UTILITIES ADVISORY COMMISSION
Special Meeting
Wednesday, October 11, 2023
Community Meeting Room & Hybrid
6:00 PM

Utilities Advisory Commission meetings will be held as "hybrid" meetings with the option to attend by teleconference/video conference or in person. To maximize public safety while still maintaining transparency and public access, members of the public can choose to participate from home or attend in person. Information on how the public may observe and participate in the meeting is located at the end of the agenda. Masks are strongly encouraged if attending in person. The meeting will be broadcast on Cable TV Channel 26, live on YouTube https://www.youtube.com/c/cityofpaloalto, and streamed to Midpen Media Center https://midpenmedia.org.

VIRTUAL PARTICIPATION **CLICK HERE TO JOIN** (https://cityofpaloalto.zoom.us/j/96691297246)
Meeting ID: 966 9129 7246 Phone: 1(669)900-6833

PUBLIC COMMENTS
Public comments will be accepted both in person and via Zoom for up to three minutes or an amount of time determined by the Chair. All requests to speak will be taken until 5 minutes after the staff's presentation. Written public comments can be submitted in advance to UACPublicMeetings@CityofPaloAlto.org and will be provided to the Council and available for inspection on the City's website. Please clearly indicate which agenda item you are referencing in your subject line.

PowerPoints, videos, or other media to be presented during public comment are accepted only by email to UACPublicMeetings@CityofPaloAlto.org at least 24 hours prior to the meeting. Once received, the Clerk will have them shared at public comment for the specified item. To uphold strong cybersecurity management practices, USB's or other physical electronic storage devices are not accepted.

TIME ESTIMATES
Listed times are estimates only and are subject to change at any time, including while the meeting is in progress. The Commission reserves the right to use more or less time on any item, to change the order of items and/or to continue items to another meeting. Particular items may be heard before or after the time estimated on the agenda. This may occur in order to best manage the time at a meeting to adapt to the participation of the public, or for any other reason intended to facilitate the meeting.

CALL TO ORDER 6:00 pm - 6:05 pm

AGENDA CHANGES, ADDITIONS AND DELETIONS 6:05 pm - 6:10 pm
The Chair or Board majority may modify the agenda order to improve meeting management.

PUBLIC COMMENT 6:10 pm - 6:25 pm
Members of the public may speak to any item NOT on the agenda.

APPROVAL OF MINUTES 6:25 pm - 6:30 pm

1. Approval of the Minutes of the Utilities Advisory Commission Meeting Held on September 6, 2023

UTILITIES DIRECTOR REPORT 6:30 pm - 6:45 pm

NEW BUSINESS (a 10 minute break will be imposed during this section)

2. Utilities Advisory Commission Recommend that the City Council Adopt a Resolution Approving the 2023 Electric Integrated Resource Plan (**ACTION** 6:45 pm to 7:45 pm) Staff: Jim Stack PhD, Senior Resource Planner

3. Update and Discussion on Undergrounding of the Electrical Distribution System and Electrification Goals (**DISCUSSION** 7:45 pm to 8:30 pm) Staff: Tomm Marshall, Assistant Director of Electric Utilities

   Attachment A: Map Presentation

COMMISSIONER COMMENTS AND REPORTS FROM MEETINGS/EVENTS

FUTURE TOPICS FOR UPCOMMING MEETING

ADJOURNMENT

SUPPLEMENTAL INFORMATION
The materials below are provided for informational purposes, not for action or discussion during UAC Meetings (Govt. Code Section 54954.2(a)(3)).

INFORMATIONAL REPORTS
Informational Report on FY 2022 Demand Side Management

12-Month Rolling Calendar

Public Letter(s) to the UAC

PUBLIC COMMENT INSTRUCTIONS

Members of the Public may provide public comments to teleconference meetings via email, teleconference, or by phone.

1. **Written public comments** may be submitted by email to UACPublicMeetings@cityofpaloalto.org.
2. **Spoken public comments using a computer** will be accepted through the teleconference meeting. To address the Council, click on the link below to access a Zoom-based meeting. Please read the following instructions carefully.
    - You may download the Zoom client or connect to the meeting in- browser. If using your browser, make sure you are using a current, up-to-date browser: Chrome 30 , Firefox 27 , Microsoft Edge 12 , Safari 7 . Certain functionality may be disabled in older browsers including Internet Explorer.
    - You may be asked to enter an email address and name. We request that you identify yourself by name as this will be visible online and will be used to notify you that it is your turn to speak.
    - When you wish to speak on an Agenda Item, click on "raise hand." The Clerk will activate and unmute speakers in turn. Speakers will be notified shortly before they are called to speak.
    - When called, please limit your remarks to the time limit allotted. A timer will be shown on the computer to help keep track of your comments.
3. **Spoken public comments using a smart phone** will be accepted through the teleconference meeting. To address the Council, download the Zoom application onto your phone from the Apple App Store or Google Play Store and enter the Meeting ID below. Please follow the instructions B-E above.
4. **Spoken public comments using a phone** use the telephone number listed below. When you wish to speak on an agenda item hit *9 on your phone so we know that you wish to speak. You will be asked to provide your first and last name before addressing the Council. You will be advised how long you have to speak. When called please limit your remarks to the agenda item and time limit allotted.

CLICK HERE TO JOIN **Meeting ID: 966 9129 7246 Phone:1-669-900-6833**

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CITY OF PALO ALTO

Utilities Advisory Commission
Staff Report

From: Dean Batchelor, Director Utilities
Lead Department: Utilities

Meeting Date: October 11, 2023
Staff Report: 2309-2035

TITLE
Approval of the Minutes of the Utilities Advisory Commission Meeting Held on September 6, 2023

RECOMMENDATION
Staff recommends that the UAC consider the following motion:

Commissioner _____ moved to approve the draft minutes of the September 6, 2023 meeting as submitted/amended.

Commissioner _____ seconded the motion.

ATTACHMENTS
Attachment A: 09-06-2023 DRAFT UAC Minutes

AUTHOR/TITLE:
Jenelle Kamian, Program Assistant I

UTILITIES ADVISORY COMMISSION MEETING
MINUTES OF SEPTEMBER 6, 2023 REGULAR MEETING

CALL TO ORDER

Chair Segal called the meeting of the Utilities Advisory Commission (UAC) to order at 6:02 p.m.

Present: Chair Segal, Vice Chair Scharff, Commissioners Croft, Forssell (arrived at 6:04 p.m.), Mauter, Metz and Phillips

Absent:

AGENDA CHANGES, ADDITIONS AND DELETIONS

None

PUBLIC COMMENT

None

APPROVAL OF MINUTES

ITEM 1: ACTION: Approval of UAC Draft Minutes from July 2023

Chair Segal invited comments on the July 5, 2023 UAC draft meeting minutes.

ACTION: Commissioner Phillips moved to approve the draft minutes of the July 5, 2023 meeting as submitted.

Commissioner Croft seconded the motion.

Motion carried 5-0 with Vice Chair Scharff, Commissioners Croft, Mauter, Metz and Phillips voting yes.

Chair Segal abstained.

Commissioner Forssell absent.

UTILITIES DIRECTOR REPORT

Dean Batchelor, Utilities Director, delivered the Director's Report.

EV Discount Campaign: CPAU offered its second Electric Vehicle (EV) Discount Campaign during July and August in partnership with Cool the Earth. This program offered discounts of $3,000 - $7,000 on select EV models from Audi, BMW, Ford and Toyota. Palo Alto residents purchased four EVs during the first EV Discount Campaign offered in March.

Qmerit: CPAU partnered with Qmerit on a program for Palo Alto homeowners to receive free online estimates from local, vetted contractors for EV charger installations, permitting and inspection costs.

SunShares: For the eighth consecutive year, the City of Palo Alto is participating in Bay Area SunShares, a solar and battery storage group-buy program administered by Building Council for Climate Change (BC3). The SunShares program offers discounted prices from two vetted installers, Solar Union and Solar Technologies. Program registration opens September 1 and closes November 15. Installation contracts must be signed by December 15.

Outage Management System Update: CPAU met the goal of having the new Outage Management System (OMS) before wintertime. As of Tuesday, August 29, this new tool is in place. Last Monday, there was an outage of about 1300 customers in an area with a combination of overhead and underground. An overhead jumper wire burnt. An underground switch had a hole on its side and investigation is ongoing as to the cause. The cables tested properly. The outage started at about 1 p.m. and ended by 7 p.m. with the exception of about 24 customers who were out until about 1:30 a.m. It seemed to Mr. Batchelor that the outage map was more precise and easier to see as customers were repowered. CPAU received less calls from customers during this outage than typical, although it was a holiday. Staff provided updates approximately every hour. Staff expected OMS to have the capability to send outage updates to customers via text by October 1.

Recent Events:

- **August 16:** Corporate EV Expo held at Stanford Hospital's main campus to educate staff on electric transportation. Approximately 350 attendees engaged with Utilities staff. EVs from Ford, Hyundai, Kia, Nissan, Tesla and Volkswagen were on display. The event was a huge success.

Upcoming Programs and Events: Details and registration at cityofpaloalto.org/workshops.

- **September 6:** E-bike 101 webinar on technology, e-Bike categories and best safety practices.
- **E-bike Discount Campaign:** Program will run from September 6 to end of the month offering a savings of $400/e-bike ($99 direct discount, $37 bike accessories, $165 bike assembly fee waived and $99 complimentary tune-up after 3 months of ownership).
- **September 10:** Several representatives from Utilities Program Services and Communications will have a table at the annual Midtown Residents Association Ice Cream Social.
- **September 14:** CPAU is partnering with the Bay Area Water Supply and Conservation Agency (BAWSCA) to host an Integrated Pest Management Webinar about safely eliminating household pests without the use of toxic pesticides.

Chair Segal drove by Embarcadero Road twice during the outage. The first time was chaotic. The second time, there was an accident and stop signs. She wondered what the process was to help drivers when an outage affected an intersection. Mr. Batchelor replied that if an outage involved a major thoroughfare, staff would contact PAPD and Public Works so they could put portable stop signs at the intersection.

In response to Commissioner Forssell querying where the e-bike discount was available, Mr. Batchelor stated he would respond to her when he had the answer. https://rideanddriveclean.org/ebike-discount-campaign-fall-2023/

Council Liaison Ed Lauing commented on the new OMS. He called in to report the outage about 30 minutes after it happened. The system thanked him, said the outage had already been reported and asked him if he wanted a call back. He said yes and received a call back as soon as it was fixed. Mr. Batchelor remarked that was one of the advantages with the new OMS.

Mr. Batchelor hoped to have some AMI meters by the end of the year. The goal was to test 500 AMI meters but staff expected to receive about 250 meters because of a supply chain issue and high demand. Meters were bench tested. Meters will be deployed once they arrive. Commercial meters have a longer timeline. In the event of an outage, Dispatch can ping the meters to determine if they are live or not responsive. Transformers will have an energy recovery control to ping to determine if it had power.

Mr. Batchelor estimated 100% of Palo Alto residential customers would have AMI by the end of fourth quarter 2024. There was no estimated timeline for commercial AMI. Mr. Batchelor's preference was to have all residential meters installed before launching on the commercial accounts.

NEW BUSINESS

ITEM 2: DISCUSSION: Discussion and Presentation - Overview of Drinking Water Quality

Utilities Director Dean Batchelor mentioned this item was on the 12-month calendar for some time. He asked Assistant Director Matt Zucca to deliver a presentation.

Water, Gas, Wastewater Engineering and Operations Assistant Director Matt Zucca provided an overview of Palo Alto's drinking water quality and regulations. The Hetch Hetchy Watershed in Yosemite Valley conveys water to Palo Alto via gravity with no pumping. The system was built about 100 years ago. SFPUC uses the pipeline system to generate electricity. There is no centralized treatment plant for Hetch Hetchy water. Water is not filtered. The water treatment process includes UV light, monochloramine, pH control and fluoridation. The Tesla Treatment Facility does UV treatment.

Palo Alto may receive a blend of filtered and unfiltered water from different sources. The Hetch Hetchy Reservoir is a high-elevation, pristine, granite watershed containing snowmelt runoff that provides 85% of our water. Since 1993, the Surface Water Treatment Rule allows for filtration avoidance waivers. SFPUC was one of five agencies in the U.S. to meet water quality standards to qualify for a filtration avoidance waiver to serve water as potable with disinfection but without filtration. Standards to qualify for this waiver include turbidity less than 5 NTU and disinfection to remove Giardia and viruses. SFPUC will treat water at the Sunol Valley Water Treatment Plant in the rare event it did not meet one of those standards. Around 15% of the total volume SFPUC delivers in its regional system is treated water from San Andreas, Crystal Springs or other watersheds.

Federal and state regulations require CPAU to annually produce and issue a Consumer Confidence Report to all its customers. This report contains an explanation of our water sources and water quality, provides data on how our water compared to MCLs (maximum contaminant levels) and whether there were any exceedances, a list of all contaminants and their typical sources.

The most common public concerns or complaints to Operations relate to taste, odor and dirty/discolored water. Mr. Zucca stated his house has old, rusted galvanized pipes. If water sits in the pipes while he is away for a weekend, water comes out brown when he turns on the faucet. Flushing mains might stir up sediment and material within the pipe that then goes into a home. Repairing a main break generates high-flow scenarios that create turbidity. Milky/cloudy water usually indicated the presence of air bubbles in the system. Bubbles float to the top and go away after letting it sit for a minute. When SFPUC operates their system, air entrainment can occur. Entrained air may look strange but there is no issue with the water. White particles in water can indicate a deterioration of the dip tube in the hot water heater. Black particles in water floating to the surface could be due to monochloramine degrading elastomers in faucet O-rings. Black flecks in a toilet can be from degradation of elastomers in the toilet flap. It is an unfiltered system, so sediment can cause particles in water.

The formal mechanism for customers to register a complaint is to call the Water Operations Team, who then reports it to the State Board. Calls regarding turbidity or suspended solids are infrequent. Taste, odor and color were the most common reasons for calls. Treated water from Crystal Springs and San Andreas Reservoir tastes different from Hetch Hetchy water, although it is also snowmelt runoff and does not taste bad. Taste and odor complaints occur for about a week when summer ends and the air temperature in the Sierras is suddenly much colder because the reservoir surface water cools and mixes from being thermally unstratified. SFPUC notifies CPAU of changes. It takes about three days for water to come down the water system. Water is not pathogenic but it is not sterile. Heterotrophic bacteria build biofilms that can accumulate in the water. SFPUC provides water to 26 BAWSCA agencies.

Water from the nearest hydrant may be tested if there is a known concern but staff avoided testing in the home because homeowners have impact over their portion of the water delivery system. The only exception is the Lead and Copper Rule regulations that required testing in the morning to capture the first flush of water after pipes were stagnant.

Palo Alto receives water from SFPUC via the Palo Alto Pipeline and Bay Division Pipeline #3. There are five turnouts. The system distributes water into nine pressure zones. Zones are at different pressures based upon their elevation. For CPAU to employ additional treatment measures would involve treating water at the five turnout locations or centralized into one or fewer locations for treatment. The California Turnout was in the middle of the street below ground. Additional treatment would require buying land, building infrastructure and staffing. Staff did not perform a detailed cost analysis but staff used U.S. EPA's model to estimate an average of $9 million per location for a total of about $50 million for a simple filtration system to solve for sediment coming into our system. Even with treatment performed at our turnouts, multiple sources in the system could contribute biofilms and pipe materials could contribute to color and suspended solids. For the model, Mr. Zucca selected granular activated carbon (GAC) because it could remove particles and absorb some organic compounds. Organics react with free chlorine and monochloramine to generate disinfection byproducts. Removal of organics resulted in fewer disinfection byproducts. Mr. Zucca was more concerned about replacing pipe nearing the end of its useful life than spending $50 million for water treatment not required by regulations.

Commissioner Phillips suggested treating water upstream from Palo Alto where land costs less, not five entry points but one much larger stream and presumably other water districts could join us. Mr. Zucca commented that BAWSCA could influence SFPUC if there was the collective will to do so but SFPUC could object because there was no regulatory driver. Mr. Zucca thought the primary interest was in water supply augmentation solutions and alternative water supply treatment. Some of those

evaluations were within the One Water Plan. There was a lot of conversation on treatment of purified water (previously called reclaimed water) but regulations were changing fast.

Palo Alto has eight active wells, one was permitted for continuous use and the rest were on emergency standby. In an emergency such as an earthquake, groundwater can generate 10 MGD. The One Water Plan will look at the possibility of incorporating groundwater along with indirect potable reuse (IPR) and direct potable reuse (DPR). The one active well is exercised to keep it active but the pump froze. When the well is operated to test it, the water goes to waste. The water quality issues with our wells are iron and manganese, secondary MCL and TDS. Most of the wells, especially the El Camino Park Well, can blend with Hetch Hetchy water.

Pumping at night when there is lower demand helped maintain the water quality in reservoirs. Commissioner Mauter wanted to talk more about that topic related to electricity with Mr. Zucca.

City-provided tap water met all water quality regulations but residents may prefer point of use (POU) or point of entry (POE) treatment. A POE home system treats water end uses, it could be a water softener but it may not have filtration. A POU system is at the end use, which could be a filter below your sink or for your refrigerator water. POE and POU treatment devices that make claims about specific performance and removal have to be State certified. For more information on POE and POU devices, go to waterboards.ca.gov/drinking_water/certlic/device/watertreatmentdevices.shtml.

Unregulated Contaminant Monitoring Rule (UCMR 5) under the Safe Drinking Water Act is the EPA process to name unregulated contaminants. EPA has to collect data on contaminants suspected to be present in drinking water but do not have health-based standards and decide whether to regulate them.

The State Water Board required water agencies at higher risk to sample for PFAS (“forever chemicals”). SFPUC was not a high-risk agency, so sampling was not required. SFPUC sampled on three occasions and all results were below the detection limit. Scheduled completion of UCMR 5 reporting is the end of 2026. EPA has MCLs for six PFAS compounds. PFAS chemical limits were in parts per trillion (ppt) levels.

In 2018, all pipes on the City side of the meter were certified as not being made of lead. Lead and Copper Rule Revisions (LCRR) require verification of no lead or copper on the customer side of the meter. Staff estimated to complete this task over the next year with 50 or 60 done daily. Customers would be notified if lead service lines were found. It was anticipated that additional staff is needed to fulfill the LCRR requirement to sample 20% of elementary schools and childcare facilities every year for five years and then on request. Mr. Zucca remarked that schools had previous testing done. This was an unfunded mandate and Mr. Zucca did not have the resources. Staff needs to spend time at each school to find out how the school was built and its plumbing to determine the appropriating sampling technique to obtain representative data. Copper is a regulated metal but Palo Alto never had a water quality issue with copper. Copper poses a risk to aquatic organisms when discharge from copper pipes goes out to the Bay. SFPUC manages pH.

Mr. Batchelor commented that rules were not as stringent when schools were tested in 2018 because the purveyor only asked for the City to test our side of the meter. It was up to the individual schools if they wanted to test their side of the meter and schools did not share their test results with the City. Mr. Zucca stated that a specialist was compiling a school list. The first compliance deadline was to scratch 10,000 services lines to make sure they do not have lead and he thought school testing was the next phase of work if CPAU had the resources.

Blending solutions treat for iron and manganese. Total dissolved solids (TDS) were a secondary MCL because it affected taste, odor and usability. TDS caused water hardness, minerality and stained wood from sprinkler systems. Treating for TDS typically required reverse osmosis or blending with higher quality water such as Hetch Hetchy water to dilute solids. Reverse osmosis was a high-energy use system and had a waste stream.

Primary MCLs have an enforceable limit, for example fines from the State Board for a bacteriological parameter such as E coli. TDS and other secondary MCLs have standards to meet minimum aesthetic quality but are not a public health concern.

Commissioner Phillips asked if there was a way to dedicate groundwater to non-potable uses, such as industrial commercial use, carwashes or golf course watering. Mr. Zucca responded that there was nothing feasible since there was not a separate system to put the groundwater in, so it would have to be hyperlocal uses. Wells at parks could be plumbed separately for local irrigation but not on a large scale. CPAU and SFPUC were evaluating IPR and DPR. IPR injects purified water into the groundwater upgradient and pulls it out from a groundwater well downgradient as a way of augmenting groundwater supplies. SFPUC was looking at pumping purified water up and over the hill into the San Andreas and Crystal Springs Reservoirs and pulling it out at the Harry Tracy Water Treatment Plant to augment local supply. The State Board is seeking public comment on DPR regulations. DPR puts purified water directly into the system or immediately upstream of a treatment system. Australia has a long history of DPR. Valley Water's purification plant would be our most likely source of DPR. Water quality concerns will be substantial on IPR or DPR as a water supply.

Commissioner Mauter inquired on the status of the One Water Report from Carollo and action based on that report. Mr. Zucca replied that the Resource Management Division (RMD) and Karla Dailey led that project, not his group. Mr. Zucca's understanding was the report would be available the first half of next year but staff could provide more specificity on the schedule.

Commissioner Forssell saw in the news that microplastics were found in the Sierra Watershed, in Lake Tahoe and snowmelt. She asked about Hetch Hetchy, if SFPUC was testing for microplastics and the method for getting rid of them. Mr. Zucca does not know if anybody sampled for microplastics. He had not heard anything in the industry focusing on microplastics. The UCMR 5 did not target microplastics.

The industry relied on EPA and the State Board to identify public health concerns. An agency like Office of Environmental Health Hazard Assessment sets health goals and the industry determines how to achieve those goals, what is cost effective and MCLs are set. The industry does not collect data for the sake of data. To manage available public funds, the focus is on complying with regulations that the EPA and State Board have set to protect public health.

Fires have become more prevalent in the Sierra, Commissioner Croft wondered if testing captured byproducts of fires or firefighting in the runoff. Mr. Zucca replied that not everything was captured. Fires in Yosemite Valley caused turbidity in the water. In situations of additional sediment into the watershed, there are taste and odor changes but it was not a public health concern. SFPUC will monitor and adjust their operations.

ACTION: None

ITEM 3: DISCUSSION: Overview of Palo Alto Fiber and Fiber Backbone Activities and Discussion of the Fiber Expansion Plan

Public Comment: Herb Borock thought that copies of Magellan's designs for fiber backbone extension and the fiber-to-the-premises network should be publicly available, including the equipment for input and output, passive optical network, number of new customers in fibers out and the locations of those nodes and segments as well as how many people were connected to each contact point.

Utilities Strategic Business Manager Dave Yuan presented project updates on fiber backbone expansion, Phase 1 of fiber-to-the-premises, and grid modernization for electrification. It had taken longer than anticipated to begin construction.

The current fiber backbone is 25 years old. There are congested segments where we are unable to add new dark fiber customers because there are no fiber strands available. New backbone is a City investment for at least the next 50 years to serve Utilities, Public Works, Public Safety and other City departments and allow for future services. It will provide additional security and reliability because it will be separate from the fiber-to-the-premises network and dark fiber network that third-party contractors may access.

The fiber-to-the-premises project would provide City-owned high-speed internet service. The City received over 740 deposits for City internet broadband. Based on survey results, staff projected up to a 40% take rate, whereas a take rate of about 25% to 30% was enough to make this business sustainable.

Grid modernization is a multiphase project estimated to take seven years. The first focus is on aerial construction areas because they pass the most homes and are faster to upgrade than underground areas. The pilot neighborhood for electrification encompasses Embarcadero, Louis Road, Oregon Avenue and Middlefield. This is one of the last areas to convert distribution lines from 4 kV to 12 kV. The original pilot consisted of about 80 poles in that area but will now expand to 400 poles.

CEQA delayed the fiber project but now staff believed there was an opportunity to align construction of the first phase of fiber-to-the-premises with grid modernization to minimize community disruption. Staff is in the process of contacting construction firms to determine the cost savings of hiring one company to upgrade power and telecom. Rincon has conducted numerous CEQA studies for the City of Palo Alto and throughout Santa Clara County. The City anticipated either a negative declaration or a mitigated negative declaration for this project. The initial study will assess aerial and underground construction, fiber hut, underground vaults, aboveground cabinets and customer connection. The CEQA timeline will take about 30 weeks, including one month of public review and comments.

Under a 1918 agreement, the City jointly own 5400 of our 6000 poles with AT&T. With the grid modernization and fiber expansion projects, the City will touch almost every pole. This will increase the volume of pole replacements from about 100 annually to about 600 over the next three to four years. The fiber expansion project will require relocation of some third-party equipment on the pole to accommodate the City's fiber attachments, so the City will work with third parties to have them move their equipment up or down the pole. The City is waiting for AT&T's response to a letter the City sent to coordinate these projects and the needed resources.

Staff explored the Northern California Joint Pole Association (NCJPA), a nonprofit organization established over a hundred years ago with about 50 members that share the cost of utility poles. It is a

consortium of private telecommunication, cable TV, phone and wireless companies, including AT&T, Comcast, Crown Castle, Verizon, PG&E as well as municipal agencies such as Alameda, Roseville, Gridley and Lodi. Six of the 16 members of the Northern California Power Agency (NCPA) are members of the NCJPA. The City's main objective of joining the NCJPA was to streamline the pole intent and billing processes as well as recover the fair costs of replacing poles from AT&T. Based on staff's preliminary review of the 200-page NCJPA Operations Handbook, the City would not achieve either objective by joining the NCJPA. It did not meet our needs and would add more complications. The City might lose control of the poles if we were to join NCJPA, which the City did not want to risk. Per our agreement, AT&T must respond within 10 days but NCJPA had a 45-day window to respond to a pole intent request. NCJPA used a shared cost or average cost across all members. The City wanted to achieve a full recovery of the actual costs. Instead of joining the NCJPA, the City will try to amend its agreement with AT&T.

