughts about local air quality. The survey results showed that 53.8% of residential customers surveyed believe they experience excellent air quality (scored 7 to 10 on a scale of 0-10).

**Graph 87: Customer Survey – Local Air Quality Ratings**



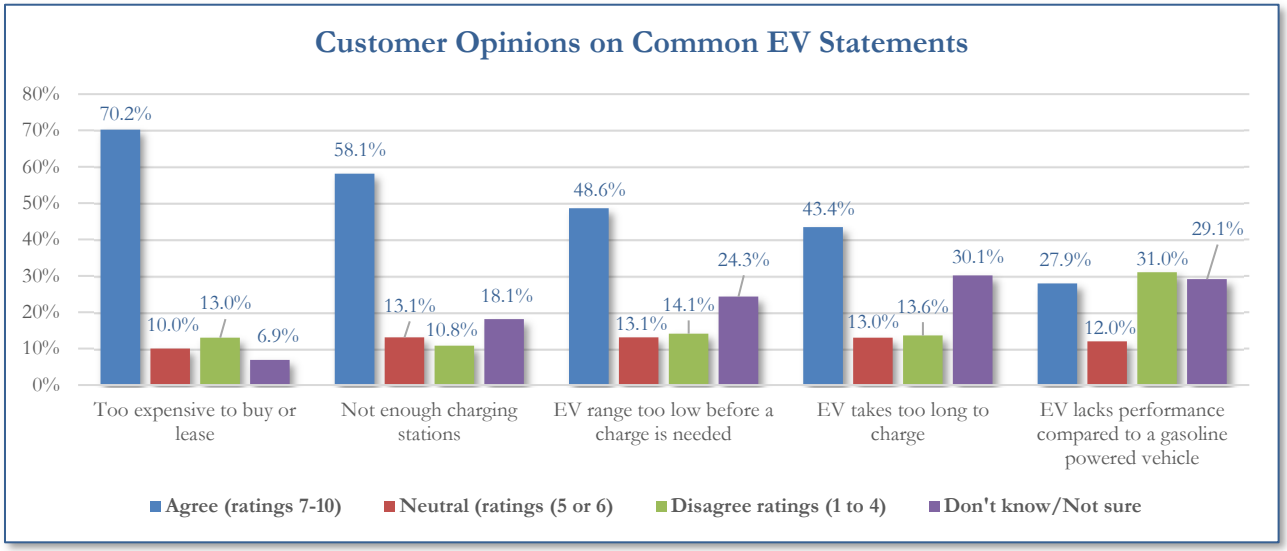
Customers were also asked if air quality has improved, stayed the same, or worsened. Of all residential customers surveyed, 62.8% indicated that local air quality has improved or stayed the about the same. To help improve local air quality, APU recognizes the importance of transportation electrification and supports it with a variety of programs. More details can be found in Section X. Transportation Electrification

## ELECTRIC VEHICLES

Only about 6% of residential customers surveyed for APU's 2018 IRP indicated that they currently owned an electric vehicle (EV), with about 15% indicating they planned to acquire one within three years. The questions in the 2023 IRP sought customer input on whether or not customers agreed with certain statements regarding EVs to gain a better understanding of how APU customers view electric vehicles today.

The 2023 IRP survey results indicated that 70.2% of residential customers feel that EVs are still too expensive to buy or lease, and there is still some apprehension with adequate charging infrastructure, EV range and the time it takes to charge the vehicle.