All the make-ready engineering was done for fiber and 6000 poles surveyed. For grid modernization, a new pole assessment is needed to add power. The City engaged a consultant who can do 1400 poles within six months.

Chair Segal inquired if the inspection determined the number of poles that had third parties encroaching our space. Mr. Yuan replied that the Magellan survey included pictures of all poles. In the first phase, probably 300 need relocating but Mr. Yuan guessed maybe at least 20 to 50 were encroaching.

The Colorado Substation will be the City's first fiber hut. It will be a prefabricated building. There were concerns about the floodplain, so all Public Works guidelines will be followed. City Hall and Equinix are strategically located to have fiber huts. The City is in discussions with Equinix to see what space is available to lease and how much cabinet or tower space we can use but the biggest challenge is how to get conduit into their building since they are congested with other telecoms.

Four new positions were approved in the FY 2024 budget but were not hired yet. CIO Darren Numoto is serving as Interim Assistant Director because he has telecom experience. The other three positions approved are a construction or outside plant manager, a sales and marketing manager, and a senior network architect or engineer.

Mr. Yuan stated that CEQA takes six months and will finish in March. The construction bid will probably take three months and evaluation another three months. Construction could begin in nine months to a year. Staff was not aware this was a CEQA issue until they found out from attorneys, so it put a delay in the timeframe. The City had to go back to Magellan to find another consultant to help us file the proper paperwork for the CEQA. Mr. Batchelor commented that there was no CEQA issue with grid modernization because we were replacing in kind, replacing the secondary to a larger sized wire and maybe a larger transformer.

Commissioner Croft asked if there was a possibility this could accelerate completion of grid modernization. Mr. Yuan replied that the current proposal accelerated the first part, 6000 homes versus 500 homes. There is a possibility of speeding up grid modernization because the consultant will be doing all the make-ready, so potentially they could speed up the pole make-readies for other aerial areas. Mr. Batchelor added that the City had difficulty securing transformers. Transformers were ordered but they are out about two years due to a supply issue. Switches might be delayed. The City needed almost double the amount of transformers than we currently have in the system. Some transformers ordered last year have been received. A shipment of 125 or 150 transformers will arrive by the end of the year.

Chair Segal noted that construction days were very short and she suggested expanding it for this project given the time constraints. Mr. Yuan replied that when obtaining permits, an exemption from Planning to expand the construction hours could be requested. Mr. Batchelor thought it may not be possible on the major thoroughfares but it was a good idea for staff to ask Planning for an exemption to stay out longer on other streets. Mr. Yuan remarked that staff was trying to have one company to closely coordinate both projects. They could do power first and then the telecom company come right afterwards and hang up all the wires and messengers to complete the task within days or weeks.

Chair Segal mentioned she received an email from Comcast announcing a new 10G plan for $60/month. AT&T does not serve her area. Chair Segal expressed her concern that the City would lose its customer base as time goes on.

In the beginning, the focus for electric grid modernization is overhead. For fiber, the City wanted to do underground and overhead if it was in the same neighborhood, which may necessitate hiring a separate underground construction firm to do the work. Electric infrastructure does not need to be upgraded in the underground areas. The secondary wire can be pulled out of the conduits for the electric project but they have to trench or bore the streets for fiber.

ACTION: None

The UAC took a break at 8:07 p.m. and resumed at 8:23 p.m.

Utilities Management Analyst Tabatha Boatwright responded to Commissioner Mauter's previously asked question regarding the One Water Plan. There have been delays with the vendor. Staff was working closely with the vendor to modify those delays. A return response was anticipated in early 2024; however, this fall there will be multiple stakeholder engagement meetings that will be posted on the website and announced.

ITEM 4: DISCUSSION: Overview of Sustainability and Climate Action Plan (S/CAP) Activities To-Date and Discussion of Reliability and Resiliency Strategic Plan Policy Guidelines

Assistant Director Resource Management Jonathan Abendschein requested UAC's feedback on the following questions: Is staff's work plan in line with Council policy guidelines? Are the right topics included? Is there a need for clarifications, additions or deletions? Are there any technologies, processes or policies that the UAC expected to see included in the plan? Are the timelines appropriate?

Commissioner Phillips was curious about how electrification would affect the 20% who are still on gas if the City's goal was 80 x 30, the impact on gas rates and any potential interruption issues. Mr. Abendschein explained it was not the focus of the Reliability and Resiliency Strategic Plan. Mr. Abendschein offered to forward to Commissioner Phillips the preliminary analysis done a few years back that less concentrated areas of the system realized more savings, which allowed CPAU to maintain rates at a reasonable level but would not be the case if a broadly distributed system were maintained for very small amounts of gas. One of S/CAP's work items is for a gas infrastructure and financial transition plan but it needed staffing. The work item received funding in the FY 2024 budget. Mr. Abendschein was requested to send that preliminary analysis to all UAC commissioners.

Commissioner Metz suggested some broad guidelines and offered to share more detailed feedback in writing. First, he opined it was essential that Resilience address items such as an outage or a car driving

into a pole as well as emergencies. The horrendous situation in Maui shows how imperative it is for the electric utility to act in emergencies.

Commissioner Metz's second guideline was the importance of CPAU coordinating with the Office of Emergency Services (OES) on planned responses to anticipated scenarios and definition of events considered a design emergency. OES has said that people need to anticipate one or two weeks with no electricity or water, which was very different from expecting the majority of customers to be repowered within 24 to 72 hours. Improve our process for preparation and assessment of local energy resources. Topics in the July meeting included demand management and distributed energy resources. Past analyses resulted in a negative conclusion on those types of technologies but Commissioner Metz thought the analyses did not impute a value to their resilience and having a fallback in an emergency. Centralized solar was overvalued; it provides RECs but does not provide energy when needed, particularly in an emergency.

Commissioner Metz commented on neighborhood and community emergency center resilience. OES wanted to keep people out of emergency centers, so there has to be a way for people to survive an emergency in their homes.

Commissioner Metz addressed the question how the UAC wanted to be informed. He believed the UAC should have a subcommittee devoted to S/CAP and Reliability and Resilience.

S/CAP had three working group teams last year and commissioners joined those team meetings. Instead of working group teams meeting individually this year, S/CAP had meetings of the working group as a whole and invited the commissioners. Commissioner Metz attended some of those meetings. Brad Eggleston is the Executive Team Lead on S/CAP and the liaison with the S/CAP Committee. Commissioner Mauter suggested monthly reports to the UAC but Mr. Abendschein deferred that to the S/CAP Committee. Mr. Abendschein stated that two-way communication by having commissioners involved with the S/CAP Committee was helpful in the past and he would forward Commissioner Mauter's comments to the S/CAP Committee.

For Task 1, S/CAP was not planning to address Utility workforce issues but the intent was to summarize its impacts on reliability, such as having a workforce that can respond to emergencies and restore service quickly, investing in our infrastructure and reporting out on outages when they occur. Regarding improving the Utility OMS and communication protocol, efforts to improve Utility's OMS will be summarized. Vice Chair Scharff pointed out that it was confusing when the work plan uses terms such as "addressing Utility workforce issues" and "improving the Utility Outage Management System" as opposed to "summarizing." Mr. Abendschein replied that he could be make modifications to clarify the work plan and report, then send it to the UAC as an informational item and send it to Council.

Vice Chair Scharff asked if the new technology referred to expecting more distributed energy such as rooftop solar or electric vehicles putting power back into the house. Mr. Abendschein answered yes to all the above. Distributed energy resources included solar, battery storage, battery to grid and microgrids alongside load management, control technologies, advanced grid automation and protection. Task 2 was a work item. A study was in progress on distributed energy resources and integrating them into the grid, identifying grid benefits that the City could leverage by providing the right programs or incentives for customers to use these technologies in a way that benefits the distribution system. Understanding how technologies for demand response might be used for the distribution system is the focus of Task 2. Task 2 was likely to have some findings or recommendations.

The extent to which those technologies can provide reliability to recover from everyday outage events and resiliency by having a way to provide yourself power, services or resources during a major emergency are focused on in Task 3. Many technologies have some resiliency benefit and S/CAP wanted to understand what role the City could have, such as community center resiliency, programs for residents to install solar and storage in their homes, neighborhood microgrids, valuing resiliency in procurement and electric vehicle to home. S/CAP wanted to make a list of potential ways the City could engage with the community and help the community implement technologies to achieve greater resiliency and be clear about the costs and staffing needs to implement any of those programs. Task 3 will be a report including pros, cons, tradeoffs and resource needs for various options in order for the UAC and Council to take action via policy direction and resources for implementation. Whether S/CAP would provide their recommendations in Task 3 was unknown.

Task 4 will be a report on S/CAP's actions and request for feedback whether to make any adjustments.

Commissioner Forssell opined the timeline looked fine and the topics seemed reasonable. When the S/CAP committee wrote reports, she would like to have it as an agenda item to allow for UAC discussion.

The percent of electricity used by commercial customers versus residential was about 80% commercial and 20% residential but that will shift when adding in big commercial projects. Multifamily was 5%. Large commercial microgrids would provide economic value and resiliency benefits. Chair Segal expressed the importance of considering if electrification or grid improvements would become a barrier to businesses in Palo Alto.

Bonds will provide funding. The City has been discussing how and when to do those bonds. Mr. Abendschein did not have further information but staff could provide an update in the future.

Mr. Abendschein stated that work is in progress on a KPI dashboard, for example the number of homes without a gas connection and the percent of new vehicle purchases that were electric. If Commissioners were looking for specific information, Mr. Abendschein could share data or dashboards if available.

ACTION: None

COMMISSIONER COMMENTS and REPORTS from MEETINGS/EVENTS

Commissioner Metz reported that the S/CAP meeting mainly focused on marketing communication of programs and a marketing consultant provided a presentation. The heat pump water heater program was the first priority. He noted that the more technical people on the S/CAP team had expertise in end-use technology within the home. He did not think any S/CAP team members had deep expertise in utilities. There was no discussion on what to do about the grid.

An active community member who was interested in being an early AMI adopter contacted Commissioner Forssell and wondered if customers could be put on a list to be included in the pilot. Utilities Director Dean Batchelor replied that customers could email Mr. Batchelor directly stating they would like to have an AMI meter. Of note, you will not see AMI data until sometime next year even if you have an AMI meter installed before then. Utilities Strategic Business Manager Dave Yuan thought it might be in February because the portal takes about five months of development after signing off the functional specs but he will keep UAC updated on the progress.

Mr. Yuan added his response to the earlier discussion about funding. The City is waiting for DOE's response to their request for $115 million for the electrification grid. The City has to spend those funds before pursuing bond financing.
Commissioner Phillips noted there was an item in the August meeting agenda for a presentation on natural gas hedging and he wanted to know what happened to that item. Mr. Batchelor explained that staff received feedback from Finance and needed to make changes before taking it to Council. It will come back to the UAC as an informational item because Finance approved it and it was moving on to Council. The UAC cancelled a meeting and was unable to address this item due to timing. Staff needs Council's approval for hedging. Pricing would not be available for the winter months if staff waited too long, so they bypassed the UAC.

FUTURE TOPICS FOR UPCOMING MEETING

Informational item on natural gas hedging.

NEXT SCHEDULED MEETING: October 11, 2023

ADJOURNMENT

Commissioner Phillips moved to adjourn.

Commissioner Mauter seconded the motion.

Motion carried 7-0 with Vice Chair Scharff, Vice Chair Scharff, Commissioners Croft, Forssell, Mauter, Metz and Phillips voting yes.

Meeting adjourned at 9:26 p.m.

CITY OF PALO ALTO

Utilities Advisory Commission
Staff Report

From: Dean Batchelor, Director Utilities
Lead Department: Utilities

Meeting Date: October 11, 2023
Staff Report: 2307-1748

TITLE

Utilities Advisory Commission Recommend that the City Council Adopt a Resolution Approving the 2023 Electric Integrated Resource Plan

RECOMMENDATION

Staff recommends that the Utilities Advisory Commission (UAC) recommend that the City Council adopt a resolution (Attachment A):

1. Approving the 2023 Electric Integrated Resource Plan (IRP) (Attachment B), which includes the four standardized tables required under the California Energy Commission's (CEC) IRP Guidelines; and
2. Approving the IRP Objective and Strategies to guide future analysis and decisions (Attachment C).

EXECUTIVE SUMMARY

In 2018, staff completed, and the City Council approved, the City's first IRP—a comprehensive long-term electric supply planning document that the City is required to complete every five years under state law[1] . With this report, staff presents the City's second IRP report to the UAC for review and recommendation to approve.

The current IRP, which must be approved by Council by January 1, 2024 in order to satisfy the City's regulatory requirements, has a planning period of 2023 through 2045. The City of Palo Alto Utilities (CPAU) currently has sufficient carbon-neutral supply resources to meet projected loads through 2028, with approximately 40% of its resources projected to come from hydroelectric supplies and the remaining 60% from renewable energy contracts. The City's projected load is expected to increase significantly over the next several years, largely due to new data center projects being implemented by multiple large commercial customers, along with the effects of the City's building and transportation electrification efforts. A primary focus of this IRP, therefore, is determining the optimal mix of resources to use to satisfy this growing load. Additionally, the City's 20-year contract with the Western Area Power Administration (WAPA) for hydroelectric

[1] CA Public Utilities Code Sec. 9621(b).

resources, which supplies over 30% of the City's energy needs in a normal hydro year, expires at the end of 2024. As with the 2018 IRP, another focus of the current IRP is determining whether to renew the contract with WAPA for an additional 30-year term (and if so, at what participation level) and/or seek other renewable supplies to meet City loads.

As required by the CEC's IRP Guidelines, the IRP includes a set of four standardized tables, which detail the City's energy, renewable energy, capacity, and greenhouse gas (GHG) emissions projections through 2045, as well as the latest versions of the City's RPS Procurement Plan and RPS Enforcement Program.

In addition to the City's 2023 IRP and its associated documents, this report includes proposed IRP Objective and Strategies to guide future analysis and decisions as staff works to prepare the City's electric supply portfolio for the upcoming shifts in the electric utility industry.

BACKGROUND

Prior to 2018, the City engaged in integrated resource planning through periodic updates to its Long-term Electric Acquisition Plan (LEAP)[2]. But in 2015, SB 350 was signed into law, and it includes a requirement that publicly-owned utilities (POUs) serving loads greater than 700,000 megawatt-hours per year, such as Palo Alto, develop and adopt an IRP and submit it to the California Energy Commission (CEC) by January 2019 and every five years thereafter.[3]

The current IRP planning period is from 2023 through 2045. As noted in the IRP report, through 2028 the City expects to have sufficient resources to meet its forecasted electric loads, with renewable power contracts supplying about 60% of its needs and the remainder coming from hydroelectric resources. This all assumes that the City renews its contract for the Western hydroelectric resource which expires at the end of 2024 for an additional 30-year period. The City also has the option to reduce its allocation under this contract (or exit it altogether) until July 1, 2024. And if the City does renew the Western contract, it will also have the option to reduce its allocation or exit the contract once every five years throughout the 30-year contract term. Therefore, a significant consideration for the IRP is the question of whether to renew the contract with Western (and if so, at what participation level) and/or seek other carbon neutral power supplies. Staff presented a preliminary analysis of the City's long-term electric supply portfolio and a variety of potential new resource options, along with an update to its long-term load forecast, to the UAC for discussion in July 2023.

Beginning in June 2022, staff has presented five different reports to the UAC and Council (including the present one) directly or indirectly related to the development of Palo Alto's 2023 IRP. These presentations and reports are summarized in Table 1 below.

[2] The City's last LEAP update was approved by Council on April 16, 2012 (Staff Report 2710, Resolution 9241).

[3] The Clean Energy and Pollution Reduction Act of 2015 also raised the state's renewable portfolio standard (RPS) to 50% by 2030 and required a doubling of energy efficiency savings by 2030. (The RPS requirement was later increased to 60% by 2030 via SB 100.) The primary objective of the IRP requirement in SB 350 is to ensure that the state's large POUs are on track to reduce their greenhouse gas emissions, helping the state meet its overall target of reducing GHG emissions to 40% below 1990 levels by 2030.

Table 1: Public Process Summary for Development of the 2023 IRP

Forum	Date	Topic	Link
UAC	6/8/2022	Overview of CPAU's IRP Development Process	Report[4]
UAC	12/7/2022	Discussion of CPAU's Long-term Electric Load Forecast	Report[5]
UAC	7/5/2023	Presentation of Electric Supply Portfolio Modeling Results	Presentation[6]
Council	9/18/2023	Annual Carbon Neutral Plan and RPS Supply Update	TBD
UAC	10/4/2023	Recommendation to Approve CPAU's 2023 IRP	TBD

Through these presentations and discussions, staff has laid out the motivations and context for the IRP, and described the resources currently in the City's supply portfolio as well as the upcoming planning decisions and uncertainties facing the City. Staff felt that this level of public discussion was important given that the City must make some important planning decisions in the next several years.

CEC IRP Guidelines & Required Elements

The schedule and structure of the IRP process has been dictated in large part by state law,[7] which requires Council adoption of Palo Alto's first IRP by January 1, 2019, submission to the CEC by April 30, 2019, and updates at least every five years thereafter.[8] Specifically, the City's IRP must demonstrate how the City's utility will:

- Meet GHG emissions reduction targets set by the State's Air Resources Board
- Ensure procurement of at least 60% renewable resources by 2030;
-
- Minimize impacts to customer bills;
- Ensure system and local reliability, including in the hour of peak net demand, and ensure the procurement of resource adequacy products to meet its peak demand and planning reserve margin;
- Strengthen the diversity, sustainability, and resilience of the bulk transmission, distribution systems and local communities;
- Enhance distribution systems and demand-side energy management;

[4] Staff Report 14279 https://www.cityofpaloalto.org/files/assets/public/v/2/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2022/06-08-2022/06-08-2022-id-14279-item-4-irp.pdf

[5] Staff Report 14908 https://www.cityofpaloalto.org/files/assets/public/v/2/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2022/12-07-2022/12-07-2022-agenda-and-packet.pdf

[6] Staff Report 2301-0799 https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2023/07-jul-2023/packet.pdf

[7] *See* Public Utilities Code sections 9621, 9622; Public Utilities Code section 399.11 also established a new Renewable Portfolio Standard (RPS) to meet 60% of the City's load from applicable renewable supplies by 2030, which the City has already achieved.

[8] Council adopted the first IRP on December 3, 2018 (Staff Report 9761, Resolution 9802), and staff submitted the IRP and the four standardized tables to the CEC on April 30, 2019. After reviewing the City's IRP and associated documents, the CEC approved the submission on August 29, 2019.

- Minimize localized air pollutants and other greenhouse gas emissions with early priority to disadvantaged communities; and
- Address the following procurement topics:
    - Energy efficiency and demand resources that are cost effective, reliable and feasible;
    - Energy storage;
    - Transportation electrification;
    - A diversified procurement portfolio of short term electricity, long term electricity, and demand response products; and
    - Resource adequacy capacity.

The IRP report presented herein satisfies all of these requirements. And, it is worthy to note, Palo Alto has already exceeded the state's 2030 goals under SB 100 of sourcing 60% of electricity supplies from renewable resource and reducing greenhouse gas emissions by 40%—which were the primary drivers of the IRP requirement in the first place.

In addition to addressing the above topics in its IRP, the City is required to submit the following four Standardized Tables to the CEC along with the IRP:

- Capacity Resource Accounting Table (CRAT): Annual peak capacity demand in each year and the contribution of each energy resource in the portfolio to meet that demand.
- Energy Balance Table (EBT): Annual total energy demand and annual estimates for energy supply from various resources.
- RPS Procurement Table (RPT): A detailed summary of a resource plan to meet the RPS requirements.
- GHG Emissions Accounting Table (GEAT): Annual GHG emissions associated with each resource in the portfolio to demonstrate compliance with the GHG emissions reduction targets established by the California Air Resources Board (CARB).

The CEC has yet to release updated versions of these tables. When they become available staff will fill them in with the City's latest portfolio projections and submit them.

Finally, the City is also required to submit to the CEC additional supplementary information along with the IRP, including the current version of the City's RPS Procurement Plan. The City last updated this document in 2020 to reflect the changes brought about by SB 100, and it does not require any further updates at this time. The current version of this document is included as an appendix to the IRP (Attachment B).

ANALYSIS

At the July 2023 UAC meeting, staff presented the Commission with an overview of the IRP, along with a preview of the portfolio modeling results it had completed at the time with help from a consultant (Ascend Analytics). The remainder of this section will cover additional information that this portfolio modeling effort has yielded, included a look at how the portfolio fares under various future hydrological and market price scenarios.

Capacity Expansion Modeling Results

For IRP portfolio development, staff relied on PowerSIMM, an industry-leading market simulation, capacity expansion, and production cost model developed by Ascend Analytics. PowerSIMM captures and quantifies elements of risk through the simulation of meaningful uncertainty with weather as a fundamental driver. After many modeling iterations were performed to ensure the robustness of the results, staff and Ascend ultimately arrived at a Recommended Portfolio that is summarized in the following figures. Figure 1 displays the volumes of new resources that the model selects (in terms of their nameplate capacity) in each year of the IRP planning period. Although the model selects new solar capacity starting in 2030, and battery energy storage systems (BESSs) starting in 2041, the actual resources that the City will contract with to meet its planning objectives will depend heavily on the responses received in future RFPs. Changing market conditions, the specific characteristics and quality of individual offers, and changing regulatory requirements all add uncertainty to the selection of future resources.

Figure 1: Nameplate Capacity of New Resource Additions for the Recommended Portfolio

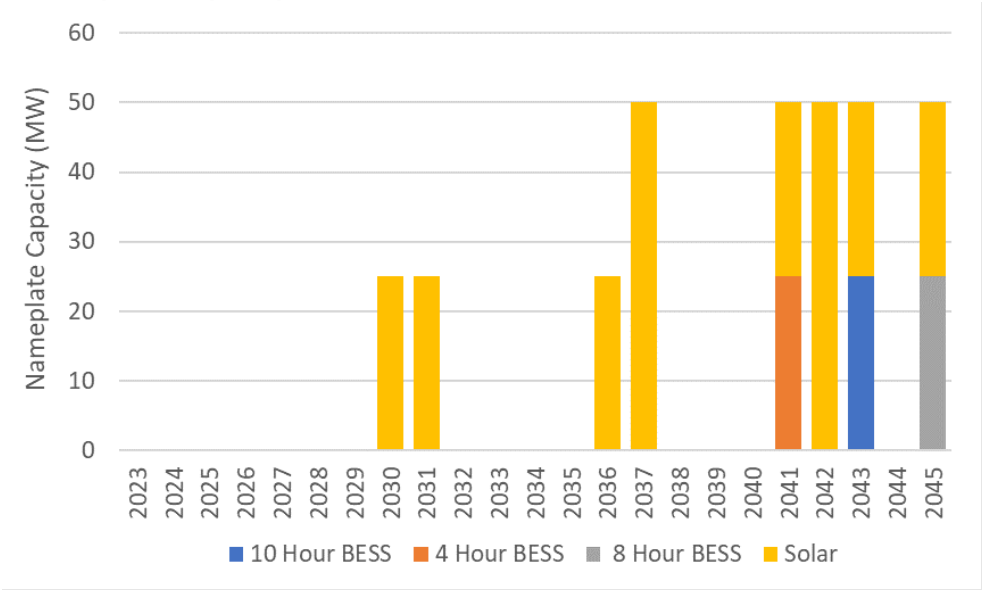
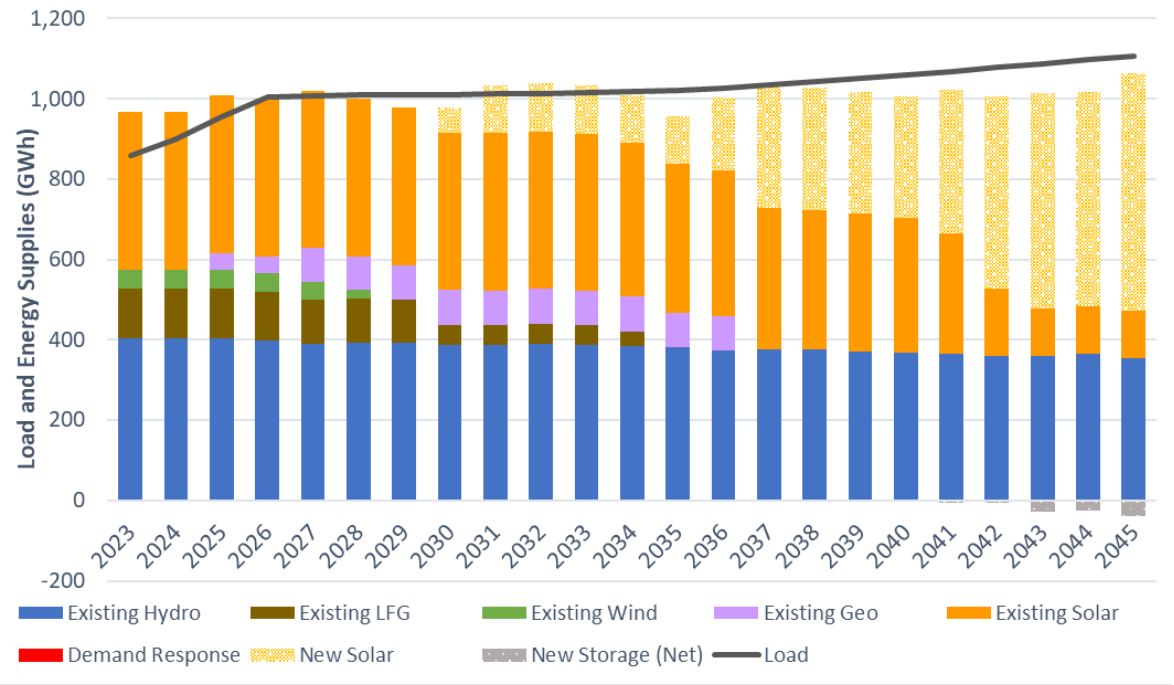


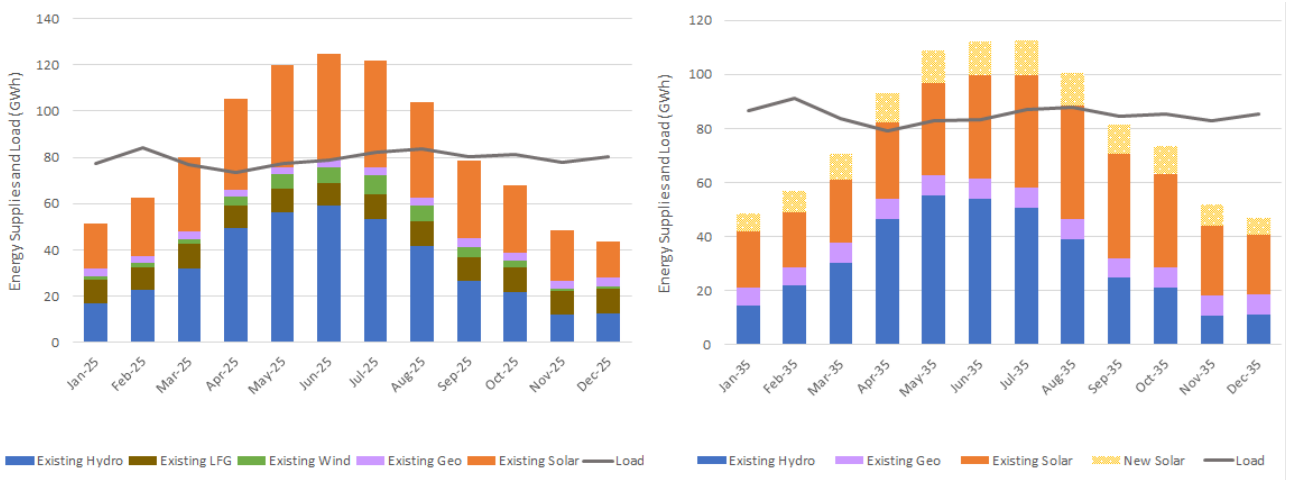
Figure 2 below shows the City's projected load and energy supplies by year under the Recommended Plan. The small deficit positions depicted in a few years in this figure would be covered using short-term market purchases of energy bundled with PCC 3 RECs. Overall, the Recommended Plan results in a portfolio that would be 98% hedged over the IRP planning period.

Figure 2: Projected Load and Energy Supply Balance for under the Recommended Plan



On an intra-year basis, the Recommended Plan would yield significant energy surpluses in the spring and summer months, followed by significant energy deficits in the fall and winter months as shown in Figure 3 below. This pattern, and the resulting market exposure that it would entail, will be another consideration in the process of selecting new resources to add to the City's supply portfolio which could lead to a more diverse mix of new resource selections than is shown here in the Recommended Plan.

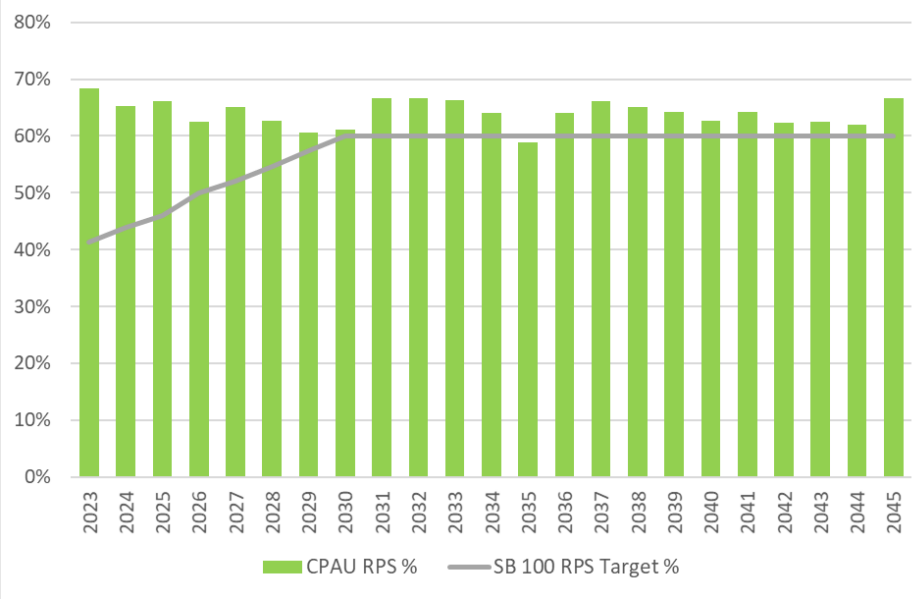
Figure 3: Monthly Load and Energy Supplies in 2025 & 2035 under the Recommended Plan



As Figure 4 below illustrates, the Recommended Plan would ensure that Palo Alto exceeds the state's annual RPS procurement targets in all but one year (2035) of the IRP planning period. However, because RPS compliance is evaluated based on aggregate procurement over three-year

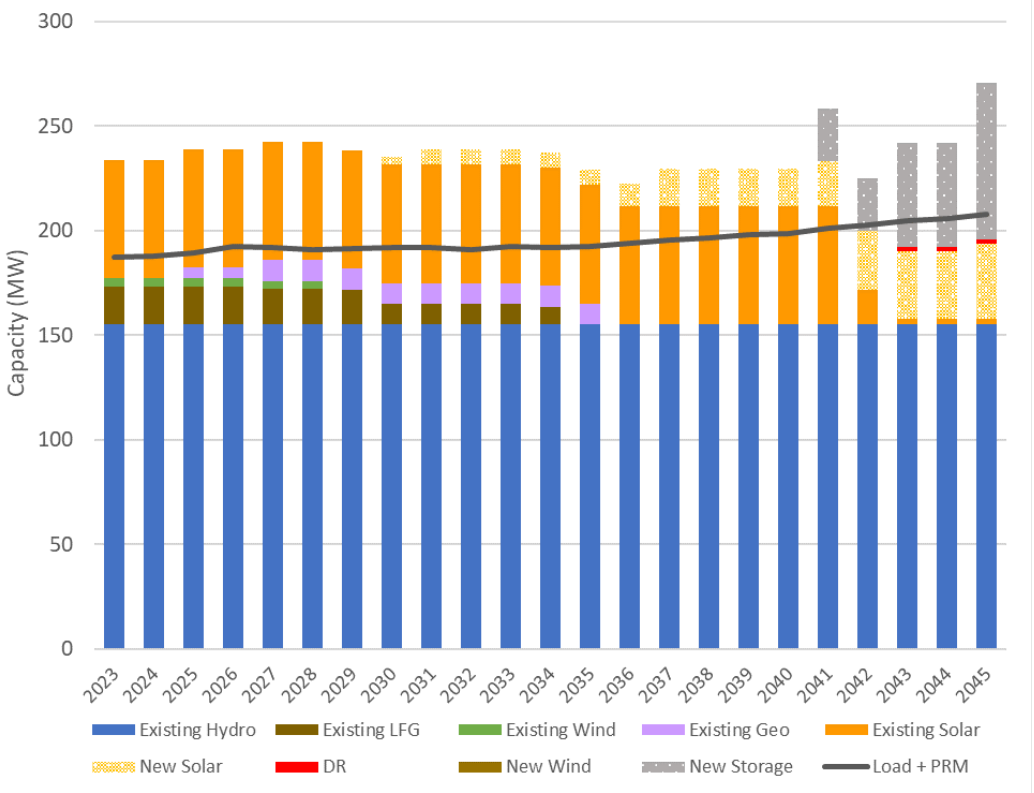
compliance periods after 2030, the City would still achieve full compliance with its RPS requirements under the Recommended Plan. (Based on historical performance, CPAU intends to meet or exceed its annual RPS procurement target in *every* year.)

Figure 4: SB 100 RPS Requirements and RPS Level under the Recommended Plan



As Figure 1 indicated, the capacity expansion model adds a significant amount of battery energy storage systems beginning in the 2040s—25 MW each of 4-hour, 8-hour, and 10-hour BESSs. According to Ascend, the model selected these resources primarily to ensure the Recommended Plan would satisfy Palo Alto's system capacity needs during this period (when almost all of the City's existing renewable energy PPAs have expired). Figure 5 illustrates how these BESS additions—along with a small volume of demand response capacity—ensure that Palo Alto can easily satisfy its system capacity needs throughout the planning period without having to rely on short-term RA purchases.

Figure 5: Projected System Capacity Requirements and Supplies for the Recommended Plan



Scenario Analysis

To try to understand the magnitude of the uncertainty around these modeling results, staff and Ascend ran the model under several different future scenarios, and then used its production cost model function to evaluate the overall cost and cost uncertainty of the supply portfolio selected in each case. The four different scenarios that were evaluated can be summarized as follows:

1. **Base Case** – Expected hydro output and expected market prices
2. **Reduced Hydro Output** – Hydro energy output is reduced by 30% and capacity is reduced by 60%, while hydro costs increase by 25%
3. **Dry Year, High Prices** – Simulating an extended drought, hydro energy output is reduced by 25%, while market prices are high
4. **Wet Year, Low Prices** – Based on historical conditions during wet years, hydro energy output is increased by 50%, while market prices are low

Interestingly, for the dry year and wet year scenarios the model selected the same new capacity additions as in the base case (see Figure 1). Despite Palo Alto's heavy concentration of large hydro resources in its existing portfolio, these long-term changes in hydrological conditions were not enough to cause the model to select a different volume or type of resources in the portfolio. Instead, the model indicates that the City should simply buy more or sell more energy and capacity in the short-term market to balance its energy and capacity needs in these situations. (While the Recommended Plan portfolio is 98% hedged on average over the IRP planning period,

the Dry Year, High Prices scenario would yield a portfolio that is 87% hedged, while the portfolio would be 121% hedged in the Wet Year, Low Prices scenario.)

In the Reduced Hydro Output case, however, the model made significantly different selections for the City's supply portfolio, as summarized in the figures below.

Figure 6: Nameplate Capacity of New Resource Additions in Reduced Hydro Output Scenario

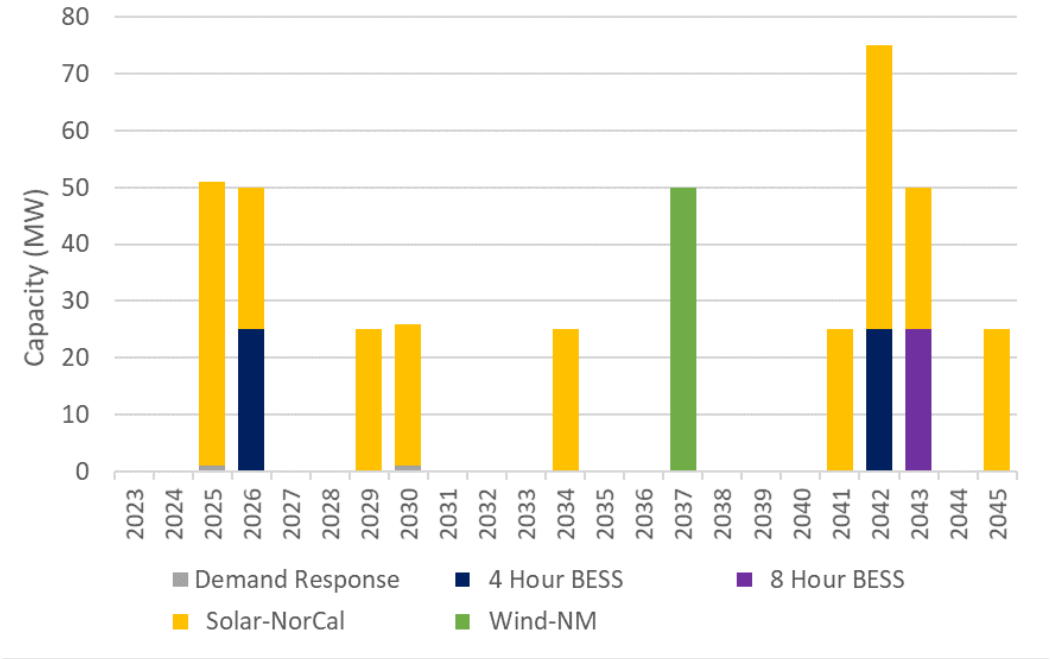


Figure 7: Projected Load and Energy Supply Balance in the Reduced Hydro Output Scenario

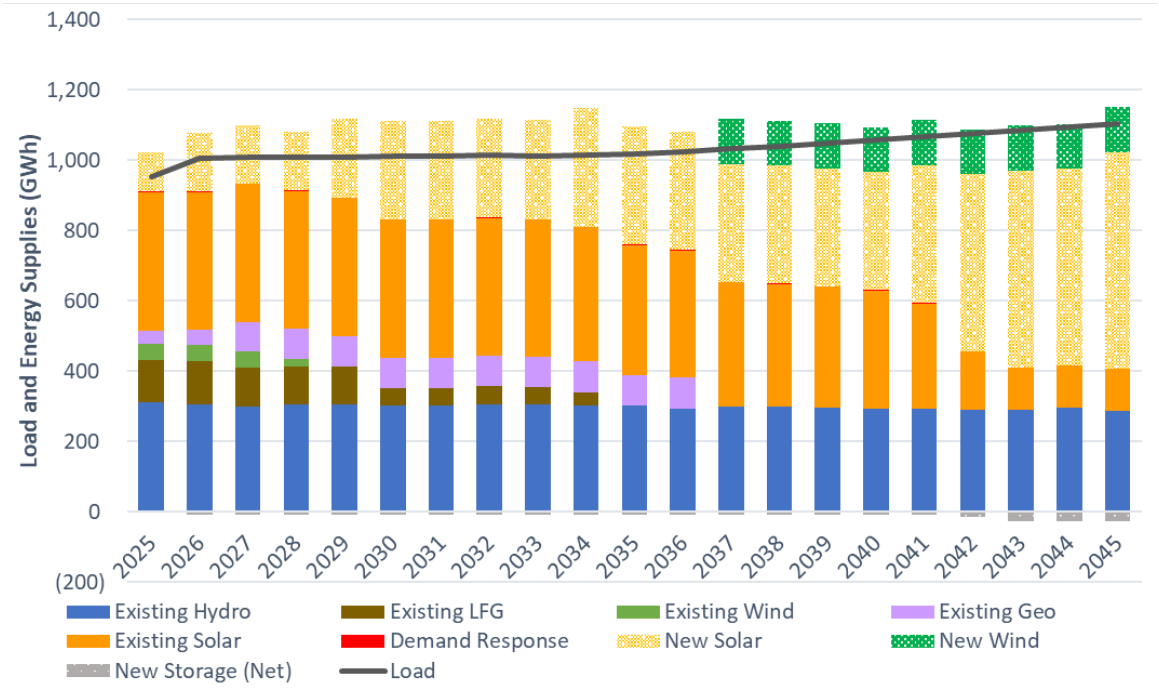
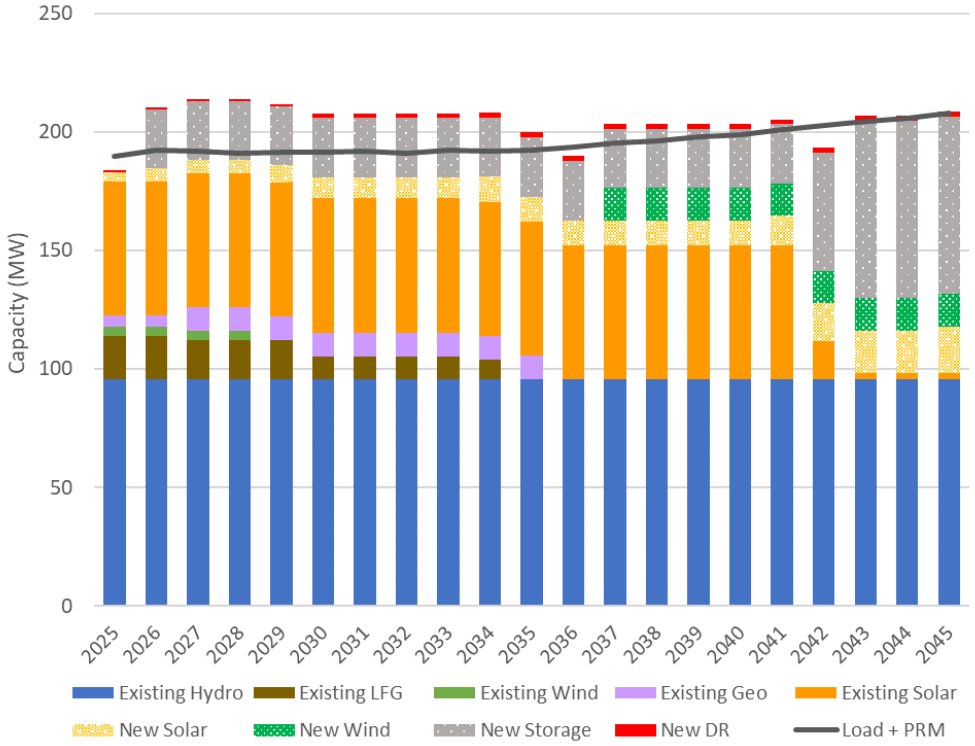


Figure 8: System Capacity Requirements and Supplies in Reduced Hydro Output Scenario



Portfolio Cost Analysis

Financial metrics for the four scenarios described above are displayed in Table below, including each scenario's average supply cost, market price, mark-to-market (MTM)[9], and risk premium[10]. As expected, this information indicates that the total portfolio in the Reduced Hydro Output scenario is significantly more costly than the Base Case portfolio. But, interestingly, the modeling indicates that the portfolio becomes significantly more valuable under both the Dry Year, High Prices scenario, as well as the Wet Year, Low Prices scenario, compared to the Base Case scenario.

[9] Mark-to-market is a risk assessment tool which measures the current estimated value of a portfolio relative to its original contracted price; a positive value indicates an increase in the value of the purchase, which would be realized only if the transaction was liquidated. It also represents the City's credit exposure with the supplier. Note that the MTM values presented in Table 2 are based on the total cost of each supply resource, but only account for the energy value (as measured by the resource's Locational Marginal Price). The RA capacity value and REC value associated with each resource's output are not considered in this calculation, thus it is not an accurate representation of the true value of each portfolio; nonetheless, the MTM differences between the four scenarios are reflective of the differences in their values.

[10] The Risk Premium metric represents the magnitude of a given portfolio's financial exposure to market price volatility, variation in generation and load, and changes in weather conditions. The risk premium, which is calculated in a manner similar to an insurance premium, is the probability-weighted average of costs between the median and 95th percentile of costs in all simulations. A smaller Risk Premium value indicates a greater level of certainty around the cost estimates presented for the given portfolio or scenario.

Table 2: Financial Performance Summary of the Four Scenarios Modeled

	Base Case	Reduced Hydro Output	Dry Year, High Prices	Wet Year, Low Prices
Average Supply Cost ($/MWh)	$63.58	$66.27	$83.05	$40.76
Average Market Price ($/MWh)	$64.17	$64.17	$88.05	$45.52
Total MTM ($/MWh)	$0.65	($3.34)	$4.09	$4.62
Average Annual MTM ($M)	$0.47	($2.00)	$5.31	$4.70
Average Annual Risk Premium ($M)	$6.43	$3.27	$19.91	$4.33

The Risk Premium results indicate that the portfolio's cost uncertainty (or value at risk) related to high market prices/dry hydro conditions is far greater than for low market prices/low hydro conditions. For this reason, CPAU tends to hedge the supply portfolio based on the assumption of slightly drier than average conditions, and also maintain significant hydroelectric reserves.

NEXT STEPS

Staff plans to present the final IRP report and associated documents to the Finance Committee in October and to the City Council in November. Under state law, final approval of the IRP report is required by January 1, 2024, and staff must submit it to the CEC by April 30, 2024.

As noted in the IRP report, the City faces a number of significant decisions in the coming years, including whether to reduce its share of (or exit) the Western contract and what to do with its share of the California-Oregon Transmission Project when the layoff of that resource ends in 2024. In addition, the City's load is expected to increase significantly in the coming years, and staff will need to contract for new resources to meet this increased demand. As staff undertakes these efforts over the implementation period of this IRP, they will provide the UAC with updates on the progress, successes, and new challenges they encounter.

FISCAL/RESOURCE IMPACT

Staff plans to implement the IRP in the coming years largely with existing staffing resources, along with assistance from the staff resources at NCPA. However, staff may also have to utilize some external consulting and legal resources to assist with some of these efforts. The cost of such external resources may amount to $100,000 to $200,000 over the next few years.

Though the approval of the IRP by itself does not have direct impact on portfolio-related costs, the different initiatives that will be undertaken in the coming years will greatly influence the electric supply costs in the coming decades.

POLICY IMPLICATIONS

The IRP report and Objective and Strategies are in line with the Utilities Strategic Plan mission and strategic direction. Specifically, the IRP report itself was contemplated under Strategy 4, Action 5, of the Financial Efficiency and Resource Optimization Priority of the Utilities 2018 Strategic Plan. These IRP documents are also in line with the Sustainability and Climate Action Plan goals of continuing to lower the carbon footprint of the community.

ENVIRONMENTAL REVIEW

The Utilities Advisory Commission's review and recommendation to Council on the 2023 IRP report does not meet the definition of a project under Public Resources Code 21065 and therefore California Environmental Quality Act (CEQA) review is not required.

ATTACHMENTS

Attachment A: Resolution Approving the 2023 Integrated Resource Plan

Attachment B: 2023 Integrated Resource Plan

Attachment C: Integrated Resource Plan Objective and Strategies

AUTHOR/TITLE:

Staff: James Stack, PhD, Senior Resource Planner

Attachment A

* NOT YET APPROVED *

Resolution No. _____

Resolution of the Council of the City of Palo Alto Approving the 2023 Electric Integrated Resource Plan (IRP),

R E C I T A L S

A. Senate Bill 350 was adopted in 2015, establishing a requirement that all publicly owned utilities (POUs) with an average load greater than 700 GWh (in the 2013-16 period) must adopt Integrated Resource Plans (IRP) by January 1, 2019, submit them to the California Energy Commission (CEC), and update them at least once every five years thereafter (Public Utilities Code Sec. 9621(b)).

B. Based on historical data, the City of Palo Alto is one of the California POUs that are required to file an IRP.

C. The CEC is required to review POU IRPs for consistency with Public Utilities Code 9621 and recommend corrections to deficiencies in the plans, according to the Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines (POU IRP Guidelines) most recently adopted by the CEC in August 2018.

D. The POU IRP Guidelines require POUs to submit certain supporting information along with the IRP, including a set of four standardized tables and a Renewable Portfolio Standard (RPS) Procurement Plan and an RPS Enforcement Program.

E. The City of Palo Alto approved the 2018 Electric IRP and related documents on December 3, 2018 (Resolution 9802) and staff submitted them to the CEC on April 30, 2019.

F. The City of Palo Alto first adopted an RPS Procurement Plan on December 12, 2011 (Resolution 9215) and last updated it on December 7, 2020 (Resolution 9929).

G. The City of Palo Alto also adopted an RPS Enforcement Program on December 12, 2011 (Resolution 9214) and last updated it on December 7, 2020 (Resolution 9929).

The Council of the City of Palo Alto does hereby RESOLVE as follows:

SECTION 1. The Council hereby approves the 2023 Electric Integrated Resource Plan (Attachment B).

SECTION 2. The Council hereby approves the four standardized tables that accompany the 2023 IRP (Appendix C to Attachment B).

SECTION 3. The Council finds that the adoption of this resolution approving the 2023 IRP and related documents is not a project subject to California Environmental Quality Act

(CEQA) review because adoption of this resolution is an administrative government activity that will not result in any direct or indirect physical change to the environment as a result (CEQA Guidelines section 15378(b)(5)).

* NOT YET APPROVED *

INTRODUCED AND PASSED:

AYES:

NOES:

ABSENT:

ABSTENTIONS:

ATTEST:

_____
City Clerk

_____
Mayor

APPROVED AS TO FORM:

_____
Assistant City Attorney

APPROVED:

_____
City Manager

_____
Director of Utilities

_____
Director of Administrative Services

City of Palo Alto

2023 Electric Integrated Resource Plan

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I. Executive Summary

The City of Palo Alto's 2023 Electric Integrated Resource Plan (IRP) is a comprehensive plan for developing a portfolio of power supply resources to meet the utility's objective of providing safe, reliable, environmentally sustainable, and cost-effective electricity services while addressing the substantial risks and uncertainties inherent in the electric utility business. The IRP also supports the City's mission to promote and sustain a superior quality of life in Palo Alto. In partnership with our community, our goal is to deliver cost-effective services in a personal, responsive and innovative manner.

The IRP meets the requirements of California Senate Bill (SB) 350 (de León, Chapter 547, Statutes of 2015), which requires publicly owned utilities (POUs) with an average annual energy load greater than 700 gigawatt-hours (GWh) to submit an updated IRP at least every five years to the California Energy Commission (CEC).

The IRP discusses current and anticipated California regulatory and policy changes facing Palo Alto and the electric utility industry. Additionally, the IRP presents the analyses conducted and underlying assumptions, and outlines a resource plan to reliably and affordably meet customers' energy needs through calendar year 2030.