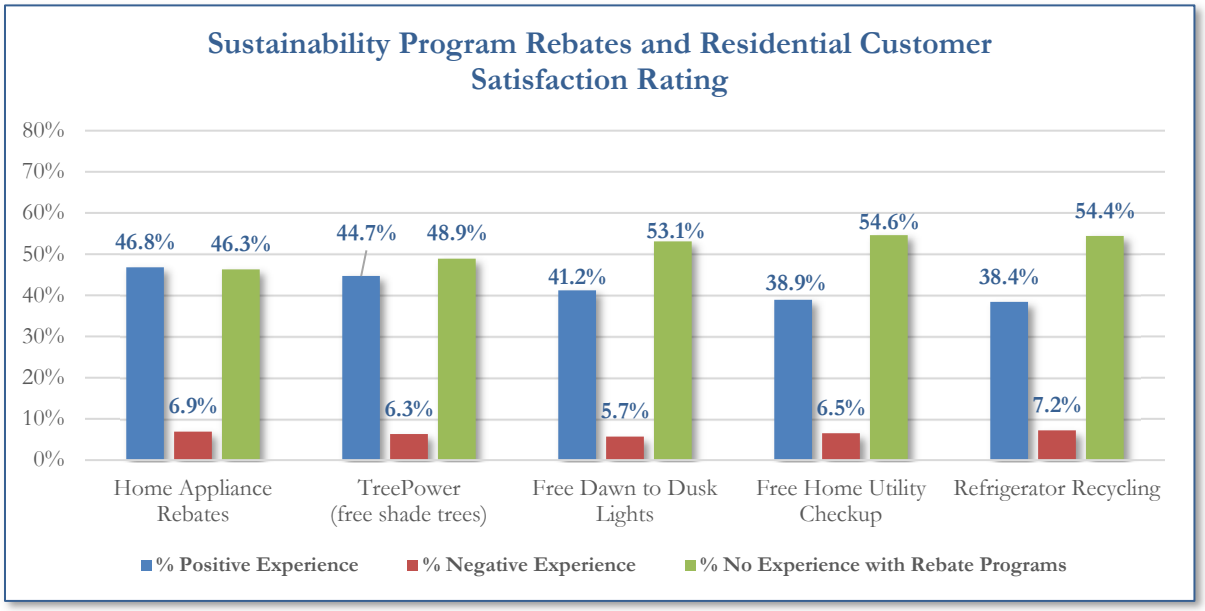
**Graph 88: Customer Survey – Customer Opinions on Common EV Statements**




## SATISFACTIONS AND EXPERIENCE WITH SUSTAINABILITY PROGRAM REBATES

In this section, customers were asked to rate their experience (or indicate if they had no experience) with APU's rebate programs that are focused on sustainability and energy savings. These programs include home appliance rebates, free shade trees, free dusk-to-dawn lighting, free home utility checkup and refrigerator recycling. Most customers responding either indicated a positive experience with APU's rebate programs or had not yet had an experience with any of the programs.

**Graph 89: Customer Survey – Sustainability Program Rebates and Satisfaction Rating**




All customer groups are motivated to use energy more efficiently both because of the benefit to the environment, and savings they would receive on their electric bills.

The survey results were incorporated in APU's energy efficiency program design. More details may be found in Section XII. Energy Efficiency and Demand Response Programs and Section XIII. Programs for Low Income and Disadvantaged Communities.

# APPENDIX C – ACRONYMS AND DEFINITIONS

| Acronym | Definition |
|---|---|
| **AB** | Assembly Bill: Legislation that is either originated or modified in the California State Assembly. |
| **AAEE** | Additional Achievable Energy Efficiency: Defined by the CEC as incremental savings from the future market potential identified in utility potential studies not included in the baseline demand forecast, but reasonably expected to occur, including future updates of building codes, appliance regulations, and new or expanded investor-owned utility or publicly owned utility efficiency programs. |
| **AAPV** | Additional Achievable Photovoltaic: Defined by the CEC as estimated additional solar photovoltaic installations above the photovoltaic adoptions in the baseline demand forecast. |
| **AMI** | Advanced Metering Infrastructure: Refers to systems that measure, collect and analyze energy usage from advanced electric meters through various communication media on request or on a pre-defined schedule. |
| **APPA** | American Public Power Association: National service organization representing the nation's more than 2,000 publicly owned electric utilities. |
| **APU** | Anaheim Public Utilities: The City of Anaheim Public Utilities Department. |
| **AQMD** | Air Quality Management District: State agency established to achieve and maintain healthful air quality. The agency's air quality goal is accomplished through a comprehensive program of planning, regulation, compliance assistance. |
| **BA** | Balancing Authority: The responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within the area, and supports interconnection frequency in real time. |
| **CAISO** | California Independent System Operator: A non-profit independent system operator which oversees the operation of California's bulk electric power system, transmission lines, and electricity market generated and transmitted by its participants. |
| **Cal-Adapt** | Cal-Adapt: A not-for-profit organization providing data and information produced by State of California's scientific and research community, and offers a view of how climate change might affect California at the local level. Cal-Adapt's development is a key recommendation of the 2009 California Climate Adaptation Strategy. |
| **CalEnviroScreen** | California Communities Environmental Health Screening Tool: A web-based tool developed by the Office of Environmental Health Hazard Assessment to identify communities in California most burdened by pollution from multiples sources and most vulnerable to its effects, taking into account socioeconomic characteristics and underlying health status. |