The electric utility industry has undergone significant changes since Palo Alto prepared its last IRP in 2018, with a continuation of the shift towards greater levels of variable, distributed, low-emissions generation, along with significant growth in energy storage capacity, building and transportation electrification load, and an expanding suite of regulatory mandates that the City must satisfy. The region has also recently experienced extreme volatility in natural gas market prices, the emergence of another state's carbon compliance market, and several other states in the region setting aggressive renewable energy and/or carbon targets. And nationally, the effects of the recent passage of the Inflation Reduction Act and the Infrastructure Investment and Jobs Act are just beginning to be felt in the industry. Table 1 provides an overview of some of the key structural changes in California's electricity market that must be addressed in the 2023 IRP, compared to their status at the time of the 2018 IRP.

Table 1: California Energy Market Changes Since 2018

IRP Topic	2018 Status	2023 Status
GHG Emissions Targets	40% below 1990 levels by 2030	40% below 1990 levels by 2030 and 85% by 2045; 100% carbon-free electricity supply by 2045
Renewable Procurement	50% by 2030 and beyond	60% by 2030 and beyond
Energy Storage	Requirement to study adoption of targets; less than 200 MW of capacity installed in CAISO	Requirement to study adoption of targets; more than 5,000 MW of capacity installed in CAISO
Transportation Electrification	Requirement to address procurement of EV infrastructure	All cars sold after 2035 be ZEV; all new public fleet purchases required to be ZEVs starting in 2027; all medium and heavy duty trucks sold to be ZEVs by 2036

Building Electrification	No goals established	Ban on new natural gas-powered space and water heaters by 2030
Structured Markets	Intra-hour market	Intra-hour market, inter-regional real-time balancing through EIM
Resource Adequacy	Local, system, and flexible capacity requirements	Local, system, and flexible capacity requirements; CPUC-jurisdictional entities moving to slice-of-day framework
Transmission Costs	2.1 cents/kWh	3.5 cents/kWh

Similarly, Palo Alto itself has undergone a myriad of changes over the past five years—both in its long-term planning goals and in how it uses electricity currently. Table 2 describes some of the major changes and accomplishments in Palo Alto since 2018, from dramatic changes in the City's power supply and emissions reduction targets, to considerable growth in local solar generation and electric vehicles (EVs).

Table 2: City of Palo Alto Energy-Related Changes Since 2018

Topic	2018 Status	2023 Status
Community-wide GHG Emissions (from electricity, natural gas and transportation)	**Goal:** Reduce GHG emissions to 80% below 1990 levels by 2030. **Achieved:** 43% below 1990 emission levels.	**Goal:** Reduce GHG emissions to 80% below 1990 by 2030. **Achieved:** 54% below 1990 emission levels (2021).
Electric Supply Portfolio	**Goal:** 50% RPS by 2030; 100% Carbon Neutral by 2013 **Achieved:** 58% RPS; 100% Carbon Neutral (annual accounting)	**Goal:** 60% RPS by 2030; 100% Carbon Neutral by 2013 **Achieved:** 65% RPS; 100% Carbon Neutral (hourly accounting)
Local Solar PV Systems	**Achieved:** 2% of load - 1,081 systems	**Achieved:** 3.1% of load - 1,609 systems (2022)
Energy Efficiency	**Goal:** 0.75% avg. annual load savings; 5.7% cumulative savings (2018-2027) **Achieved:** 0.73% of avg. annual load; 4.4% cumulative 6-year savings (2007-2012)	**Goal:** 0.68% avg. annual load savings; 4.4% cumulative savings (2022-2031) **Achieved:** 0.74% of avg. annual load; 4.5%[1] cumulative 6-year savings (2013-2018)
Energy Storage	**Goal:** No explicit goal.	**Goal:** No explicit goal or rebates as not yet cost-effective. Facilitate customer adoption in coordination with Building department. **Achieved:** 34 systems

[1] Includes savings related to Codes and Standards changes, as well as estimated savings for 2023.

Transportation Electrification	**Goal:** No explicit goal. **Achieved:** Approx. 3,000 EVs registered in Palo Alto; 60 City-owned EV chargers; incentives for EV charger installation.	**Goal:** Target 50% EVs by 2030 **Achieved:** Approx. 6,000 EVs registered in Palo Alto; 124 City-owned EV chargers; Incentives for EV charger installation.
Building Electrification	**Goal:** No explicit goal.	**Goal:** Reduce GHG emissions from the direct use of natural gas in the buildings sector by at least 60% below 1990 levels by 2030
Annual Energy Load	925 GWh	860 GWh
Summer Peak Capacity Load	182.5 MW	178.1 MW
Average Retail Rate[2]	13.9 cents/kWh	21.36 cents/kWh

The IRP planning period is from 2023 through 2045. Through 2028, the City of Palo Alto Utilities (CPAU) has sufficient renewable contracts to supply over 60% of the City's needs. The City's one long-term wind contract and all five landfill-gas-to energy contracts expire in the late 2020's or early 2030's, while the six long-term solar contracts all extend beyond 2040. The City's contract with the Western Area Power Administration (WAPA) for hydroelectric resources, which supplies nearly 40% of the City's energy needs in a normal hydro year, expires at the end of 2024, but the City has already executed a renewed 30-year contract with WAPA (although it retains the ability to reduce its allocation or exit the contract until July 2024).

CPAU expects to continue operating within the Northern California Power Agency's (NCPA) Metered Sub-System Aggregation (MSSA) Agreement with the California Independent System Operator (CAISO). Under this agreement, NCPA balances CPAU's loads and resources to comply with CAISO planning and operating protocols. With resources available under the NCPA MSSA Agreement, Palo Alto has access to sufficient system, local, and flexible capacity, as well as resources to provide ancillary services to reliably meet City loads.

Costs are projected to increase through 2045, primarily due to transmission and distribution system upgrade costs, increasing environmental regulations, and renewable integration costs (which are part of the tradeoff between pursuing sustainable electricity supplies and reducing overall supply costs). Retail energy sales are also projected to increase through 2045 due to building and transportation electrification; increases in energy efficiency and local solar installations are expected to offset these load increases to some degree, but the overall trend in load is expected to be upward.

[2] Retail rate and energy efficiency values are for Fiscal Years 2018 and 2023; the rest of the values in Table 2 are for Calendar Years 2018 and 2023.

CPAU staff will provide public updates on the progress, successes, and new challenges over the implementation period of this IRP.

A. *CEC IRP Guidelines & Required Elements*

The schedule and structure of the IRP process is being guided in large part by state law,[3] which requires Council adoption of Palo Alto's IRP by January 1, 2019, submission to the CEC by April 30, 2019, and updates at least once every five years thereafter. Specifically, the City's IRP demonstrates how the City's utility will:

- Meet GHG emissions reduction targets set by the State's Air Resources Board (Sections II.B, II.C.ii, X.B);
- Ensure procurement of at least 60% renewable resources by 2030 (see IRP Sections II.B, II.C.iii, V.A, X.A);
- Minimizes impacts to ratepayers' bills (Section VI);
- Ensure system and local reliability, including in the hour of peak net demand, and ensure the procurement of resource adequacy products to meet its peak demand and planning reserve margin, sufficient to provide reliable electric service to its customers (Sections III.B.vii, IV.E, IV.F, VII)
- Strengthen the diversity, sustainability, and resilience of the bulk transmission and distribution systems, and local communities (Sections II.B, IV.A.ii, IV.E, IV.F, VII, VIII)
- Enhance distribution systems and demand-side energy management (Sections IV.A.i, VII.B)
- Minimize localized air pollutants and other greenhouse gas emissions with early priority to disadvantaged communities (Sections II.B, IV.A.ii, IX)
- Address rate design, existing or planned incentives, and customer education and outreach that support transportation electrification consistent with the state's carbon-neutrality goals in Executive Order B-55-18 (Sections II.C.vi, IV.A.iii, VI)
- Address the following procurement topics:
    - Energy efficiency and demand resources that are cost effective, reliable, and feasible (Sections II.B, II.C.iv, III.B.i, IV.A.i)
    - Energy storage (Section III.B.iv)
    - Transportation electrification (Section II.C.vi, III.D.iii, IV.A.iii)
    - A diversified procurement portfolio of short-term electricity, long-term electricity, and demand response products and strategies or programs (Section III.B.v)
    - Resource adequacy (Sections IV.G, V.A)

The City currently has the resources, plans, and programs in place needed to achieve all of the objectives addressed by the IRP. In addition, and in order to demonstrate compliance with the objectives listed in the IRP Guidelines, CPAU must include the following four Standardized Tables as part of its IRP submission:

[3] *See* Public Utilities Code sections 9621, 9622; Public Utilities Code section 399.11 also established a new Renewable Portfolio Standard (RPS) to meet 60% of the City's load from applicable renewable supplies by 2030, which the City has already achieved. SB 350 also requires the doubling of energy efficiency savings targets by 2030 and establishes a new Renewable Portfolio Standard (RPS) to meet 50% of the City's load from applicable renewable supplies by 2030. The 10-Year Energy Efficiency Potential Plan approved by Council in March 2017 addresses the new energy efficiency savings requirements and the City expects to achieve an RPS of 58% in 2023.

- Capacity Resource Accounting Table (CRAT): Annual peak capacity demand in each year and the contribution of each energy resource (capacity) in the POU's portfolio to meet that demand.
- Energy Balance Table (EBT): Annual total energy demand and annual estimates for energy supply from various resources.
- RPS Procurement Table (RPT): A detailed summary of a POU resource plan to meet the RPS requirements.
- GHG Emissions Accounting Table (GEAT): Annual GHG emissions associated with each resource in the POU's portfolio to demonstrate compliance with the GHG emissions reduction targets established by CARB.

This IRP along with the four aforementioned Standardized Tables and the materials listed in the Supporting Information section satisfy the IRP filing guidelines listed in the CEC guidelines.

B. *Public Process Summary*

Palo Alto staff has provided numerous reports and presentation related to various facets of the IRP to the Utilities Advisory Commission (UAC) over the past 15 months. The current IRP report was reviewed by the UAC on October 11, 2023, before being presented to the Finance Committee and City Council for approval in November and December 2023. Table 3 below lists all public presentations related to the IRP, with links to the associated reports.

Table 3: Public Process Summary for Development of the 2023 IRP

Forum	Date	Topic	Link
UAC	6/8/2022	Overview of CPAU's IRP Development Process	Report
UAC	12/7/2022	Discussion of CPAU's Long-term Electric Load Forecast	Report
UAC	7/5/2023	Presentation of Electric Supply Portfolio Modeling Results	Presentation
Council	9/18/2023	Annual Carbon Neutral Plan and RPS Supply Update	TBD
UAC	10/11/2023	Recommendation to Approve CPAU's 2023 IRP	TBD
Finance	11/7/2023	Recommendation to Approve CPAU's 2023 IRP	TBD
Council	12/4/2023	Approval of CPAU's 2023 IRP	TBD

An IRP represents a snapshot of a continuous process that evolves and transforms over time. The conditions and circumstances in which utilities must make decisions about how to meet customers' future electric energy needs are ever-changing. The IRP process utilizes a methodology and framework for assessing a utility's ever-changing business and operating requirements and adapting to factors such as changing technology, regulations, and customer behavior. Assumptions, scenarios, and results are all reviewed and updated as information and events unfold, and the process is continually revisited under formal or informal resource planning efforts.

II. Background & Achievements to Date

A. *CPAU History and Mission Statement*

The City of Palo Alto Utilities' (CPAU) history began over one hundred years ago, in 1896, when the water supply system was first installed. Two years later, the wastewater or sewer collection system came online. In 1900, the municipal electric power system began operation, followed in 1917 by a natural gas distribution system. While CPAU and the utilities industry have evolved dramatically over 123 years, the City has nonetheless maintained a consistent set of core values: Quality, Courtesy, Efficiency, Integrity, and Innovation.

Palo Alto's 2023 IRP is a comprehensive planning document to guide long-term power planning aligned with CPAU's Mission Statement, which is "to provide safe, reliable, environmentally sustainable and cost effective services."[4]

B. *Previous IRPs & Recent Accomplishments*

Palo Alto regularly engages in long-term planning efforts related to its electric supply portfolio – previously under the auspices of the Long-term Electric Acquisition Plan (LEAP) and more recently through the IRP. The last time the City completed a LEAP update was on April 16, 2012 (Staff Report 2710, Resolution 9241). A few years later, in 2015, Senate Bill 350 (SB 350) was signed into law, and it includes a requirement that publicly-owned utilities (POUs) serving loads greater than 700,000 megawatt-hours per year, such as Palo Alto, develop and adopt an IRP by January 1, 2019 and submit it to the CEC by April 30, 2019 and every five years thereafter.[5]

As part of the 2012 LEAP update and the 2018 IRP, the City Council approved a set of electric portfolio decision-making Objectives and Strategies; as part of the current IRP process, staff developed an updated version. The current Objective and Strategies, which aligns with the Utilities 2018 Strategic Plan, is very similar to the ones adopted in 2012 and 2018, with the new version placing greater emphasis on managing uncertainty related to resource availability and costs, regulatory uncertainty, and the increased penetration of DERs, electric vehicles (EVs), and building electrification.

The 2018 IRP included a Work Plan describing a set of ongoing tasks and new initiatives for the City to undertake in order to satisfy the Objectives and Strategies. In carrying out this Implementation Plan and other initiatives, Palo Alto has accomplished the following over the past five years:

- Continued to achieve the goals set in the City's **Carbon Neutral Electric Supply Plan**, as it has every year since 2013, while also changing from an annual accounting methodology to a stricter hourly accounting approach in 2020;

[4] See the City of Palo Alto Utilities 2018 Strategic Plan, which includes the Mission Statement and Strategic Direction, here:https://www.cityofpaloalto.org/files/assets/public/utilities/city-of-palo-alto-utilities-2018-strategic-plan-overview.pdf.

[5] *See* Public Utilities Code sections 9621, 9622. The Clean Energy and Pollution Reduction Act of 2015 also raised the state's renewable portfolio standard (RPS) to 50% by 2030 (a standard that was subsequently raised to 60% through SB 100 (2018)) and required a doubling of energy efficiency savings by 2030. The primary objective of the IRP requirement in SB 350 is to ensure that the state's large POUs are on track to reduce their greenhouse gas emissions, helping the state meet its overall target of reducing GHG emissions to 40% below 1990 levels by 2030.

- Increased the **renewable energy supply** from 57% of total load to 65% of total load, fully complying with all CEC RPS procurement and filing requirements without relying on any optional compliance measures or the use of historic carryover generation;
- **Reduced GHG emissions** related to electricity by 123,000 MT CO2e, helping reduce community-wide emissions by 54% compared to 1990 levels;
- Increased the amount of local solar generation participating in the City's **Feed-in Tariff program** (Palo Alto CLEAN) from 1.6 MW to 2.9 MW;
- Executed a **new geothermal power contract** (10 MW of capacity);
- Executed a 30-year extension of the **Western Area Power Administration hydroelectric contract**;
- Achieved cumulative **energy efficiency savings** of 7.4%[6] since 2012;
- Coordinated with other departments on the installation of dozens of new **public EV charger ports** owned and maintained by the City, more than doubling the overall total (now 124);
- Launched a **heat pump water heater program** that provides installation service and on-bill financing to homeowners;
- Launched rebates and a **building electrification technical assistance** program to support electrification projects in commercial buildings;
- Adopted **aggressive energy efficiency goals** which require new and innovative programs;
- Adopted a **Sustainability and Climate Action Plan (S/CAP) Implementation Work Plan** to help the community achieve its goal of reducing emissions to 80% below 1990 levels by 2030;
- Continued to **balance the City's loads and resources** under the CAISO-NCPA Metered Subsystem Agreement;
- Participated in the **SunShares solar group buy program** with 63 solar installations, 21 of which include a storage system, and 3 standalone storage installations initiated since 2021;
- Adopted **local reach codes** that requires all new construction projects to be all-electric with no natural gas appliances.
- Expanded **EV charging infrastructure requirements** for new construction projects above state's minimum requirements.
- Operated an **appliance recycling program** that recycled 50 freezers and 380 refrigerators over the programs 3-year lifetime.

C. *Changing Planning Environment*

Across the industry, integrated resource planning has undergone significant changes in recent years. Traditionally, an IRP was an opportunity for a utility to evaluate the steady growth of its customer loads over a 10+ year planning horizon, and develop a plan for meeting that load growth through staged additions of new centralized thermal generation resources. Today's IRPs, however, have to consider how to integrate increasing volumes of variable and/or distributed generation in an environment of increasing regulatory mandates, all while maintaining reliability and controlling costs. Accordingly, the objective of this IRP is to evaluate Palo Alto's portfolio of resources against the changing utility landscape and California's environmental requirements, while recommending strategies to ensure Palo Alto continues to meet the Council's goals for affordability and sustainability. The following is a description of some of the primary changes to the utilities planning environment over the past several years.

[6] Includes savings related to Codes and Standards changes, as well as estimated savings for 2023.

i. Load Profile Uncertainty & Overgeneration

California's resource mix has changed considerably in recent years as a result of its ambitious renewable mandates and the rapidly declining costs of solar and wind resources. The shift to renewables has led to a fundamental change in the grid's daily net load shape, which traditionally had a single peak lasting several hours each day, but which now has a small peak in the morning and a large, sharp peak in the late evening, and a much lower level throughout the middle of the day. During these midday "solar hours," market prices tend to be dramatically lower and at times can even be negative, as the market sends a price signal that there is too much energy on the grid and that generators either need to pay to generate or curtail their generation. The changing load shape means new resources will be needed, and existing resources will need to be used differently, while maintaining affordability for customers.

Solar and wind resources, unless paired with multi-hour energy storage systems, are intermittent sources of generation, where energy output is a function of fuel availability (i.e., sunlight and wind). In order to accommodate large volumes of intermittent resources, the system must include a sufficient supply of highly responsive resources (or load) to follow this new demand profile. Recent capacity additions for RPS compliance have largely been solar resources, which are introducing a surplus of energy supply in the daytime hours, particularly in the spring and fall when renewable resources maintain higher levels of output and customer loads are at seasonal lows.

ii. GHG Emission Reductions

In 2006, California passed Assembly Bill (AB) 32, the California Global Warming Solutions Act. AB 32 is a mandate for several sectors, including the electricity sector, to reduce GHG emissions to 1990 levels by 2020. In 2016, AB 32 was augmented by Senate Bill (SB) 32, which mandated a GHG emissions reduction target of 40% below 1990 levels by 2030. In 2022, CARB raised the 2030 GHG emissions reduction goal to 48% below 1990 levels and added a new target of net zero emissions by 2045. California's aggressive GHG emissions reduction goals will be achieved through a combination of market mechanisms (e.g., Cap and Trade) and prescriptive mandates (e.g., RPS) to retire and replace high emitting resources with cleaner resources.

In order to achieve these targets, many sectors of the economy – including industry, transportation, and electricity – will need to reduce their GHG emissions. The state's electric sector GHG emissions in 1990 were 108 MMT CO2e. Reducing this amount by 48% creates a target of 56 MMT CO2e; however, CARB's 2030 GHG planning target range of 30-53 MMT CO2e for the electricity sector is a 51% to 72% reduction, well in excess of the sector's pro-rata share of the overall reduction target.[7]

The electricity sector is expected to surpass its pro-rata emission reduction share due primarily to the 60% RPS goal and aggressive energy efficiency requirements. SB 350 requires that POU IRPs not only describe how they will meet their 60% RPS target by 2030, but also how they will contribute to the

[7] The two other major sectors in the economy are the industrial and transportation sectors. In the Scoping Plan, CARB estimates the industrial sector can reduce GHG emissions between 8% and 15%, while the transportation sector can reduce GHG emissions between 27% and 32%. Much of the transportation sector's emissions reduction burden is expected to be shifted to the electricity sector via transportation electrification, which was not accounted for in CARB's Scoping Plan. This means the electricity sector's GHG emissions reduction burden will be even greater than it appears.

electricity sector's share of GHG emissions reductions target for that year. For benchmarking in this IRP and for portfolio planning purposes, Palo Alto used the mid-range value of 41.5 MMT CO2e as the 2030 target for the electricity sector (of which Palo Alto's load-based pro rata share is 72,000 MT CO2e). These goals are for planning purposes and not compulsory; however, if changes to the regulations occur, Palo Alto will reflect those updates in its future resource planning efforts.

iii. Renewable Portfolio Standards (RPS)

One of the primary mechanisms for reducing GHG emissions in the electricity sector is the state's RPS. The state's RPS program mandates that an increasing percentage of retail sales be served by qualifying renewable generation. An RPS mandate was first imposed on Palo Alto by SB X1-2 in 2011, and subsequently expanded by SB 350 in 2015 and SB 100 in 2018. Currently, the major targets are 50% by 2026 and 60% by 2030. Through a formal rulemaking process, the CEC adopted multi-year Compliance Periods and procurement targets for each calendar year (CY) through the year 2030, as outlined below:

$$\text{Compliance Period 4 Target} \geq 35.75\% \times \text{CPAU Retail Sales}_{2021} + 38.5\% \times \text{CPAU Retail Sales}_{2022} + 41.25\% \times \text{CPAU Retail Sales}_{2023} + 44\% \times \text{CPAU Retail Sales}_{2024}$$

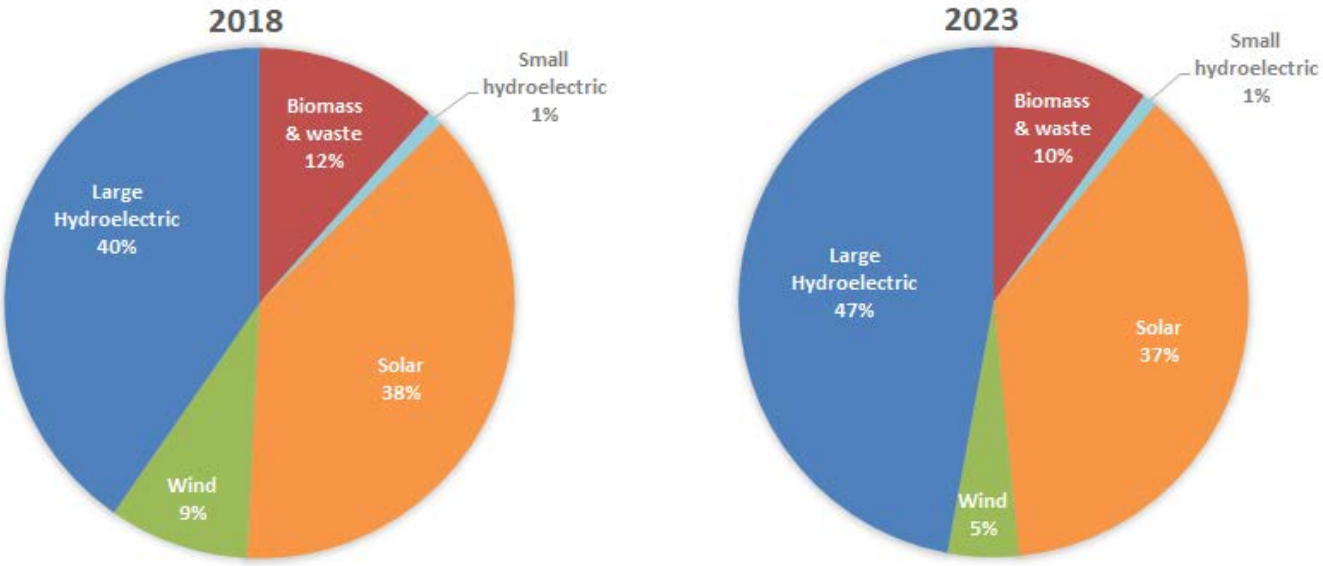
$$\text{Compliance Period 5 Target} \geq 46\% \times \text{CPAU Retail Sales}_{2025} + 50\% \times \text{CPAU Retail Sales}_{2026} + 52\% \times \text{CPAU Retail Sales}_{2027}$$

$$\text{Compliance Period 6 Target} \geq 54.67\% \times \text{CPAU Retail Sales}_{2028} + 57.33\% \times \text{CPAU Retail Sales}_{2029} + 60\% \times \text{CPAU Retail Sales}_{2030}$$

In addition to the minimum renewable generation procurement requirements, the RPS program also includes portfolio balancing requirements and long-term contract requirements, as described in Palo Alto's RPS Procurement Plan (included as Supplementary Information).

Palo Alto satisfies its RPS requirements through a diverse portfolio of qualifying renewable resources – wind, solar, bioenergy (landfill gas), and small hydro. In addition, approximately half of Palo Alto's load is served by large hydro, a carbon-free resource that helps reduce GHG emissions but which cannot be counted for RPS compliance. Figure 1 illustrates Palo Alto's actual and projected power supply mix for 2018 and 2023. If the City maintains its full contract allocation with the Western Area Power Administration after 2024, the 2030 power supply mix is projected to be similar to the 2023 mix, but with less wind and landfill gas; these resources would be replaced with another (as yet undetermined) renewable energy source.

Figure 1: Palo Alto Power Supply Changes Since Previous IRP



iv. Regional Grid Transformation

CPAU is a market participant in CAISO, the non-profit agency that manages 26,000 circuit miles of high-voltage power lines that make up 80% of California's power grid, serving 30 million consumers. CAISO also operates a competitive wholesale energy and ancillary services market, and is responsible for grid reliability and efficiency. While the vast amount of new variable renewable energy resources that have been built in California in recent years have driven down the state's GHG emissions associated with electricity usage, they have also presented CAISO with significant challenges for maintaining grid reliability and energy market stability.

In an effort to promote the reliability of the greater regional electric transmission system, CAISO has recently been pursuing several initiatives aimed at greater integration of the CAISO grid with other balancing authority areas (BAAs) in the region. These efforts – including the Western Energy Imbalance Market (WEIM) and the Extended Day Ahead Market (EDAM) – are attempting to leverage the significant resource diversity and transmission connectivity between major supply and demand regions throughout the western United States, creating additional benefits through strong regional collaboration across a larger geographic footprint. Since its launch in 2014, the WEIM has grown to 22 participating entities representing 79% of the load in the Western Interconnection, and delivering more than $3 billion in benefits, along with reliability and environmental benefits.

v. Energy Efficiency

California has continually increased the energy efficiency of its new buildings and appliances since the Warren Alquist Act of 1974. These efficiency standards (Title 24) were updated to mandate Zero Net Energy (ZNE) residential new construction starting in 2020. ZNE homes require energy efficiency that will be achieved through implementing a high-efficiency envelope (insulation, windows, etc.), and efficient heating, ventilation, and air conditioning units. The remaining energy consumption must be offset by on-

site generation, sized so that the annual building electricity consumption is equal to the building's electricity generation.

vi. Building & Transportation Electrification

Since January 2020, Palo Alto's local reach codes require that all low-rise residential new construction projects to be all-electric. Beginning January 2023, Palo Alto has expanded the all-electric new construction requirement to include nonresidential buildings and has also prohibited new gas infrastructure for outdoor equipment such as pools, spas and BBQ grills. Since 2016, Palo Alto has offered rebates to encourage homeowners to replace their gas water heaters with heat pump water heaters (HPWH). Uptake of the rebate program has been low due to high upfront cost and low awareness of heat pump technology. In Spring 2023, Palo Alto launched an innovative program that offers end-to-end HPWH installation service with on-bill financing to lower the upfront cost to homeowners. Within the Bay Area, other community choice aggregators (CCAs) and agencies such as BayREN have begun incentivizing the adoption of HPWHs as a strategy to reduce fossil fuel use and lower GHG emissions. At the state level, the TECH Clean program is a statewide initiative to accelerate the adoption of heat pump water heating and space heating technology across California. The Federal Inflation Reduction Act of 2022 further created tax incentives and rebates to support heat pump technologies. Collectively, these incentives are expected to reduce the cost barrier and advance the market transformation for heat pump technologies. In September 2022, the California Air Resources Board voted to ban the sale of new natural gas-powered space and water heaters in California by 2030. This is an important step to help California meet its carbon-neutral goal by 2045, given that residential and commercial buildings account for around 25% of the state's GHG emissions.

The 2022 California Green Building Standards (CALGreen) specify minimum EV infrastructure requirements for new buildings and existing multifamily buildings. Through its local green building codes, Palo Alto has adopted EV infrastructure requirements that exceed these minimum state requirements. These local efforts, along with EV customer programs described below and the state's Advanced Clean Cars regulations that require 100% sales to be emission free by 2035 and Advanced Clean Trucks/Fleets Regulations requiring fleets and trucks sold to be emission free by 2036 will greatly enhance Palo Alto's ability to meet its GHG reduction goals.

D. *Overview of IRP Methodology*

Integrated resource planning is the process that utilities undertake to determine a long-term plan to ensure generation resources are adequate to meet projected future peak capacity and energy needs, while achieving other utility goals such as maintaining an adequate capacity reserve margin for system reliability. Resource plans must ensure generation reliability is maintained at or above industry-standard levels. IRPs should also forecast long-term costs and potential rate impacts to customers to ensure that the utility can monitor and track trends with sufficient time to implement solutions to ensure reliability, compliance, and affordable electric service. An effective resource plan should also provide a reasonable degree of flexibility for the utility to deal with uncertainty in technological change and future regulations.

IRPs require the use of sophisticated analytical tools capable of evaluating and comparing the costs and benefits of a comprehensive set of alternative supply and demand resources. Supply options typically

include the evaluation of new conventional generation resources, renewable energy technologies, and distributed energy resources. Demand options typically include consideration of demand response programs, energy efficiency programs, and other "behind the meter" options which may reduce the overall load that the utility must be prepared to supply.

IRPs utilize various economic analyses and methodologies to assess alternative scenarios (e.g., different combinations of supply and demand resources) and sensitivities to key assumptions to arrive at an economically optimal resource plan (subject to various constraints, such as regulatory mandates and local policies). The key steps in the resource planning process are outlined below.

Step 1: EXAMINE PLANNING FRAMEWORK AND RISKS: Identify and assess challenges the utility faces in the current business and regulatory environment.

Step 2: ASSESS NEEDS: Develop forecasts of load changes (incorporating impacts of cost-effective demand-side resources), existing plant conditions, contract terms, and operational constraints to determine resource needs over the planning period.

Step 3: CONSIDER RESOURCE OPTIONS: Evaluate available generation resources, including centralized and distributed renewables and long-term market power purchases to identify the role each will play in meeting customer needs and regulatory and policy goals.

Step 4: DEVELOP RESOURCE PORTFOLIOS: Develop resource portfolios and evaluate them quantitatively and qualitatively to determine a preferred portfolio. Evaluation relies upon GHG emission requirements, needs assessment, and planning data specified in previous steps.

Step 5: PERFORM SCENARIO AND RISK ANALYSIS: Perform detailed evaluations of preferred resource portfolios through scenario and risk analysis, to assess performance under a range of potential market and regulatory conditions.

Step 6: IDENTIFY PLAN: Identify a "Preferred Plan" based on the resource portfolio expected to reliably serve demand at a reasonable long-term cost, while achieving regulatory compliance, accounting for inherent risks, and allowing for flexibility to respond to future policy changes.

III. Forecast Methodology for Energy and Peak Demand

Palo Alto's forecasted energy and demand were generated by creating an econometric model for monthly energy and peak demand and then adding the non-linear components of EV load growth, building electrification growth, and additional commercial projects planned. Energy and peak demand profiles for these additional loads were generated they were added to the energy and peak demand forecast.

Equation 1: Methodology Energy and Peak Demand Forecast

$$Forecast = Econometric\ Forecast + EV_{Nonlinear\ Growth} + Building\ Elec. + New\ Com.\ Loads$$

More details on the econometric forecast and additional nonlinear loads that were added to the IRP long-term forecast are shown in the December 2022 Utilities Advisory Commission meeting (ID # 14677).[8]

A. *Description of Econometric Forecast Models*

i. Energy Econometric Model

The econometric model inputs (i.e. independent variables) have been selected based on the availability of data, economic theory, and tests to validate the forecasts with actual energy (or demand) data. The coefficients of the models were obtained via statistical estimation on historical (in-sample) data where the Yule-Walker Generalized Least Squares method was employed to take into account the autocorrelation structure of the residuals to obtain valid standard error estimates. The coefficients were then combined with forecasts of each driver (independent variable) to produce the forecasted energy (or peak demand). Forecasts of the economic driver variable were provided by the Bureau of Economic Analysis and the forecasted values provided by the UCLA Anderson Forecast group. Weather variables were obtained from NOAA, and the forecasted weather conditions were set to reflect normal weather based on average temperatures across the training data set.

ii. Peak Demand Econometric Model

The Peak Demand forecast is also an econometric model that maps a set of calendar variables, weather variables, and the energy forecast onto Palo Alto's monthly peak demand measured at its CAISO meter. Similar to the Energy Forecast, monthly dummy variables are used in the model to capture underlying changes in Palo Alto customers' electric consumption throughout the year. Daily heating and cooling degree days corresponding to the peak day of the month is used as the weather driver. Monthly historical energy usage is added as the final variable explaining peak demand.

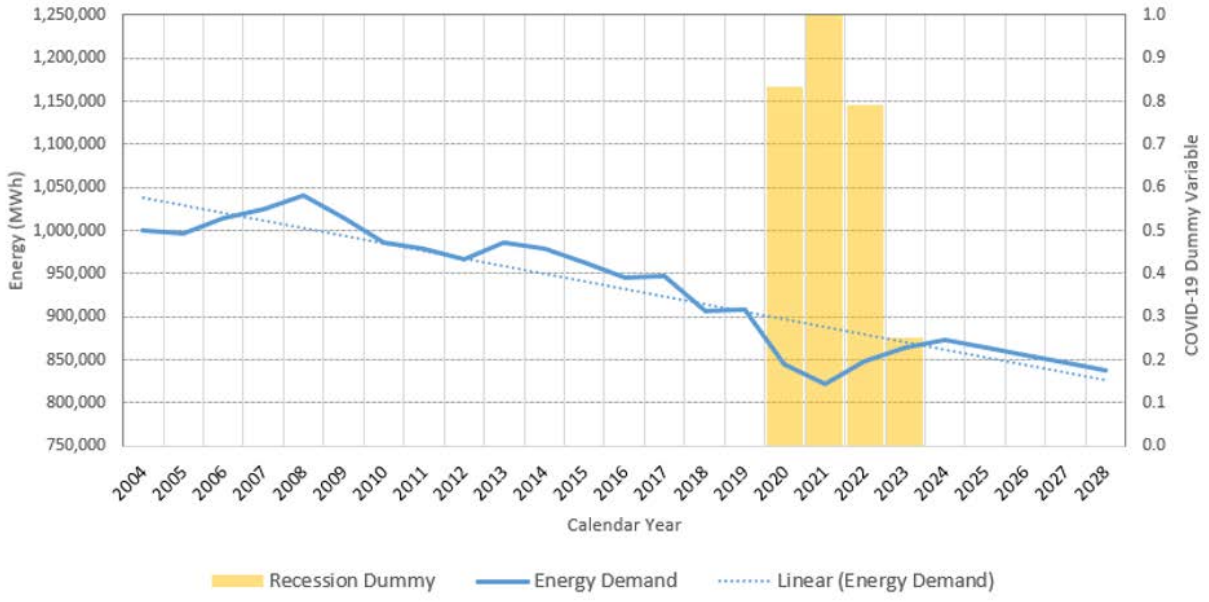
iii. Impact of COVID-19 Recession

The recession due to COVID-19 required an additional 'recession dummy' variable superimposed on top of it, given it is the only time in recent history of stay at home orders and required working from home.

[8] https://www.cityofpaloalto.org/files/assets/public/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2022/12-07-2022/12-07-2022-agenda-and-packet.pdf
Page 71 (ID # 14677)

The electricity consumption of Palo Alto is rebounding as Palo Alto exits the COVID-19 recession, and electricity consumption expected to largely normalize by 2023.

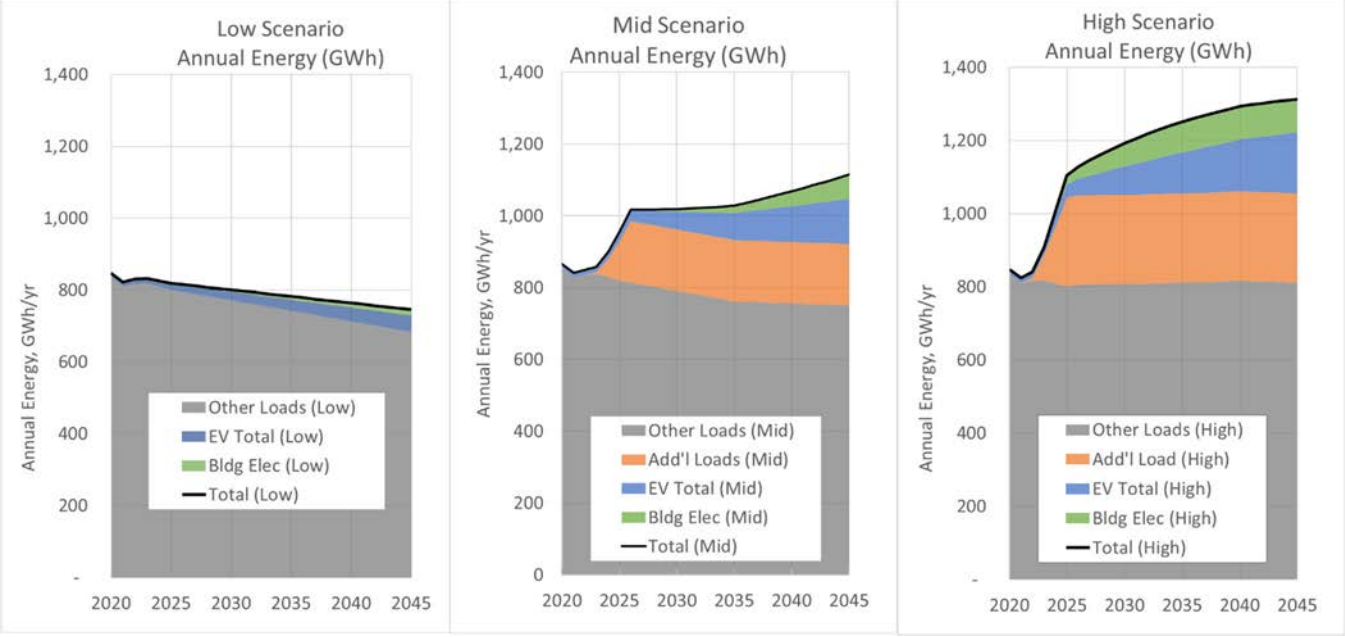
Figure 2. Graph of Long-term Linear Load Loss and COVID-19 Recession



B. *Overall Forecast Including Linear and Nonlinear Trends*

The combined forecast for low, mid, and high projections are shown in Figure 3 total expected additional data center load, total EV load, building electrification load, in order show the relative scale of expected loads.

Figure 3. Load Projections with Total EV loads, New Data Center Loads, and Electrification



For both electric vehicle adoption and building electrification rate, the high case assumes meeting 71% reduction in CO2 emissions from 1990 levels by 2030. The low forecasts for both electric vehicle adoption and building electrification rate assume linear extrapolation of current trends of the last three to five years. The mid forecasts for both electric vehicles and building electrification are aggressive but potentially realistic. The data center additional load growth is for additional data centers which are planned for the next three years, with 70% of customer projected loads assumed for the mid forecast, and 100% for the high case.

Table 4. Additional Loads with Nonlinear Components

	2020	2045 projection		
Additional Modeled Load Growth	**Actual**	**Low**	**Mid**	**High**
Additional Data Centers, GWh	-	0 (0%)	161 (19%)	230 (27%)
Electric Vehicles, GWh	10 (1%)	46 (5%)	129 (15%)	165 (19%)
Building Electrification, GWh	1 (0.1%)	16 (2%)	69 (8%)	91 (11%)
Total, GWh	**11 (1%)**	**62 (7%)**	**359 (42%)**	**486 57%**

Table 5. Assumptions behind Growth Factors for Data Centers, EVs, and Building Electrification

	Low Projection			Mid Projection			High Projection		
New Load Assumptions	2020	2030	2045	2020	2030	2045	2020	2030	2045
New Data Centers	-	-	-	-	70%	70%	100	100%	100%
Electric Vehicles									
Residents Vehicles	10%	21%	42%	10%	31%	61%	10%	44%	86%
Res. New Vehicles	30%	40%	62%	30%	50%	80%	30%	85%	100%
Building Electrification									
Single-Family All-electric	1%	7%	26%	1%	10%	87%	1%	100%	100%
Gas Packs Converted	0%	0%	0%	0%	0%	75%	0%	75%	100%
School Sqft Converted	0%	0%	0%	0%	0%	25%	0%	25%	50%
Large Com. Converted	0%	0%	0%	0%	5%	20%	0%	20%	40%

C. *Changes in Seasonal and Hourly Usage Patterns*

Staff is also exploring the changing trends of electricity usage and have updated the hourly models to encompass these hourly and seasonal trends (higher winter loads, nighttime loads), behind the meter solar and batteries, and elevated temperatures from climate change (e.g. more air conditioning, less heating overall). Approximately half of the building electrification load is expected to be from heating homes and businesses, which will have more usage in the winter and in the night. Staff has incorporated this into our hourly forecast and will consider running sensitivities around it. Electric vehicles used for

commuting are also assumed to charge more in the evenings and at night, which staff have also integrated into the hourly forecast.

D. *Specific Components of Forecast*

i. Energy Efficiency Forecast

a. Committed Energy Efficiency

AB 2021 (2006) required POUs to identify all potentially achievable cost-effective electric efficiency savings and to establish annual targets for energy efficiency savings over ten years, with the first set of EE targets to be reported to the CEC by June 1, 2007, and updated every three years thereafter. AB 2227 (2012) amended this target-setting schedule to every four years. Palo Alto adopted its first Ten-Year Energy Efficiency Portfolio Plan in April 2007, which included annual electric and gas efficiency targets between 2008 and 2017, with a ten-year cumulative savings goal of 3.5% of forecasted energy use. In accordance with California law, the electric efficiency targets were updated in 2010, with the ten-year cumulative savings goal doubling to 7.2% between 2011 and 2020. Since then, increasingly stringent statewide building code and appliance standards have resulted in substantial energy savings. However, these "codes and standards" energy savings cannot be counted toward meeting the utility's EE goals.

The ten-year electric efficiency targets were updated again in 2012, with the ten-year cumulative electric efficiency savings being revised downwards to 4.8% between 2014 and 2023. For fiscal year (FY) 2017, CPAU achieved electric savings of 0.7% of load through its customer efficiency programs. Cumulative electric efficiency savings since 2006 are about 6% of the FY 2017 electric usage. Adoption rates for EE are based on the 10-year Energy Efficiency Goals for 2023-2027 which were updated in 2017. The ten-year cumulative electric efficiency savings target was updated to 5.7% between 2023 and 2027. In 2021, CPAU updated its 10-year Energy Efficiency goals for 2022-2031 with a cumulative EE savings goals of 4.4%. Energy efficiency goals were set lower for this period due to the impacts of Covid-19 on energy efficiency program participation and the growing focus on promoting electrification over efficiency.

b. Additional Achievable Energy Efficiency

There is no additional achievable energy efficiency assumed in this IRP forecast because the additional achievable energy efficiency is already included in the adopted energy efficiency goals for 2022 to 2031.

ii. Solar Photovoltaic Forecast

We have projected approximately linear growth of local solar through 2045. Solar PV projections are based on technical and economic potential; they indicate that adoption will grow steadily, with the growth rate itself plateauing as is typically seen in a maturing market. These projections include only behind-the-meter installations in residential and commercial sectors.

iii. Transportation Electrification Forecast

The EV adoption rate in Palo Alto is around 15% of total vehicles registered in the City at the end of 2022, approximately four times greater than the California statewide average, and this residential adoption rate relative to statewide average projections is assumed to continue at a roughly linear pace until 2045. To estimate the EV adoption rates of commuters *into* Palo Alto, the observed adoption rate from 2017

census data for the entire Bay Area was extended to 2030. In addition to the number of residential EVs there are projected to be approximately 1,900, 3,000, and 11,000 commuter EVs in 2017, 2020 and 2030, respectively. CPAU staff projects roughly linear energy consumption growth from EVs until 2045 given the competing forces of increasing EV adoption, smaller EVs such as electric bikes, and fewer vehicle miles traveled (from increased telecommuting, walking, and cycling). Detailed estimates of load growth are shown above in Table 5.

iv. Building Electrification Forecast

As mentioned above, staff has estimated a substantial amount of conversions of current residential and commercial natural gas appliances to electric. Table 5 shows the underlying assumptions for rate of conversions. The assumed scenario is represented in the 'mid' scenario.

v. Energy Storage Forecast

CPAU, in coordination with the Palo Alto Development Services Department, is facilitating the adoption of energy storage systems by customers by streamlining the process for permitting and interconnecting such systems. Detailed analysis in 2020 showed that batteries are currently not cost effective from a societal perspective within CPAU's service territory and therefore Palo Alto currently does not provide any rebates for energy storage systems.[9] The current net energy metering rate provides some incentive for energy storage systems by incentivizing onsite usage, with a lower buyback rate for power exported to the grid. The current relatively high monthly demand charges for commercial customers incentivizes energy storage systems to lower peak monthly demand. Staff is also currently evaluating proposals for large utility-scale batteries at our resources or new resources. Some battery storage is included in our recommended electric supply portfolio.

vi. SB 338 Requirements

On September 30, 2017, SB 338 was signed into law by Governor Brown, including additional provisions for the POU IRPs, which were effective January 1, 2018. This included revisions to Public Utilities Code section 9621(c), requiring the POU's governing board to *"consider the role of existing renewable generation, grid operational efficiencies, energy storage, and distributed energy resources, including energy efficiency, in helping to ensure each utility meets energy needs and reliability needs in hours to encompass the hour of peak demand of electricity, excluding demand met by variable renewable generation directly connected to a California balancing authority, as defined in Section 399.12, while reducing the need for new electricity generation resources and new transmission resources in achieving the state's energy goals at the least cost to ratepayers."*

As part of the comprehensive process undertaken to develop this IRP, CPAU staff reviewed and considered resource options that included all of the technologically feasible and cost-effective options available to it, including what options would be best utilized to meet energy needs and reliability requirements during hours of net peak[10] demand for the utility. This includes a review of the best

[9] https://efiling.energy.ca.gov/GetDocument.aspx?tn=236202-1&DocumentContentId=69171
https://www.cityofpaloalto.org/files/assets/public/city-clerk/resolutions/reso-9396.pdf

[10] "Net peak demand" is defined as peak electricity demand, excluding demand met by variable renewable generation directly connected to a California balancing authority.

available options considering both new and existing preferred resources, as would necessarily be assessed in order to ensure that Palo Alto provides its customers with the cleanest and most cost-effective generation resources, while also ensuring that the City meets all of the statutory requirements of not only Section 9621, but other procurement and resources mandates, as well.

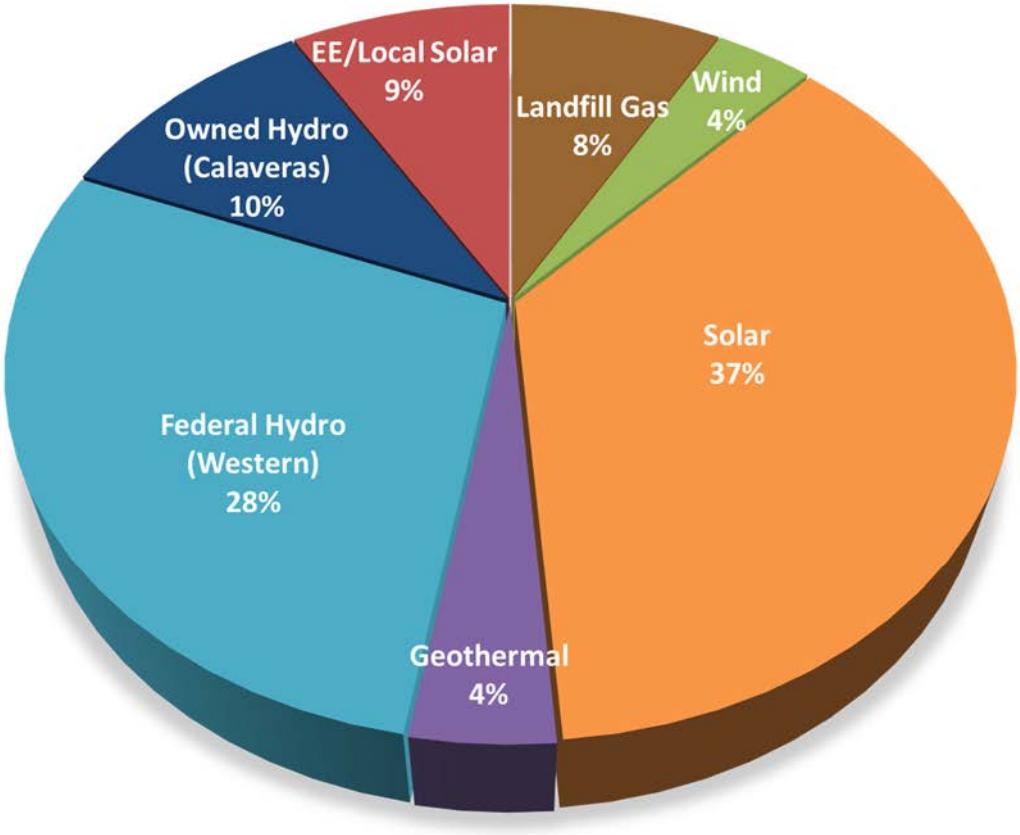
IV.

The City's current electric supply portfolio comprises the following major types of resources:

- Energy efficiency and distributed generation;
- Federal hydro (Western contract);
- Owned hydro (Calaveras);
- Long-term, in-state, RPS-eligible power purchase agreements (PPAs), which include solar, wind, and landfill-gas resources; and
- Market power purchases, matched with RECs, for monthly/hourly portfolio balancing.

For calendar year 2025, the projected contribution of each of these five resource types to the City's overall electric supply portfolio is represented in Figure 4 below.

Figure 4: Projected Palo Alto Electric Supply Mix in CY 2025 by Resource Type
*** Estimated Average Annual Unit Cost of 6 ¢/kWh ***



A. *Energy Efficiency, Building Electrification, Transportation Electrification & Local Renewable Generation*

i. Energy Efficiency

Palo Alto has long recognized cost-effective energy efficiency (EE) as the highest priority energy resource, given that EE typically displaces relatively expensive electricity generation and lowers energy bills for customers.

Palo Alto places such emphasis on energy efficiency and demand side management programs that each year we prepare a detailed Demand Side Management Annual Report describing and reporting on efficiency savings from electricity, gas, and water.

Highlights of Current Energy Efficiency Programs

- **Multifamily Residence Plus+ Program -** This CPAU program focuses on multifamily buildings, especially below-market rate apartment complexes, providing free, direct installation of energy efficiency measures to multifamily residences with four or more units including hospices, care centers, and rehabilitation facilities. Efficiency measures covered under this program include efficient lighting, attic insulation, refrigerator replacement, and more recently, high efficiency toilets as well as air source heat pump systems to replace gas furnaces.