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| **CalEPA** | California Environmental Protection Agency: State agency created by the Governor's Executive Order in 1991 which develops, implements and enforces the State's environmental laws that regulate air, water and soil quality, pesticide use and waste recycling and reduction. |
| **CalETC** | California Electric Transportation Coalition: A non-profit association committed to the successful introduction and large-scale deployment of all forms of electric transportation including plug-in electric vehicles of all weight classes, transit buses, port electrification, off-road electric vehicles and equipment, and rail. |
| **CARB** | California Air Resources Board: California's clean air agency. Responsible for promoting and protecting public health, welfare and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the State. |
| **CEC** | California Energy Commission: The State's primary energy policy and energy planning agency. Responsible for ensuring publicly owned utilities' compliance with the State's Renewables Portfolio Standard and Title 20 data reporting requirements. |
| **CDBG** | Community Development Block Grant: As defined by the Department of Housing and Urban Development, the Community Development Block Grant funds activities that benefit low- and moderate-income persons, the prevention or elimination of slums or blight, or other community development activities that address an urgent threat to health or safety. |
| **City Council** | City Council of the City of Anaheim: The governing body of the City of Anaheim, which includes Anaheim Public Utilities. |
| **CMUA** | California Municipal Utilities Association: An association incorporated in 1933 to represent the interests of California's publicly owned electric utilities before the California Legislature and other regulatory bodies. |
| **CO2** | Carbon Dioxide: A colorless, odorless gas found in the atmosphere that is associated with global warming. It is released into the atmosphere through the burning of fossil fuels like coal, oil and natural gas. |
| **CO2e** | Carbon Dioxide Equivalent: A standard unit for measuring carbon footprints. The idea is to express the impact of each different greenhouse gas in terms of the amount of CO2 that would create the same amount of warming. |
| **CAIDI** | Customer Average Interruption Duration Index: Electric reliability index that measures how long it takes to restore service once a customer is interrupted. |
| **CP** | Compliance Period: The six compliance periods under the Renewables Portfolio Standard are defined in Public Utilities Code section 399.30 (c):<br>(1) Compliance Period 1: January 1, 2011, to December 31, 2013, inclusive.<br>(2) Compliance Period 2: January 1, 2014, to December 31, 2016, inclusive.<br>(3) Compliance Period 3: January 1, 2017, to December 31, 2020, inclusive.<br>(4) Compliance Period 4: January 1, 2021, to December 31, 2024, inclusive. |

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| | (5) Compliance Period 5: January 1, 2025, to December 31, 2027, inclusive.<br>(6) Compliance Period 6: January 1, 2028, to December 31, 2030, inclusive. |
| **CPUC** | California Public Utilities Commission: Regulates California's investor-owned electric utilities, telecommunications, natural gas, water and passenger transportation companies, in addition to household goods movers and the safety of rail transit. |
| **CTG** | Combustion Turbine Generator: Electric generator that is commonly powered by a natural gas burning turbine. The CTG burns natural gas to produce hot combustion gases that pass directly through the turbine, spinning the blades of the turbine to generate electricity. APU uses natural gas to run its CTG (also referred to as Kraemer Power Plant), which produces 48 MW of electricity for the city. |
| **DAC** | Disadvantaged Communities: Disadvantaged communities are designated by CalEPA, pursuant to Senate Bill 535 (De León), using the California Communities Environmental Health Screening Tool ("CalEnviroScreen"). Disadvantaged communities are identified by census tract and are those that scored at or above the 75th percentile. |
| **DER** | Distributed Energy Resource: Any resource on the distribution system that produces electricity. It may include technologies such as, rooftop solar, fuel cells or energy storage. |
| **DOE** | Department of Energy: A cabinet-level department of the United States government responsible for the federal energy policies. |
| **DSM** | Demand-Side Management: The management of mechanisms and technologies such as efficiency measures and load-management practices that reduce or manage end-user demand. |
| **EE** | Energy Efficiency: Practices or programs designed to reduce the amount of energy required to provide the same service and level/quality of output. Some examples include: switching to LED lightbulbs, installing efficient appliances, installing new windows and re-insulating homes to use less energy for heating and cooling, including smart thermostats, etc. |
| **EIA** | Energy Information Administration: Statistical agency of the DOE created by Congress in 1977 that provides policy-independent data, forecasts and analyses to promote sound policy making, efficient markets and public understanding regarding energy, and its interaction with the economy and the environment. |
| **EMA** | Environmental Mitigation Adjustment: APU's automatic upward or downward rate adjustment mechanism that recovers fluctuations in environmental mitigation costs related to the procurement, generation, transmission, or distribution of electricity. |
| **EPA** | Environmental Protection Agency: Federal agency that develops rules and regulations concerning environmental protection, and monitors utilities and other industries. |