- **The Home Efficiency Genie Program -** The Genie was launched in 2015 as a home efficiency assessment program. The program provides phone consultation to customers to review their utility bills and advise on efficiency upgrade projects. For a fee, residents can receive an in-depth home efficiency assessment which includes air leakage testing, duct inspection, and insulation analysis. In 2019, a home electrification readiness assessment was added to help homeowners determine existing home amp loads and electric main panel size, and to provide project guidance on home electrification projects such as adding EV charger or a HPWH.

- **Heat-Pump Water Heater Program –** In Spring 2023, Palo Alto launched a full-service HPWH program that provides end-to-end service to replace a gas water heater with a HPWH in single family homes. The project cost is subsidized by CPAU, and to further lower the upfront cost to residents, CPAU offers a zero interest on-bill financing option. Customers can also opt for a rebate if they prefer to choose their own contractor. The program has a goal of installing 1000 HPWHs in one year.

- **Green Building Ordinance –** The Green Building Ordinance (GBO) is Palo Alto's local building reach code that is more stringent than the state's Title 24 standards. Prior to the 2022 code cycle, the GBO requires that new construction projects exceed the state's energy and water efficiency standards. For the 2022 code cycle, Palo Alto requires that all new construction projects be all-electric with no gas-fired equipment or appliances.

- **Residential Energy Assistance Program (REAP) -** This program provides qualifying low-income residents with free energy and water efficiency measures such as LED lighting, heating system upgrades, weather stripping and shell insulation. More recently, high efficiency toilets, heat

pump water heaters, and air source heat pump systems are added to the measure list. This program has equal focus on efficiency and comfort, so there may not be reported energy savings for a customer project.

- **Business Energy Advisor** – Commercial customers can get a free consultation and on-site assessment from the Business Energy Advisor with custom recommendations for to help them lower their utility costs with more efficient equipment. From there, the Business Energy Advisor can help them find qualified contractors, identify rebates available, and explore financing options.

- **Commercial and Industrial Energy Efficiency Program (CIEEP)** – This program provides commercial and industrial (C&I) customers with a free high-level assessment of their facility's energy usage and concrete recommendations for saving energy. The program has been running since 2009, providing cash incentives and no-cost expert engineering support through Enovity.

ii. Building Electrification

CPAU is currently offering a concierge program (the Heat Pump Water Heater program) to help single family residents switch from a gas water heater to a heat pump water heater at a discounted project cost using a City contractor; zero-interest financing is available to lower the upfront project cost. Residents can also choose their own contractor to install a heat pump water heater and receive a $2,300 rebate.

For commercial customers, CPAU is offering free on-site assessment to identify electrification opportunities and free consultation for contractor selection, equipment selection and permitting. Electrification rebates are available for eligible products to offset project costs.

iii. Transportation Electrification

CPAU provides customers with a wealth of information on choosing and comparing vehicles and provides both financial and technical assistance to support the installation of EV charging equipment. CPAU offers qualifying customers (including school, non-profits, and multi-family properties) rebates of up to $80,000 for installing EV charging equipment. If customers installing EV charging infrastructure need to upgrade their electric service capacity, CPAU also offers Transformer Upgrade Rebates (up to $10,000 for single-family homes and up to $100,000 for schools, non-profits organizations, public entities, and multi-family/mixed-use properties).

In terms of technical assistance, CPAU provides customers who want to install an EV charger at their home with a free online estimate for their project and also connects them with a local, vetted professional who will handle the permitting and inspections process for them. CPAU also offers an EV Charging Technical Assistance Program that provides personalized technical assistance, free of charge, to support owners and managers of schools, non-profits, multifamily properties, and small to medium businesses navigate the process of installing EV charging infrastructure. This assistance can include help with site assessments, engineering, design, vetting contractor bids, and project managing the installations.

iv. Local Renewable Generation

Local renewable energy programs are critical to lowering emissions of local air pollutants and CPAU has enacted a number of initiatives and programs to facilitate customer adoption.

The following is a description of Palo Alto's current customer-side renewable generation programs:

- **SunShares -** Every year since 2015 Palo Alto has been an active partner in promoting the Bay Area SunShares PV Group-buy program which pre-screens solar installers and negotiates lower rates for customers. Since 2015, Palo Alto has been the top "Outreach Partner," both in terms of the number of solar contracts signed and the kilowatts of rooftop solar capacity installed annually through the program. In 2021 and 2022 Palo Alto customers completed 63 solar installations totaling 368 kW through the SunShares program, 21 of which include a storage system, and 3 standalone storage installations.
- **Net-Energy Metering Successor Program -** Prior to January 1, 2018 residential and commercial customers in Palo Alto who installed approved PV systems were able to sign up for the CPAU Net Energy Metering (NEM) program. CPAU reached the NEM cap of 10.8 MW in January 2018 and CPAU is now offering a NEM Successor Program instead. The NEM Successor process is integrated with the permitting process, and customers receive a credit for electricity exported to the grid based on CPAU's avoided costs.
- **Palo Alto CLEAN (Clean Local Energy Accessible Now) -** This feed-in tariff program purchases electricity generated by renewable energy resources located in Palo Alto's service territory and interconnected on the utility-side of the electric meter. The electricity is purchased by Palo Alto for the electric renewable portfolio standard. The program was launched in 2012 and has been modified several times since then. In February 2014 the City Council approved a total program capacity of 3 MW at a price of 16.5 cents per kilowatt hour (kWh) fixed for 20 years. In May 2017 the City Council approved additional minor changes to the program, including adding a 15-year contract term option and removing the total participation cap for both solar and non-solar eligible renewable energy resources. CPAU is currently offering to purchase the output of eligible renewable electric generation systems located in Palo Alto at the following prices:
    - For solar energy resources: 16.5 cents per kilowatt hour (¢/kWh) for a 15-, 20- or 25-year contract term until the subscribed capacity reaches 3 MW – after that the price will drop to 8.8 ¢/kWh for a 15-year contract term, 8.9 ¢/kWh for a 20-year contract term, or 9.1 ¢/kWh for a 25-year contract term; and
    - For non-solar eligible renewable energy resources: 8.3 ¢/kWh for a 15-year contract term, 8.4 ¢/kWh for a 20-year contract term, or 8.5 ¢/kWh for a 25-year contract term.

  There is no minimum or maximum project size, but the program is best suited for commercial property owners with available roof-tops or parking lots. In 2016, Palo Alto's Public Works Department solicited proposals to install solar PV systems and electric vehicle chargers at four City-owned parking structures; all four of these parking garage solar PV systems participate in the CLEAN program and are now operational. As of August 2023, there are a total of six solar PV systems participating in the Palo Alto CLEAN program, accounting for 2.915 MW of the capacity available at the 16.5 ¢/kWh contract rate, with contract terms ranging from 15 to 25-years.

B. *Hydroelectric Resources*

i. Sierra Nevada Region Western Area Power Authority (WAPA) Base Resource

Since the 1960s, CPAU's participation as a power customer of the Central Valley Project (CVP) has been an instrumental factor in its ability to deliver low-carbon electricity to Palo Altans at low rates. The U.S. Bureau of Reclamation (BOR) built the CVP in the 1930s and is charged with the operation, maintenance, and stewardship of the project. The CVP was constructed primarily for flood control of the Sacramento Valley area; however, it is also used to provide water for irrigation and municipal use and for navigation and recreational purposes. Hydroelectric generation is a lower priority function of the CVP, relative to the purposes listed previously.

The BOR is legally required to first provide power to "Project Use" for operations and pumping water through the CVP project, and then to "First Preference Customers," those customers whose livelihood and/or property/land was impacted by the construction of the CVP. The remaining hydroelectricity ("Base Resource") is then made available for marketing under long-term contracts with not-for-profit entities such as municipal utilities and special districts. The Western Area Power Administration (WAPA) is the federal Power Marketing Agency charged with marketing and contracting with customers for the electric output associated with the CVP, and collecting funds to meet allocated revenue requirements on behalf of the BOR. WAPA also responsible for transmission of the federal power.

In 2000, the City executed a new 20-year contract with WAPA for CVP power deliveries starting in 2005. Under this contract the City receives 12.3% of all the Base Resource product output and is obligated to pay 12.3% of all the CVP's revenue requirements as allocated to power customers, regardless of the amount of energy received. Under normal precipitation and hydrological conditions, this resource provides over 30% of CPAU's electricity needs. However, since 2005 the amount has varied from a low of 11% to a high of 64%. Given that the overall cost of this contract is essentially fixed while the amount of energy the City receives from it varies significantly with weather conditions, the corresponding cost per MWh has ranged from $22 to $105/MWh.

The current Base Resource contract will expire at the end of 2024. Under WAPA's 2025 Power Marketing Plan, CPAU, as an existing Base Resource power customer, recently executed a contract to renew its Base Resource allocation at 98% of its existing allocation level for a thirty-year term (2025-2054).[11] However, under the terms of the Power Marketing Plan, all Base Resource power customers have the ability to reduce their allocation under the new contract—or exit the agreement entirely—until the end of June 2024. Therefore, a key consideration of the current IRP is whether or not the City should exercise this option to reduce its allocation, and if so, to what degree—and what alternative resources to replace it with.

The analysis necessary to aid Council in its decision will consider the cost and the value of the resource going forward. Generation is highly variable and uncertain due to unpredictable precipitation conditions,

[11] Resolution 9946: https://www.cityofpaloalto.org/files/assets/public/v/1/city-clerk/resolutions/resolutions-1909-to-present/2021/reso-9946.pdf

climate change, and the potential for new environmental policies and/or projects which threaten to erode generation volumes and/or value.

The costs associated with participating in the Base Resource are also highly uncertain. The project has many parts that need to be replaced, as it was first put into service nearly eighty years ago. Additionally, funding requirements under the Central Valley Project Improvement Act (CVPIA)[12] and the appropriateness of the allocation of Restoration Fund collections between water and power customers is of serious concern to CPAU and other power customers, who have been actively encouraging BOR and Congress to adjust this allocation.

NCPA staff and CPAU staff are in the process of assessing the potential impact and likelihood of several issues which threaten to dilute the future value of Base Resource, as well as NCPA's and CPAU's ability to influence these issues. These issues are in addition to highly variable hydrological and precipitation conditions which naturally create substantial year-to-year variations in the value of the resource. Staff and NCPA have begun analyzing each of these risk factors to aid in the decision of whether to reduce CPAU's Base Resource allocation by June 30, 2024 for the 2025-2030 period. One aspect that helps to mitigate the financial risk of this resource is the contractual ability to decrease CPAU's share or exit the contract entirely every five years.

ii. Calaveras

The Calaveras hydroelectric project was bond-funded and built as a joint project between members[13] of the Northern California Power Agency (NCPA) and the Calaveras County Water District (CCWD) in 1983. CCWD holds the Federal Energy Regulatory Commission (FERC) license and NCPA is the project operator. The project resides on the North Fork of the Stanislaus River in Calaveras, Alpine and Tuolumne Counties. Calaveras was built primarily for hydroelectric generation purposes and as such water is stored and managed to optimize generation value and to meet member owners' energy needs. Palo Alto's share in the project is 22.92%, which serves approximately 10% of the City's annual load in an average hydro year.

Calaveras' project capacity is about 253 MW and it can generate approximately 400 gigawatt-hours (GWh) of energy annually under average hydroelectric conditions. Palo Alto's corresponding share of the output is 58 MW of capacity and 92 GWh of annual energy under average conditions.

As of January 2024, the City's outstanding debt on the project is approximately $39 million, of which a large portion will be maturing in 2024 and the remainder will mature in 2032. Through fiscal year 2024, the City's annual debt related to this project is on average about $8.5 million; for the remaining years until 2032, the annual debt is about $4.2 million. In addition, efforts are underway to apply for

[12] The Central Valley Project Improvement Act was passed by the U.S. Congress in 1992 to establish the Restoration Fund, funding requirements and goals to restore the habitat of the area impacted by the CVP. Water and power customers are obligated to pay into the Restoration Fund. https://www.usbr.gov/mp/cvpia/docs/public-law-102-575.pdf

[13] NCPA members participating in the Calaveras Project via the Calaveras Third Phase Agreement with NCPA include the cities of Alameda, Biggs, Gridley, Healdsburg, Lodi, Lompoc, Palo Alto, Roseville, Santa Clara, and Ukiah, and the Plumas-Sierra Rural Electric Cooperative.

relicensing, given that the current FERC license for the project expires in 2032. The costs associated with this relicensing effort are yet to be finalized, but they will be collected from participants in the coming years. NCPA has also recently initiated efforts to dredge one of the Calaveras system's major reservoirs, to remove trees, soil, sand, gravel and other debris that have been deposited into the reservoir in recent years by high inflows. Like the relicensing effort, the costs associated with this dredging project have yet to be finalized but will be collected by the project's participants in the coming years.

Historically, debt and other costs associated with Calaveras have resulted in the overall value of the project being below market.[14] However, because Calaveras' variable operating and maintenance costs are relatively low, the project is dispatched regularly for the purpose of generating energy. Additionally, Calaveras has the ability to meet several CAISO compliance and operating requirements, including: following variations in the City's load in real-time (load following), ancillary services related to regulation energy and spinning reserves; and meeting some of the City's Resource Adequacy requirements, including flexible capacity and system capacity. Calaveras also serves as an energy storage asset, since water is stored in the main reservoir, New Spicer Meadow, and released at optimal times to meet energy and capacity needs. In the long-term it is expected that the value of Calaveras will increase, assuming average or above average hydroelectric conditions and favorable regulatory requirements.

While there are no imminent decisions associated with Calaveras, a few issues may be worth evaluating in the context of the IRP, including:

1. Assessment of Calaveras' value and operating strategies, given the City's commitment to other large hydroelectric resources, RPS resources, and hydro risk management objectives;
2. How to best optimize Calaveras given its flexible dispatch ability, which enables it to meet intermittent resource integration requirements; and
3. The value of the City's long-term stake in Calaveras, including the post-2032 period, when the current FERC license expires.

C. *Renewable Energy Resources*

i. Wind PPAs

Palo Alto currently has one long-term contract for the output of a wind power project. Under this contract with Avangrid Renewables the City receives a 20 MW share of the output of the High Winds I project located in Solano County. This resource typically supplies about 4% of Palo Alto's total electric supply needs and its contract term ends in 2028. The project is considered fully deliverable, and it is located in the Bay Area local capacity area.

[14] In anticipation of Direct Access and the possibility for load to leave CPAU, in 1996 Council approved a competitive-transition-charge (CTC) to be added as a non-by-passable fee on all CPAU customers electricity bills. This was done to collect the above market cost (stranded cost) associated with Calaveras debt and the funds were held in the Calaveras Reserve, which had been established in 1983 to help defray cost associated with Calaveras. The Calaveras Reserve was repurposed in 2011 and is now the Electric Special Project Reserve (see Staff Report 2160).

ii. Landfill Gas (LFG) PPAs

Palo Alto currently has five long-term contracts with Ameresco for the output of landfill gas electricity projects. The five contracts include a 1.5 MW share of a project located in Watsonville, a 5.1 MW share of a project located in Half Moon Bay, a 1.9 MW share of a project located in Pittsburg, and the entire output of a 1.4 MW project located in Gonzales and a 4.1 MW project located in Linden. The terms of these agreements are all 20 years, with contract expiration dates between 2025 and 2034. Together, the five resources currently supply about 11% of Palo Alto's total electric supply needs. All five projects are also considered fully deliverable, with two of them located in the Bay Area local capacity area.

iii. Solar PPAs

Since the beginning of 2012, Palo Alto has executed six long-term contracts for utility-scale solar PV projects. These six contracts include three with AES (the 26.7 MW Hayworth Solar project located in Bakersfield, the 20 MW Western Antelope Blue Sky Ranch B project and the 40 MW Elevation Solar C project – both of which are located in Lancaster), two with Boralex (the 20 MW EE Kettleman Land project in Kettleman City and the 20 MW Frontier Solar project located in Newman), and one with Clearway Energy (the 26 MW Golden Fields Solar III project in Rosamond). These six projects are all currently operational, and they provide over 40% of Palo Alto's total electricity needs. The terms of these agreements are all at least 25 years, with contract expiration dates starting in 2040. The three projects operated by AES are considered fully deliverable, with the Hayworth project located in the Kern local capacity area, and the other two located in the Big Creek-Ventura local capacity area. Golden Fields Solar III is also considered fully deliverable, providing valuable system capacity to the grid.

D. *Market Purchases & RECs*

Palo Alto has nine active Master Agreements for the purchase and sale of market electric power (with BP Energy, Shell Energy North America, Powerex Corp, Cargill Power Markets, Exelon Generation, Avangrid Renewables, NextEra Energy Marketing, Turlock Irrigation District, and PacifiCorp) to facilitate competitive forward market power purchases and sales to meet Palo Alto's loads in the short- to medium-term. As of June 30, 2023, Palo Alto had outstanding electricity purchase commitments for the period July 2023 to June 2024 totaling 42 GWh, and sales commitments for this period totaling 33 GWh. These market based purchases and sales are made within the parameters of Palo Alto's Energy Risk Management Program, which the City is in the process of revising to bring them into alignment with current market conditions and norms.

In FY 2023, gross market-based purchases (including both forward transactions and spot-market transactions) provided approximately 12% of Palo Alto's electricity needs, while gross market-based sales were equivalent to 13% of Palo Alto's needs (i.e., the City was a net seller of market-based energy). However, the volume of market purchases and sales is highly dependent on hydro conditions and long-term commitments to renewable resource-based supplies. During normal hydro conditions, gross market purchases are expected to meet approximately 15% of energy needs, while gross market sales will amount to approximately 25% of energy needs. NCPA serves as Palo Alto's scheduling and billing agent for all transactions, and acts as the interface with the CAISO under a Metered Subsystem Aggregation Agreement (MSSA).

Since 2013, Palo Alto has operated under a Carbon Neutral Plan for its electric supply portfolio, ensuring that all electrical generation that serves the City's needs produces zero GHG emissions on a net annual basis. In 2020, in recognition of the changing dynamics of California's electric grid and power supply mix, the City updated its Carbon Neutral Plan, switching from the original annual accounting approach to a stricter hourly accounting approach for defining "carbon neutrality." Under the new methodology, the City weights its hourly net surplus or net deficit positions by the grid's average emissions intensity value for that hour, then sums these hourly emissions totals over the course of the year. (In years where this calculation determines that the City has been a net emitter of greenhouse gases, CPAU purchases unbundled RECs to neutralize these residual emissions.) By recognizing the effects that the huge amounts of new solar generation have had on the hourly emissions profile of grid electricity in the state, the City is holding its carbon neutrality claims to the highest possible standard.

E. *COBUG*

In 2002, shortly after experiencing a series of rolling blackouts during the California energy crisis, the City decided to invest in a set of locally-sited natural gas-fired back-up generators in order to stave off such events in the future. These four generators, together known as the Cooperatively Owned Back-Up Generator (COBUG), total 4.5 MW in capacity. These units are close to their end of life, and an evaluation is underway to determine the best use of the space these units are currently occupying in the Municipal Services Center.

F. *California-Oregon Transmission Project (COTP)*

Fourteen Northern California cities and special districts and one rural electric cooperative, including Palo Alto, are members or associate members of a California joint powers agency known as the Transmission Agency of Northern California (TANC). TANC, together with the City of Redding, WAPA, two California water districts, and Pacific Gas and Electric (PG&E) own the California-Oregon Transmission Project (COTP), a 339-mile long, 1,600 MW, 500 kV transmission power project between Southern Oregon and Central California. Palo Alto is entitled to 4.0% of TANC's share of COTP transfer capability (50 MW). As a result of low utilization of the transmission capacity and therefore low value relative to costs (in addition to a focus on acquiring in-state renewable resources), in August 2008 Palo Alto effected a long-term assignment of its full share and obligations in COTP to the Sacramento Municipal Utility District (SMUD), Turlock Irrigation District (TID), and Modesto Irrigation District (MID). The long-term assignment is for 15 years (through the beginning of 2024), with an option to extend the assignment for an additional five years. Staff is currently evaluating executing a new layoff or bringing the resource back to the portfolio.

G. *Resource Adequacy Capacity*

As described above, the majority of Palo Alto's long-term generation contracts (and its one owned thermal generating asset) are deemed fully deliverable and provide the City with Resource Adequacy (RA) capacity to satisfy its CAISO regulatory requirements. The amounts of RA capacity provided to Palo Alto by each resource are detailed in the CRAT standardized table in the appendices of this report, and a high-level overview is provided in Table 6 below.

Table 6: Palo Alto's Resource Adequacy Capacity Portfolio

Project	Resource Type	Local Area	Flexible RA?	Average NQC (MW)
Western Base Resource	Hydroelectric	CAISO System	No	147.0[15]
Calaveras	Hydroelectric	CAISO System	Yes	58.0
High Winds	Wind	Bay Area	No	5.4
Santa Cruz LFG	Landfill Gas	CAISO System	No	1.5
Ox Mountain LFG	Landfill Gas	Bay Area	No	5.2
Keller Canyon LFG	Landfill Gas	Bay Area	No	1.8
Johnson Canyon LFG	Landfill Gas	CAISO System	No	1.4
San Joaquin LFG	Landfill Gas	CAISO System	No	4.2
Hayworth Solar	Solar PV	Kern	No	12.8
Elevation Solar C	Solar PV	Big Creek-Ventura	No	26.3
Western Antelope	Solar PV	Big Creek-Ventura	No	13.2
Golden Fields Solar III	Solar PV	CAISO System	No	17.1
COBUG	Natural Gas	Bay Area	No	2.25

[15] https://www.wapa.gov/regions/SN/Operations/Documents/FinalGreenbook2004.pdf Palo Alto's share of average Base Resource Capacity from Greenbook values.

V. Future Procurement Needs and Scenario Analysis

A. *Needs Assessment: Energy, RPS, Resource Adequacy Capacity*

To evaluate the need for additional resource procurement during the IRP planning period, CPAU compared its load forecast with its resource supply projections (on both a monthly and an annual basis) in terms of energy, RPS supplies, and capacity. Over the next few years, Palo Alto's resource portfolio has a slight surplus of energy, as well as a surplus of RPS generation (relative to its RPS procurement requirements under SB 100) and capacity, as detailed in the Standardized Tables presented in Appendix D.

Figure 5 below presents the City's projected load and contracted energy supplies through 2045. (Note that all figures in this section are based on the assumptions that the Western Base Resource contract is renewed in 2025, all renewable energy PPAs are allowed to expire at the end of their contract terms, and no additional resources are procured.) Although the City is projected to have an annual energy surplus through 2025, the relatively rapid projected growth in total load over the next few years is expected to result in slight overall energy deficits beginning in 2029, with these deficits growing over time as existing contracts expire.