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| **ES** | Energy Storage: A system that stores energy and uses the stored energy at a later time. Energy storage is recognized as an increasingly important element in the electricity system, being able to modulate demand and act as flexible generation when needed. |
| **FERC** | Federal Energy Regulatory Commission: An independent regulatory agency within the Department of Energy that regulates the transmission and sale of natural gas for resale in interstate commerce; regulates the transmission of oil by pipeline in interstate commerce; regulates the transmission and wholesale sale of electricity in interstate commerce; licenses and inspects private, municipal and state hydroelectric projects; oversees environmental matters related to natural gas, oil, electricity and hydroelectric projects; administers accounting and financial reporting regulations and conduct of jurisdictional companies; and approves site choices as well as abandonment of interstate pipeline facilities. |
| **EV** | Electric vehicle. A vehicle which uses one or more electric motors for propulsion. |
| **GHG** | Greenhouse gas. A gas that contributes to the greenhouse effect by absorbing infrared radiation (e.g., carbon dioxide and methane). |
| **IEPR** | Integrated Energy Policy Report. A report adopted by the California Energy Commission and transmitted to the Governor and Legislature every two years. It includes trends and issues concerning electricity and natural gas, transportation, energy efficiency, renewables, and public interest energy research. |
| **IPP** | Intermountain Power Project: A coal-fired baseload power plant in Utah. APU executed a power sales agreement in the early 1980s for 13.225% of the energy output from this power plant. Thirty-six utilities serving California and Utah receive capacity and energy from this project. |
| **IR** | Integrated Resources: A work group under the Power Supply Division of Anaheim Public Utilities. It is responsible for long-term resource planning, regulatory compliance and renewable procurement. |
| **IRP** | Integrated Resource Plan: A long-term comprehensive plan that balances the mix of demand and supply resources over a long-term planning horizon to meet specified policy goals. |
| **ISO** | Independent System Operator: An agency created to operate, control and ensure the integrity of the integrated transmission grid independently of any generation, wholesale or retail market. |
| **LADWP** | Los Angeles Department of Water and Power: A publicly owned utility that supplies electric and water to residents and businesses in Los Angeles and surrounding communities. |
| **LCR** | Local Capacity Requirement: The minimum resource capacity required by the CAISO in each local area to meet established reliability criteria. CAISO performs annual studies to identify the local capacity requirement for the following calendar year. |

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| **LEED** | Leadership in Energy and Environmental Design: One of the most popular green building certification programs used worldwide. Developed by the non-profit Green Building Council, it includes a set of rating systems for the design, construction, operation, and maintenance of green buildings, homes, and neighborhoods that aims to help building owners and operators be environmentally responsible and use resources efficiently. |
| **LI-DAC** | Low Income and Disadvantaged Communities: Disadvantaged communities are designated by CalEPA using the California Communities Environmental Health Screening Tool. Low income communities are defined by the Department of Housing and Urban Development as Community Development Block Grant areas. Combined, these two areas are designated by APU as low income and disadvantaged communities. |
| **LIHEAP** | Low Income Home Energy Assistance Program: APU program that provides monetary assistance to low income households for the payment of utility bills and creation of payment plans for customers that have past-due account balances. |
| **LSE** | Load Serving Entities: An entity that serves end users within the CAISO area and has been granted authority or has an obligation pursuant to state or local law, regulation, or franchise to sell electric energy to end users. |
| **LUC** | The Latino Utilities Coalition: An outreach and advocacy group established by APU to help solicit input and feedback on utility matters pertaining to the Latino community. Members are comprised of community leaders, city policy makers, school administrators, concerned citizens, and members of the business community. |
| **MTCO2e** | Metric Tons of Carbon Dioxide Equivalent: A metric measure used to compare the emissions from different greenhouse gases based upon their global warming potential. It can also be converted to KGCO2e (=MTCOT2*1,000) or MMTCO2e (=MTCOT2/1,000). |
| **NCPA** | Northern California Power Agency: A not-for-profit Joint Powers Agency, whose members are publicly owned utilities located in Northern California. |
| **NEM** | Net energy metering: A special billing arrangement that provides credit to customers with eligible renewable electric generation facility (e.g., solar photovoltaic systems) for the electricity the system adds to the electric grid. |
| **NERC** | North American Electric Reliability Council: A not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the bulk power system through system awareness; and educates, trains, and certifies industry personnel. |
| **PCC** | Portfolio Content Category: It refers to one of three categories of electricity products procured from an eligible renewable energy resource, as specified in Section 3203 of |

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| | CEC's Enforcement Procedures for the Renewable Portfolio Standard for Local Publicly Owned Electric Utilities[49]. |
| **PG&E** | Pacific Gas & Electric: An investor-owned utility that provides natural gas and electric services to Northern and Central California. |
| **PV** | Photovoltaics: Commonly seen on rooftop solar panels, the technology covers the conversion of light into electricity using semiconducting materials that exhibit the photovoltaic effect. |
| **RA** | Resource adequacy. The CAISO requirements that ensures sufficient capacity exists for grid-wide reliability, including system capacity, local and flexible capacity requirements. |
| **PCA** | Power Cost Adjustment: APU's automatic upward or downward rate adjustment mechanism that recovers the fluctuations in power supply costs and other relevant operational costs. |
| **PEV** | Plug-in Electric Vehicle: A vehicle that draws electricity from a battery and is capable of being charged from an external source. |
| **POU** | Publicly Owned Utilities: Not-for-profit utilities that are owned by customers and subject to local public control and regulation. |
| **PUB** | Public Utilities Board: APU's advisory board comprised of seven Anaheim residents that makes recommendations to the City Council on major APU issues. |
| **RP3** | Reliable Public Power Provider: The RP3 designation lasts three years and recognizes utilities that demonstrate high proficiency in reliability, safety, work force development, and system improvement. In 2017, the American Public Power Association recognized APU once again as a (RP3). Of the 2,000 public power utilities nation-wide, only 235 hold the RP3 designation. |
| **RPS** | Renewable Portfolio Standard: A State program that by law requires utilities in California to increase the production and procurement of energy from renewable energy resources, such as wind, solar, biomass, and geothermal. |
| **RSA** | Rate Stabilization Adjustment: Automatic upward or downward rate adjustment mechanism that recovers the cost of fluctuating power supply costs. It contains two components (1) a Power Cost Adjustment (PCA) to recover fluctuations in power supply costs and other relevant operational costs, and (2) an Environmental Mitigation Adjustment (EMA) to recover fluctuations in environmental mitigation costs related to the procurement, generation, transmission, or distribution of electricity. |

[49] http://www.energy.ca.gov/portfolio/

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| **SAIDI** | System Average Interruption Duration Index: Electric reliability index that measures how long the average customer is interrupted. |
| **SAIFI** | System Average Interruption Frequency Index: Electric reliability index measured by recording how many times service is interrupted. |
| **SB** | Senate Bill: Legislation that is either originated or modified in the California State Senate. |
| **SCADA** | Supervisory Control and Data Acquisition: Information systems used in industry to monitor and control plant status and provide logging facilities. |
| **SCAQMD** | South Coast Air Quality Management District: An air pollution control agency responsible for regulating sources of air pollution in the South Coast Air Basin in Southern California. |
| **SCE** | Southern California Edison (Company): The largest investor-owned electric utilities serving Central and Southern California. |
| **SCPPA** | Southern California Public Power Authority: A joint powers agency comprised of eleven publicly owned utilities and one irrigation district located Southern California. |
| **SP-15** | South of Path 15: South of California transmission Path 15, a CAISO pricing zone covering Southern California. |
| **TOU** | Time of Use: Billing rate structure that allows customers to reduce electricity costs by shifting energy use to off-peak hours during which they are charged a lower rate. |
| **ZEV** | Zero-emission vehicles: A vehicle that emits no exhaust gas from its source of power, such as plug-in electric vehicles and hydrogen electric vehicles. |