Figure 5: Palo Alto's Projected Load and Contracted Energy Supplies

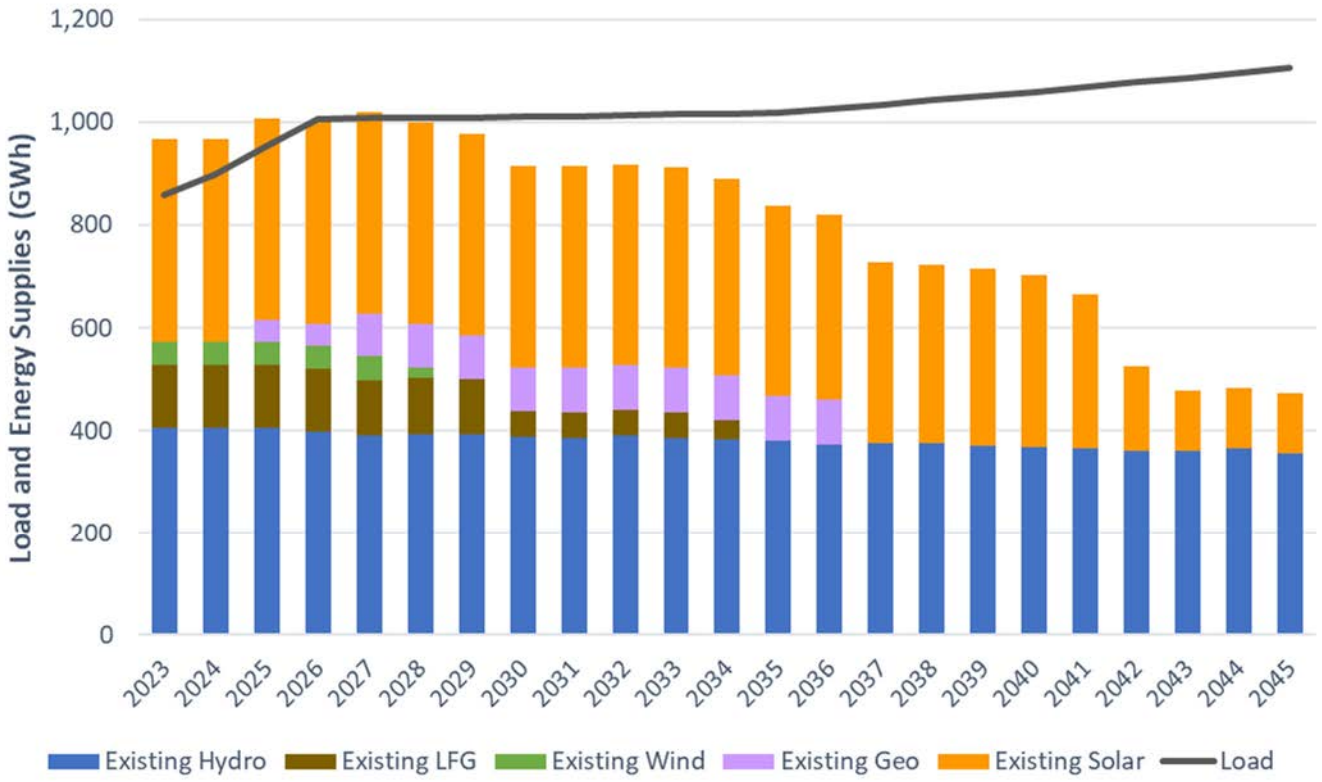
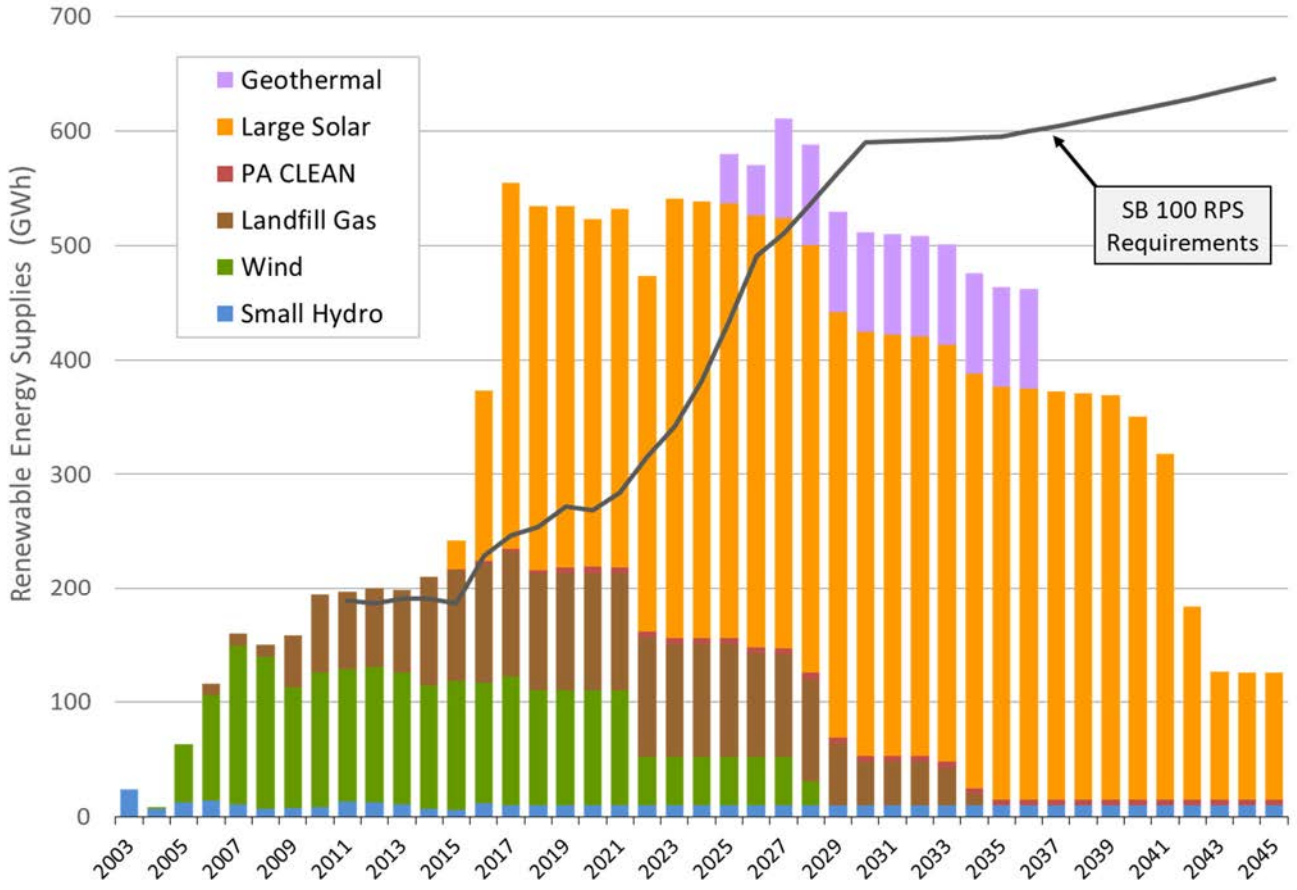


Figure 6 below depicts the City's projected supplies[16] of eligible renewable generation for the period 2003 to 2045, as well as the City's annual RPS generation procurement requirements under SB 100, based on its actual and forecasted retail sales volumes. (Note that this figure assumes no utilization of CPAU's Historic Carryover and Excess Procurement supplies from prior years. Such supplies do exist and could be utilized in the event of an RPS supply shortage, but it is not the City's plan to rely on these supplies for compliance with SB 100's RPS procurement requirements.) Just like with the City's projected long-term energy deficits, Figure 6 indicates that the City's RPS deficits are also projected to begin in 2029.

Figure 6: Palo Alto's RPS Generation Projections and RPS Compliance Requirements



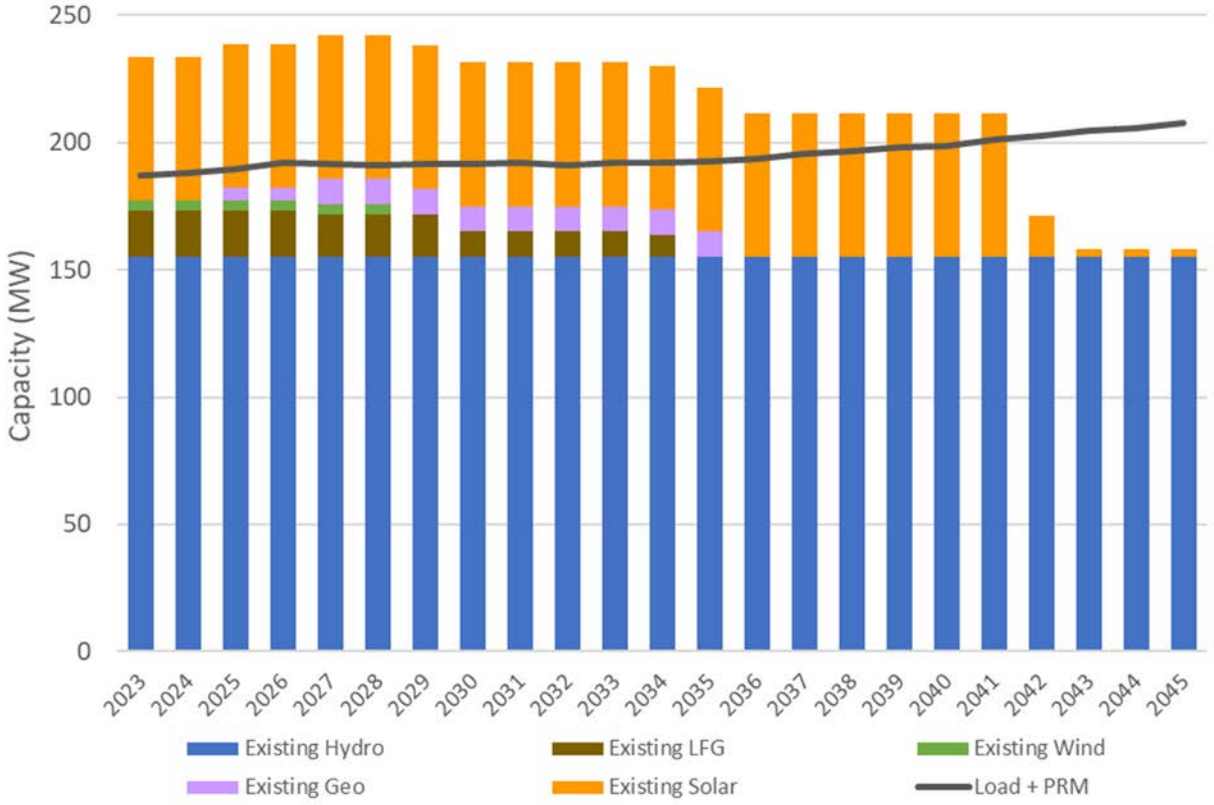
In terms of capacity needs, the City has a projected surplus of system RA capacity until the early 2040s (as Figure 7 illustrates), but deficit positions in local and flexible RA capacity.[17] The City makes up these deficits each year via bilateral RA capacity purchases. One of the challenges that CPAU faces over the IRP planning period is ensuring that it can continue to procure adequate supplies of local and flexible RA

[16] Note that renewable energy supplies shown in Figure 6 which are surplus to the City's RPS procurement requirements may ultimately be sold or banked for use in future compliance periods. A portion of the excess supplies for 2020-2023 were sold and replaced with PCC 3 supplies (unbundled RECs).

[17] For additional details on Palo Alto's projected needs and supplies of electrical generation, RPS generation, and RA capacity, please see the EBT, RPT, and CRAT standardized tables in Appendix D to this report.

capacity – both to satisfy its regulatory compliance obligations, and to ensure the overall reliability of the CAISO bulk transmission system.[18]

Figure 7: Palo Alto's Contracted System Capacity Supplies and Requirements



The remainder of this section will focus on determining the optimal mix of new resource acquisitions that will allow Palo Alto to satisfy its energy, RPS, and capacity needs while minimizing supply costs and cost uncertainty—all while remaining compliant with the City's Carbon Neutral Plan requirements.

B. *Portfolio Optimization Analysis*

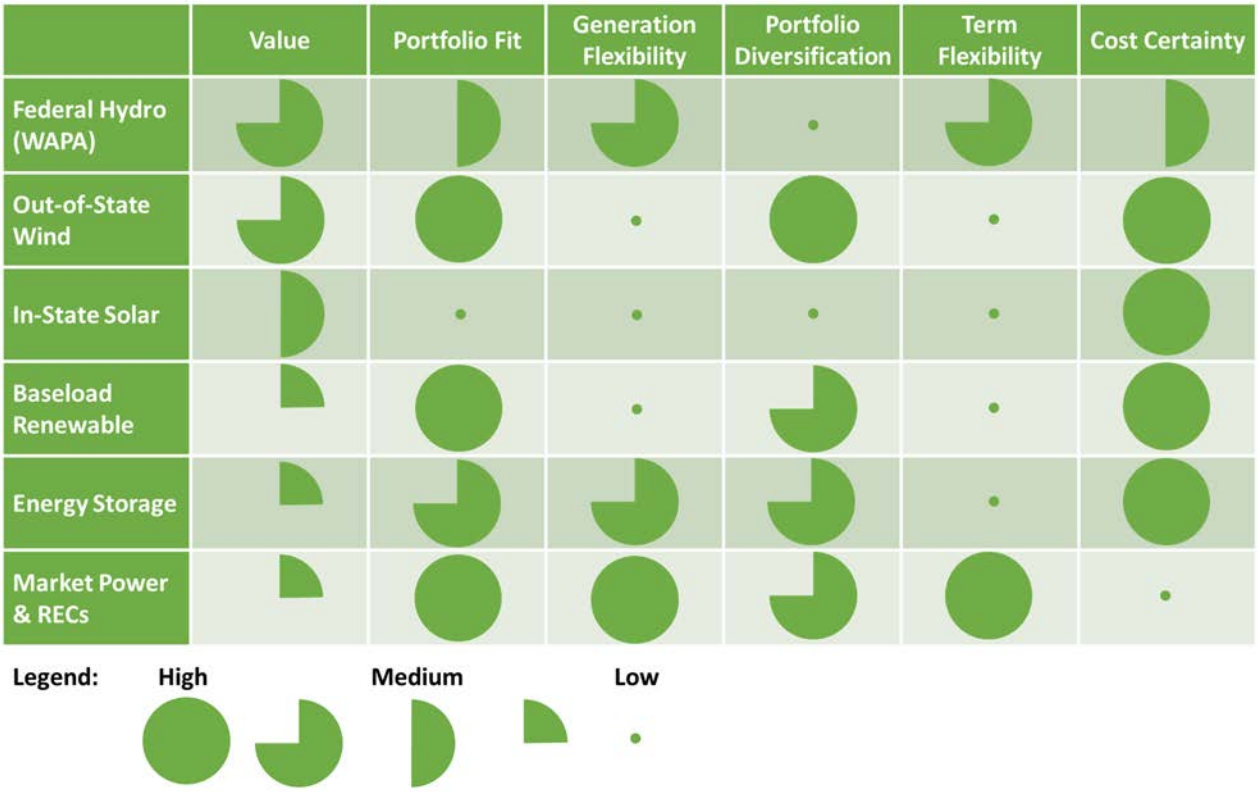
As noted in the July 2023 presentation to the Palo Alto UAC, CPAU staff worked with a consultant, Ascend Analytics (Ascend), to evaluate a large number of potential new supply-side and demand-side resources in the portfolio optimization analysis it performed for this IRP. CPAU staff and Ascend worked together to develop assumptions around the long-term generation levels and costs for its existing portfolio of resources, and Ascend provided a forecast of long-term capital and operating costs for various new resource options.

[18] Also, if Palo Alto opts not to renew its Western Base Resource contract in 2025 – or significantly scales back its share of this resource – then the City will face the additional challenge of ensuring it has adequate *system* RA capacity to meet its planning reserve margin requirements. As Table 6 indicates, the Western Base Resource contract is by far the City's largest source of system RA capacity.

Table 7 below summarizes the various resource types and their relative merits that staff considered most closely in its portfolio analysis. The key indicators used for comparing the different portfolio options are:

- Value: The net value of a resource; the projected revenue from selling the resource's energy into the CAISO market less the resource's bi-lateral contract cost;
- Portfolio Fit: Lower reliance on the grid for hourly load balancing;
- Diversification: Geographic and resource diversity;
- Term Flexibility: Flexibility in length of contract and termination provisions; and
- Cost Certainty: Degree of certainty of future resource costs.

Table 7: Relative Merits of Candidate Resources Considered to Rebalance Supply Portfolio
*** Ratings reflect relative changes from current portfolio of resources ***



i. Capacity Expansion Modeling Results

For IRP portfolio development, CPAU relied on PowerSIMM, an industry-leading market simulation, capacity expansion, and production cost model developed by Ascend. PowerSIMM captures and quantifies elements of risk through the simulation of meaningful uncertainty with weather as a fundamental driver. PowerSIMM is a "hybrid model," meaning it uses both market data and long-term fundamentals to simulate load, renewables, and CAISO spot market prices against which resources are dispatched and valued. Setting the model up involved gathering historical generation data, resource specifications, cost projections, and other relevant inputs and feeding them into the model. CPAU staff then validated the model by running it under various weather and pricing conditions and confirming that its outputs matched staff's expectations. A set of economic dispatch studies were then run for every

resource, and these results were fed into PowerSIMM's Automated Resource Selection (ARS) module, which used the information to select resource additions based on minimizing the cost of procuring and operating new and existing resources while also satisfying all of the IRP objectives.

Once additional resources were selected by the ARS module, they were incorporated into a portfolio including CPAU's existing resources and evaluated using an hourly dispatch model to understand the overall implications of the selections on the portfolio. To capture the uncertainty in future conditions, these hourly dispatch studies used a stochastic framework to simulate 100 different future conditions, in which market prices, weather patterns, renewable generation, water availability, and load were varied according to distributions observed in the historical data. To capture the uncertainty associated with the distribution of portfolio costs across these 100 different simulations, a risk premium metric for the portfolio was developed, which represents the magnitude of the portfolio's financial exposure to market price volatility, variation in generation and load, and changes in weather conditions.

After many modeling iterations were performed to ensure the robustness of the results, CPAU staff and Ascend ultimately arrived at a Recommended Portfolio that is summarized in the following figures. Figure 8 displays the volumes of new resources that the model selects (in terms of their nameplate capacity) in each year of the planning period. Although the model selects new solar capacity starting in 2030, and storage capacity starting in 2041, the actual resources that the City will contract with to meet its planning objectives will depend heavily on the responses received in future RFPs. Changing market conditions, the specific characteristics and quality of individual offers, and changing regulatory requirements all add uncertainty to the selection of future resources.

Figure 8: Nameplate Capacity of New Resource Additions for the Recommended Portfolio

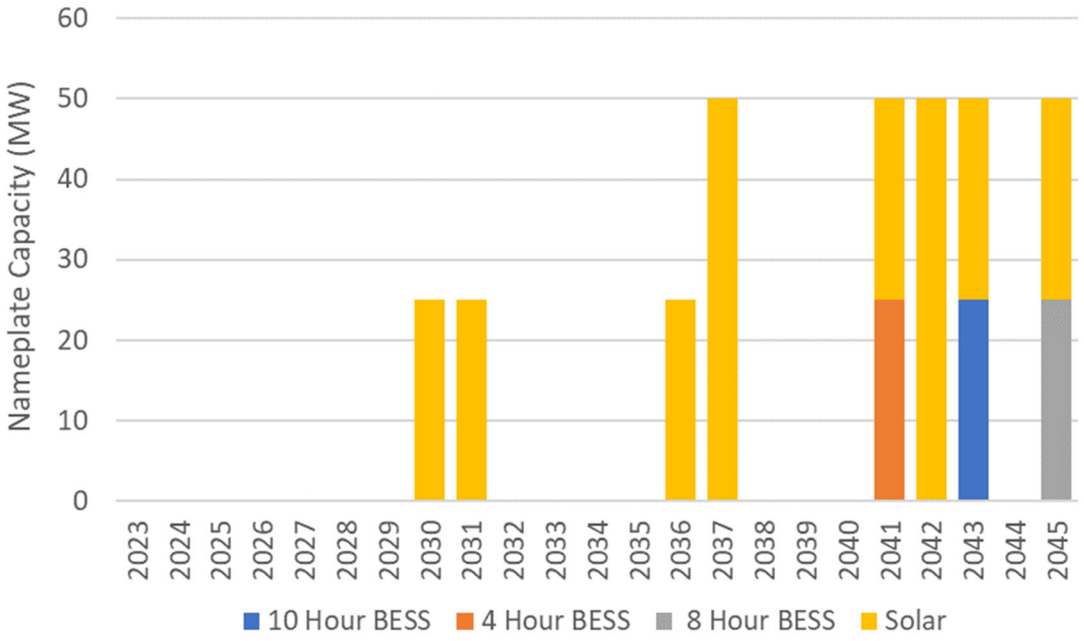
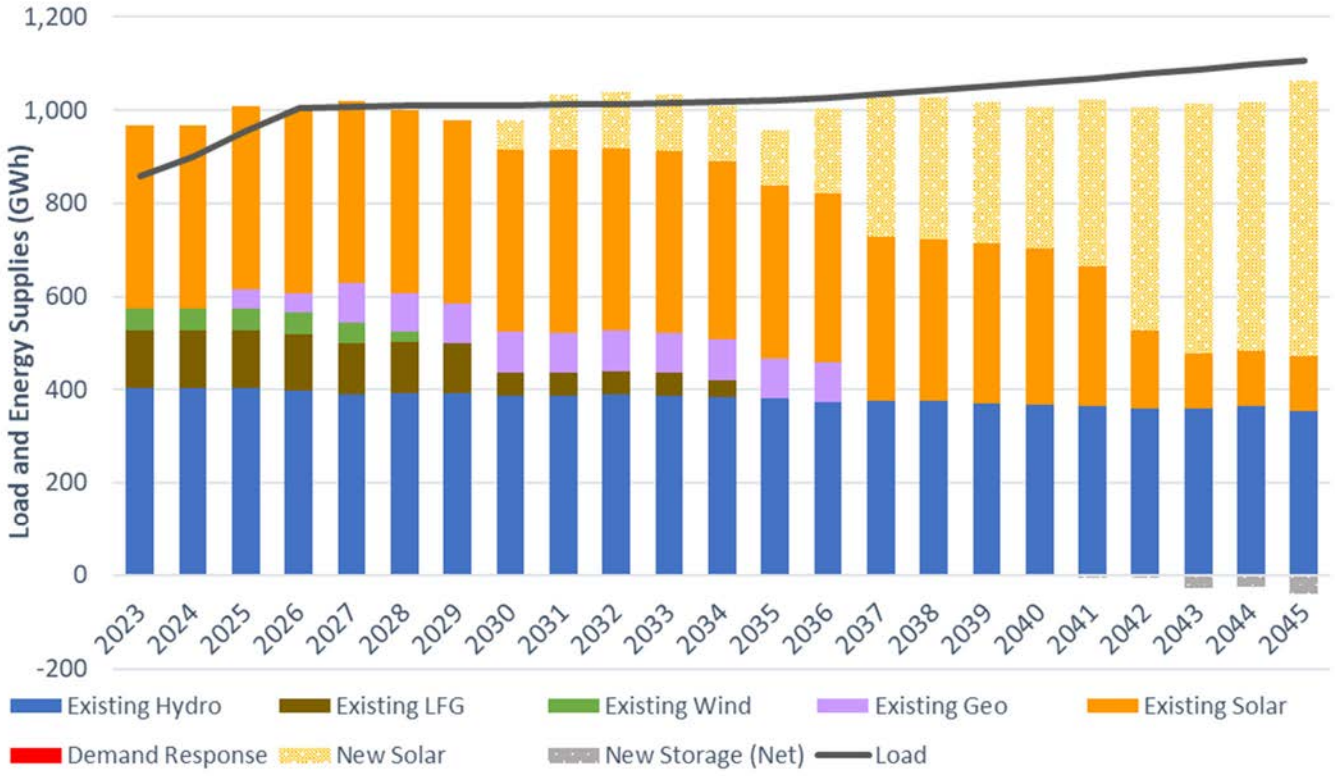


Figure 9 below shows the City's projected load and energy supplies by year under the Recommended Plan. The small deficit positions depicted in a few years in this figure would be covered using short-term

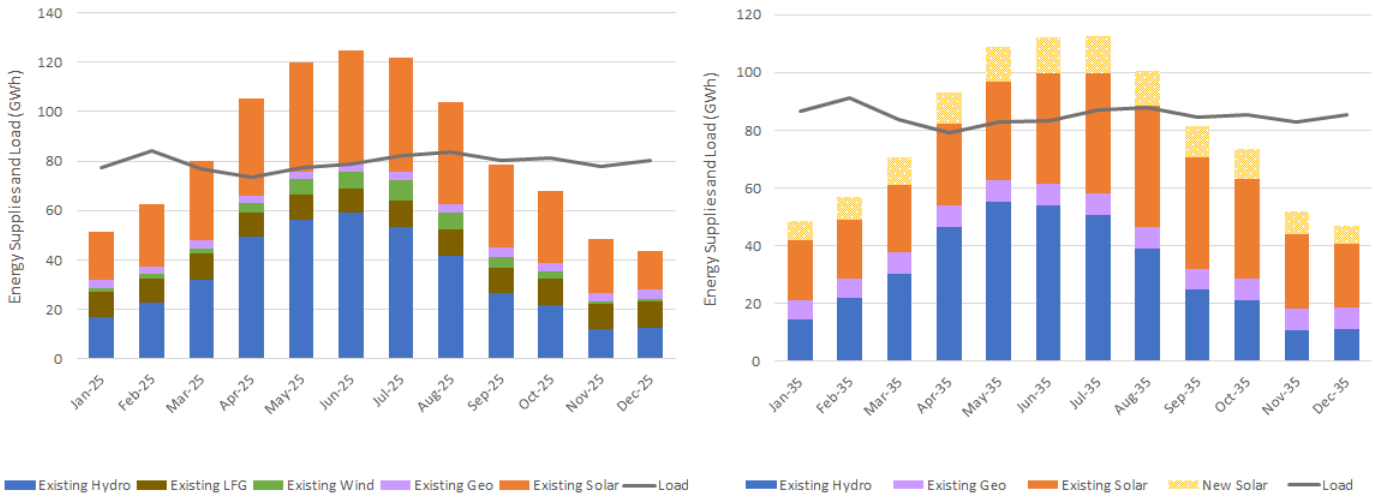
market purchases of energy bundled with PCC 3 RECs. Overall, the Recommended Plan results in a portfolio that would be 98% hedged over the IRP planning period.

Figure 9: Projected Load and Energy Supply Balance for Palo Alto's Recommended Plan



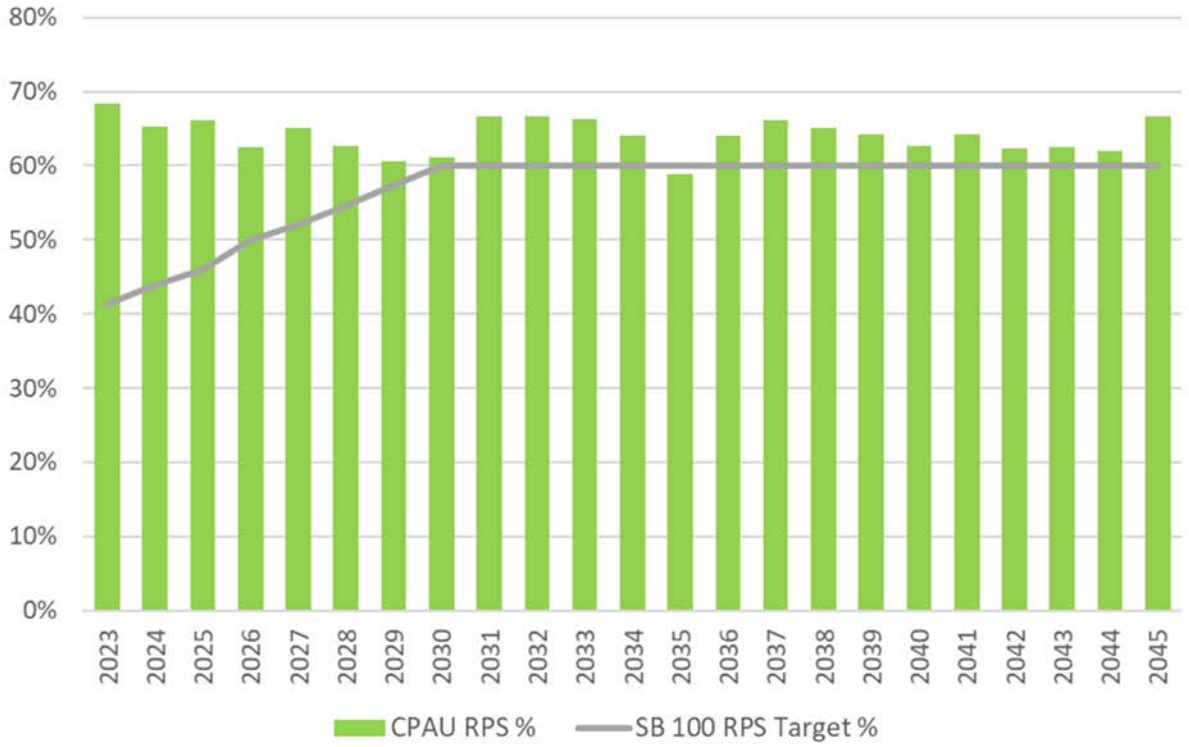
On an intra-year basis, the Recommended Plan would yield significant energy surpluses in the spring and summer months, followed by significant energy deficits in the fall and winter months as shown in Figure 10 below. This pattern, and the resulting market exposure that it would entail, will be another consideration in the process of selecting new resources to add to the City's supply portfolio which could lead to a more diverse mix of new resource selections than is shown here in the Recommended Plan.

Figure 10: Palo Alto's Monthly Load and Energy Supplies in 2025 & 2035



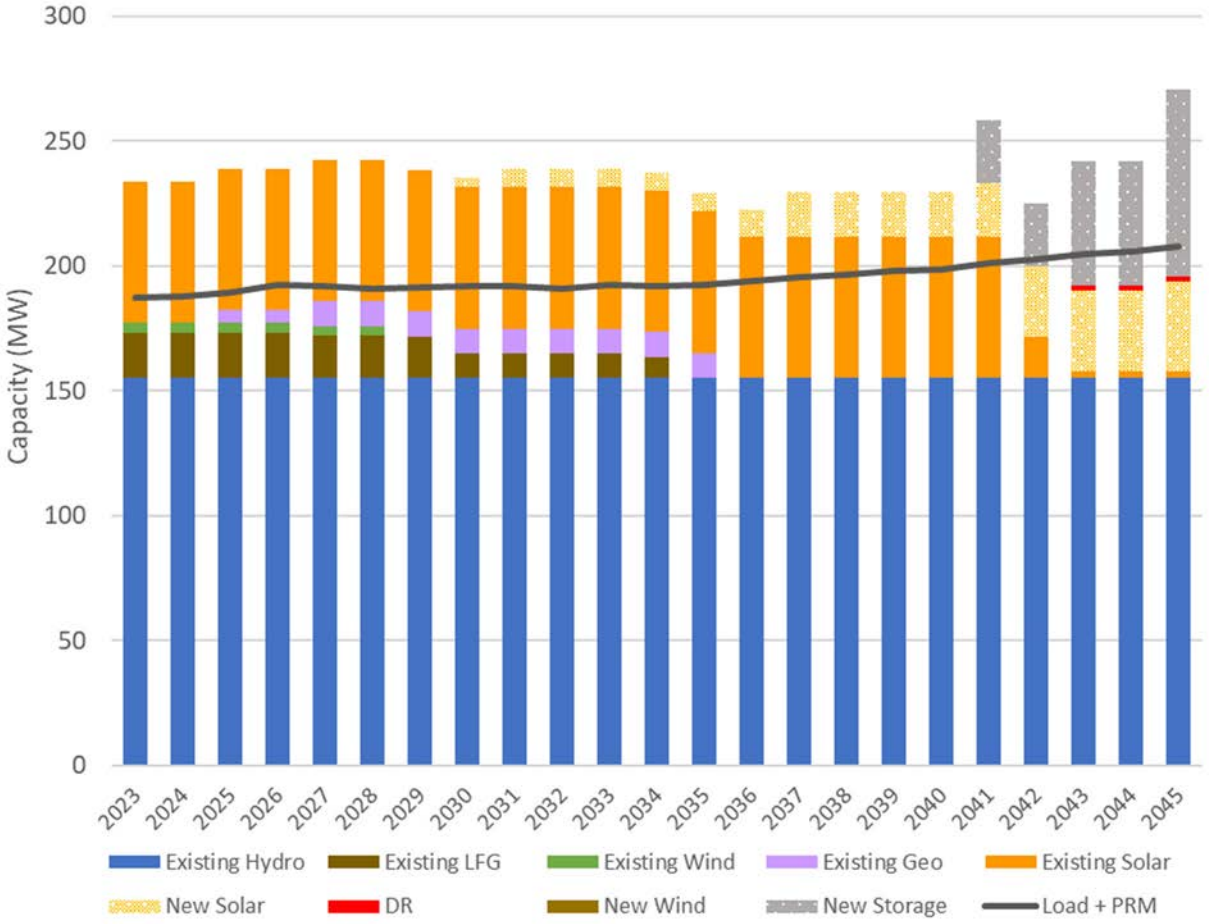
As Figure 11 below illustrates, the Recommended Plan would ensure that Palo Alto exceeds the state's annual RPS procurement targets in all but one year (2035) of the IRP planning period. However, because RPS compliance is evaluated based on aggregate procurement over three-year compliance periods after 2030, the City would still easily achieve full compliance with its RPS requirements under the Recommended Plan. (And in reality, CPAU intends to meet or exceed its annual RPS procurement target in *every* year.)

Figure 11: SB 100 RPS Requirements and RPS Level of the Recommended Plan



As Figure 8 indicated, the capacity expansion model adds a significant amount of battery energy storage systems (BESSs) beginning in the 2040s—25 MW each of 4-hour, 8-hour, and 10-hour BESSs. According to Ascend, the model selected these resources primarily to ensure the Recommended Plan would satisfy Palo Alto's system capacity needs during this period (when almost all of the City's existing renewable energy PPAs have expired). Figure 12 illustrates how these BESS additions—along with a small volume of demand response capacity—ensure that Palo Alto can easily satisfy its system capacity needs throughout the planning period without having to rely on short-term RA purchases.

Figure 12: Projected System Capacity Requirements and Supplies for Palo Alto's Recommended Plan



ii. Scenario Analysis

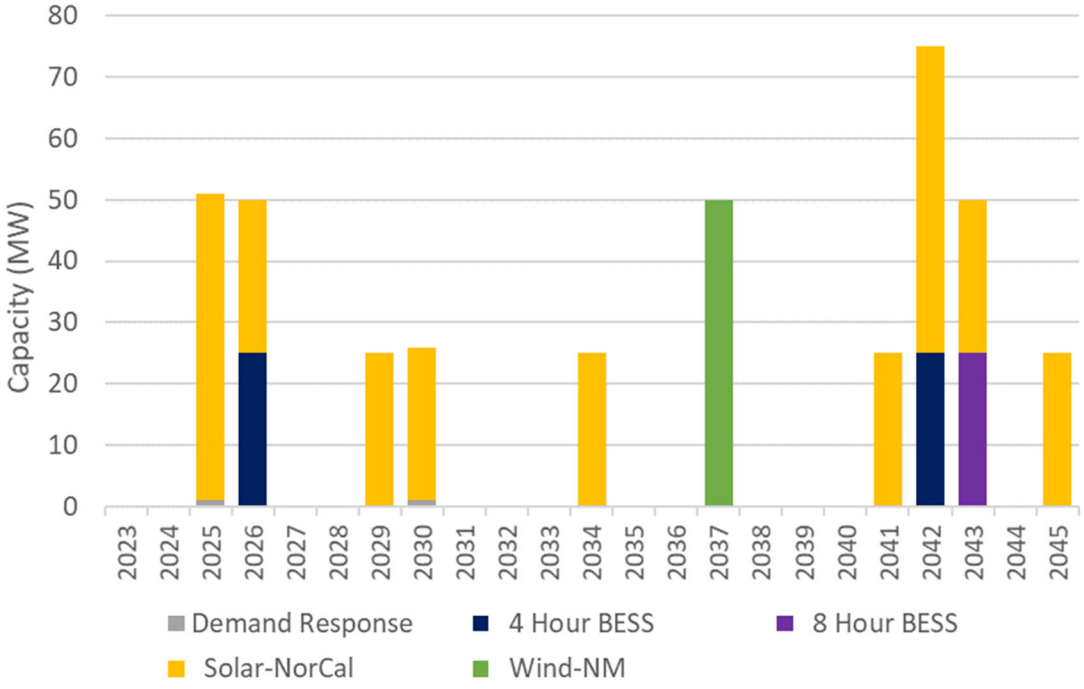
Given the extended length of the IRP planning period, there is obviously a tremendous amount of uncertainty around the performance and characteristics of the City's electric supply portfolio. Changes in hydrological conditions, regulatory requirements, technological advancements, and the City's load, among many other factors, could all have tremendous implications for the results of this portfolio modeling analysis and the ultimate selection of new resources to include in the City's portfolio. To try to understand the magnitude of this uncertainty, CPAU staff and Ascend ran the ARS module under several different future scenarios, and then used PowerSIMM's production cost model function to evaluate the overall cost and cost uncertainty of the supply portfolio selected in each case. The four different scenarios that were evaluated can be summarized as follows:

1. **Base Case** – Expected hydro output and expected market prices (P50)
2. **Reduced Hydro Output** – Hydro energy output is reduced by 30% and capacity is reduced by 60%, while hydro costs increase by 25%
3. **Dry Year, High Prices** – Simulating an extended drought, hydro energy output is reduced by 25%, and market prices are high (P95)
4. **Wet Year, Low Prices** – Based on historical conditions during wet years, hydro energy output is increased by 50%, and market prices are low (P5)

Interestingly, for the wet year and dry year scenarios the model selected the same new capacity additions as in the base case (see Figure 8). Despite Palo Alto's heavy concentration of large hydro resources in its existing portfolio, these long-term changes in hydrological conditions were not enough to cause the model to select a different volume or type of resources to include in the portfolio. Instead, the model indicates that the City should simply buy more or sell more energy and capacity in the short-term market to balance its energy and capacity needs in these situations. (While the Recommended Plan portfolio is 98% hedged on average over the IRP planning period, the Dry Year, High Prices scenario would yield a portfolio that is 87% hedged, while the portfolio would be 121% hedged in the Wet Year, Low Prices scenario.)

In the Reduced Hydro Output case, however, the model made significantly different selections for the City's supply portfolio, as summarized in the figures below.

Figure 13: Nameplate Capacity of New Resource Additions in Reduced Hydro Output Scenario



Because of the new resources added to the portfolio in the Reduced Hydro Output scenario, the overall hedge level was 106% for the planning period, as Figure 14 illustrates.

Figure 14: Projected Load and Energy Supply Balance in the Reduced Hydro Output Scenario

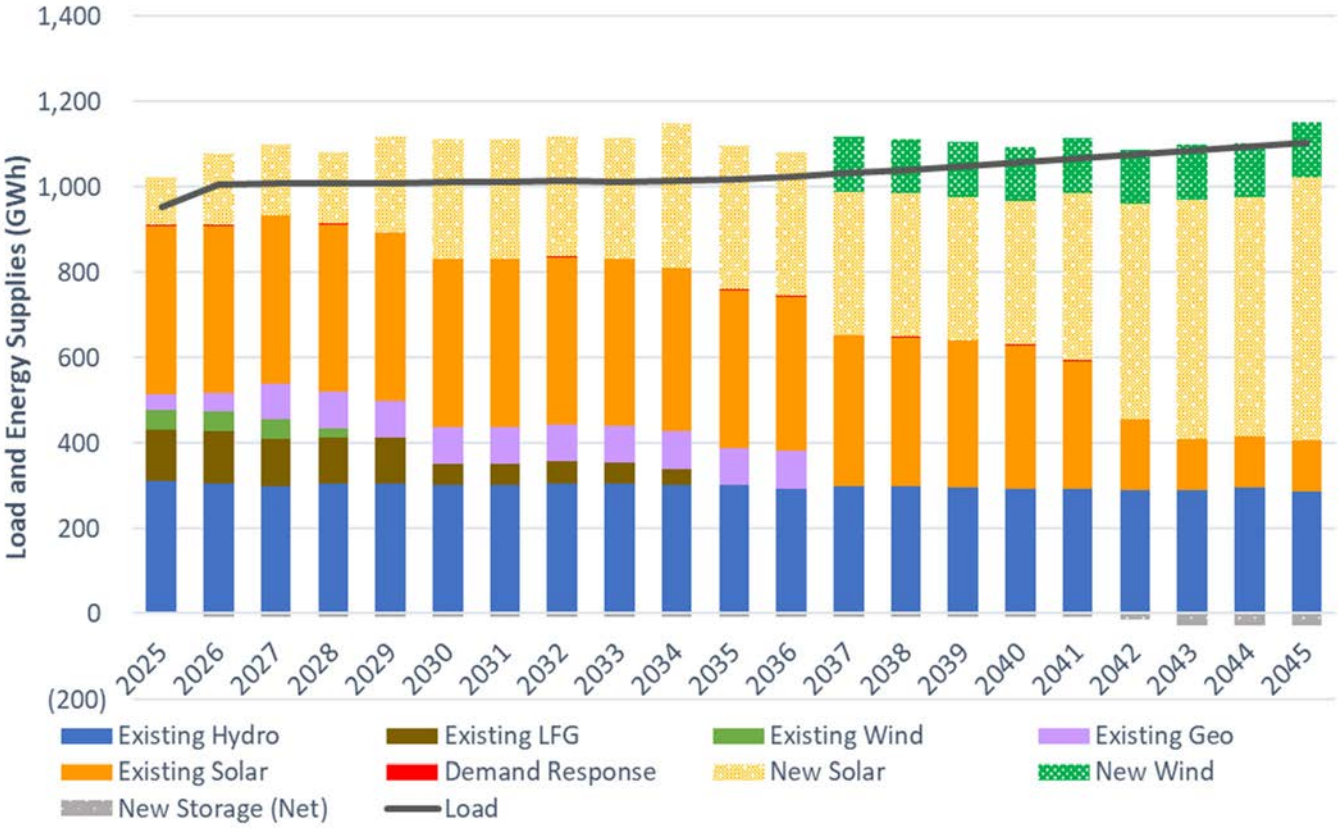
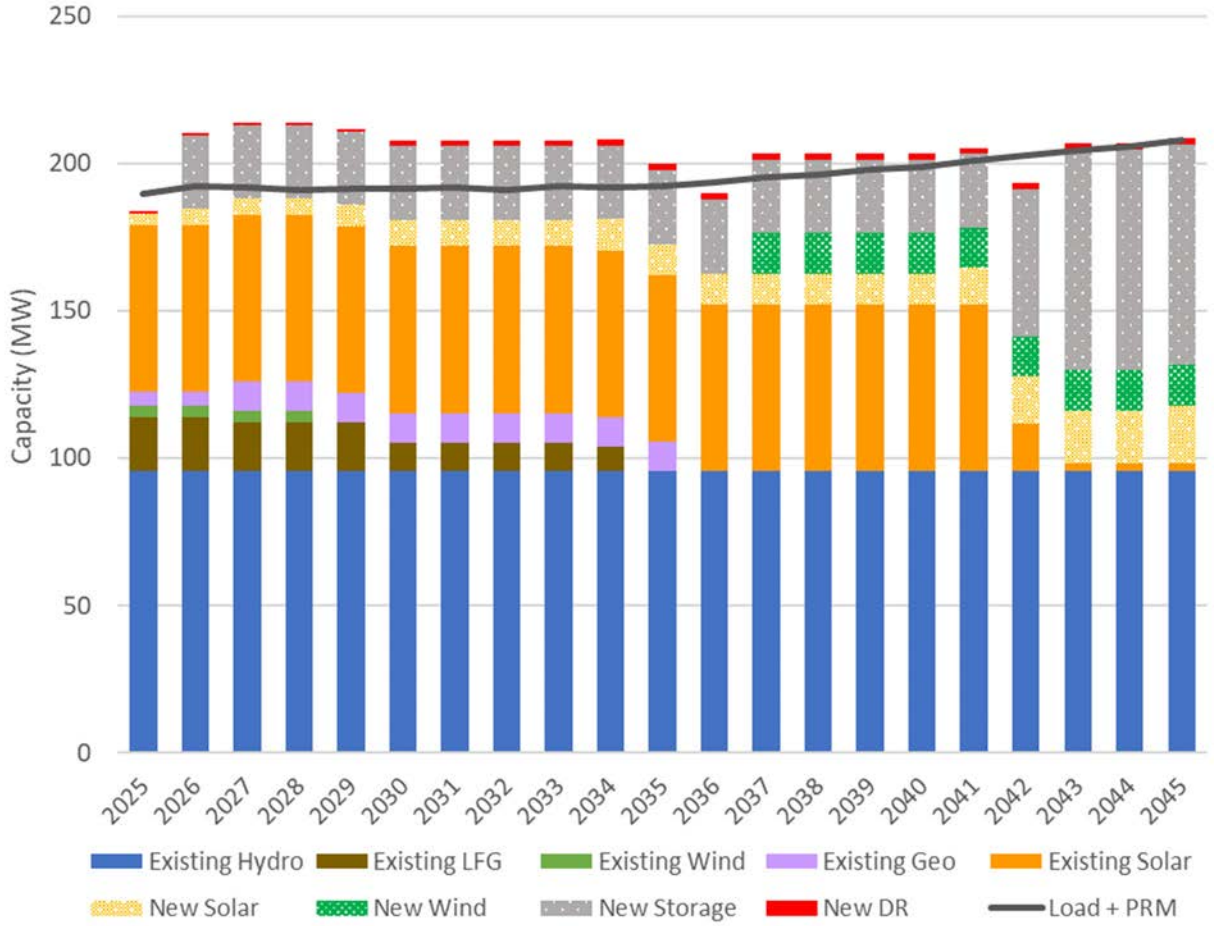


Figure 15: Projected System Capacity Requirements and Supplies in Reduced Hydro Output Scenario



iii. Portfolio Cost Uncertainty and Management

Financial metrics for the four scenarios described above are displayed in Table 8 below, including each scenario's average supply cost, NP15 market price, mark-to-market (MTM)[19], and risk premium[20]. As expected, this information indicates that the total portfolio in the Reduced Hydro Output scenario is significantly more costly than the Base Case portfolio. But, interestingly, the modeling indicates that the

[19] Mark-to-market is a risk assessment tool which measures the current estimated value of a portfolio relative to its original contracted price; a positive value indicates an increase in the value of the purchase, which would be realized only if the transaction was liquidated. It also represents the City's credit exposure with the supplier. Note that the MTM values presented in Table 8 are based on the total cost of each supply resource, but only account for the energy value (as measured by the resource's Locational Marginal Price). The RA capacity value and REC value associated with each resource's output are not considered in this calculation, thus it is not an accurate representation of the true value of each portfolio; nonetheless, the MTM differences between the four scenarios are reflective of the differences in their values.

[20] The expected value of the cost of each portfolio is the probability-weighted average cost of CPAU's supply portfolio across all simulations performed in the analysis. The risk premium, which is calculated in a manner similar to an insurance premium, is the probability-weighted average of costs between the median and 95th percentile of costs in all simulations. It is essentially a measure of the uncertainty or risk in the estimated value of the different portfolios considered, reflecting the possibility that supply costs may be greater than the expected costs.

portfolio becomes significantly more valuable under both the Dry Year, High Prices scenario, as well as the Wet Year, Low Prices scenario, compared to the Base Case scenario.

Table 8: Financial Performance Summary of the Four Scenarios Modeled

	Base Case	Reduced Hydro Output	Dry Year, High Prices	Wet Year, Low Prices
Average Supply Cost ($/MWh)	$63.58	$66.27	$83.05	$40.76
Average Market Price ($/MWh)	$64.17	$64.17	$88.05	$45.52
Total MTM ($/MWh)	$0.65	($3.34)	$4.09	$4.62
Average Annual MTM ($M)	$0.47	($2.00)	$5.31	$4.70
Average Annual Risk Premium ($M)	$6.43	$3.27	$19.91	$4.33

The Risk Premium results indicate that the portfolio's cost uncertainty (or value at risk) related to high market prices/dry hydro conditions is far greater than for low market prices/low hydro conditions. For this reason, CPAU tends to hedge the supply portfolio based on the assumption of slightly drier than average conditions, and also maintains significant hydroelectric reserves.

The cost uncertainty of the electric supply portfolio in the short-term is primarily driven by the water available for hydroelectric production, and is estimated at $15 to $20 million per year at prevailing market prices. Palo Alto is well positioned to manage this cost uncertainty through its hydro rate adjustment mechanism[21] and by maintaining sufficient cash reserves. The cost uncertainty related to seasonally balancing the portfolio[22] is minimal since market price variability between seasons is highly correlated and because staff executes seasonal buy-sell transactions at the same time.

As noted above, in the long-term, there are a number of issues that could dramatically affect the value of the Western resource in the coming years. As such, a large focus of staff efforts in the next five years will be to better understand the long-term economics of the Western Base Resource contract and determine if and when to reduce its allocation of this resource.

There are also proceedings underway to investigate market restructuring to deal with issues related to the integration of variable renewable resources, very steep evening ramp periods, and the appropriate valuation of dispatchable generation capacity. Volatility in market prices, as the CAISO and the CEC determine how to send price signals to ensure a reliable grid, could leave a seasonally unbalanced portfolio such as the City's current portfolio exposed. Increases in transmission charges could also make remote resources compare less favorably to local resources and demand-side management in the future.

[21] For additional detail on the hydro rate adjustment mechanism, please see Staff Report ID 8962 (March 2023): https://www.cityofpaloalto.org/civicax/filebank/documents/63851.

[22] Revenues received from the sale of surplus energy during the spring and summer periods are utilized to purchase electricity needs for the fall and winter periods.

VI. Supply Costs & Retail Rates

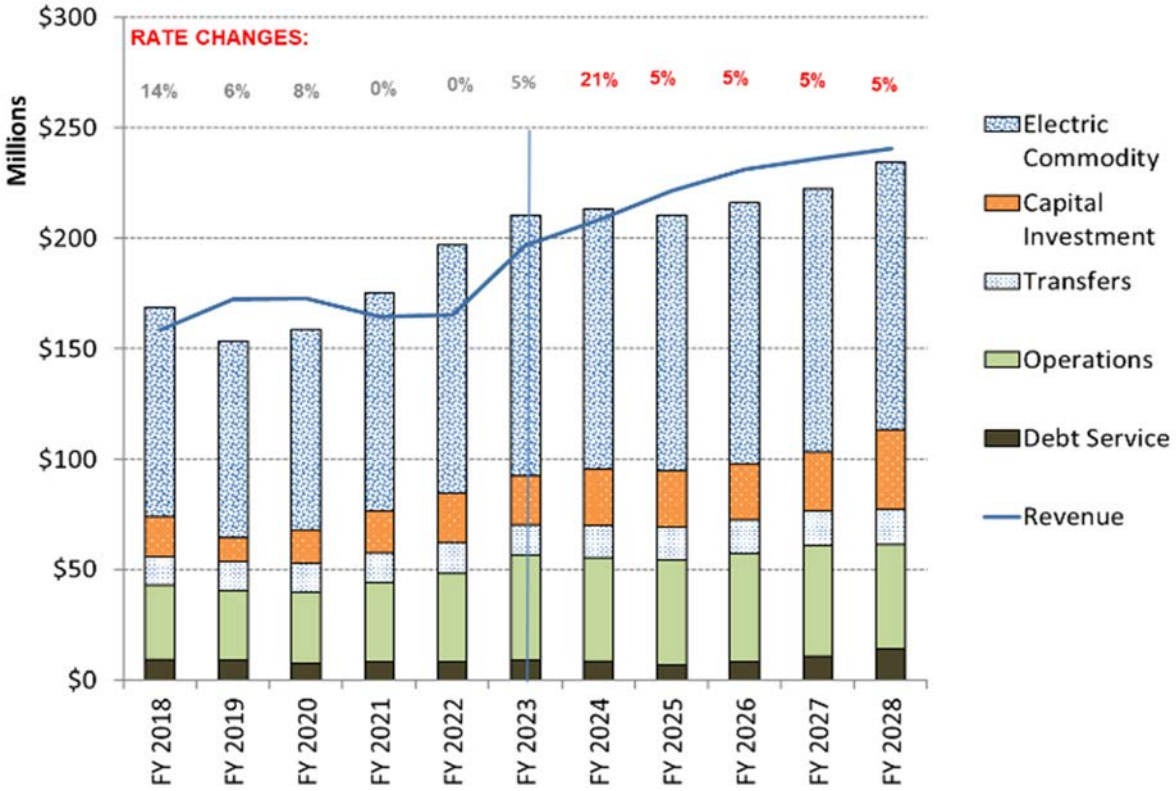
Critical to the success of an IRP, in addition to ensuring that the adopted plan leads to compliance with all regulatory requirements, is ensuring that it also results in supply cost minimization and (ideally) low and stable customer retail rates. As described in the FY 2024 Electric Utility Financial Plan and Rate Proposal to the Palo Alto City Council, CPAU staff projects supply costs to rise substantially for the next several years, largely driven by increases in transmission costs, higher RPS requirements, general capacity shortfalls, and increased natural gas prices.

Retail rates are also projected to rise due to substantial additional capital investment in the electric distribution system (largely driven by modernizing the residential portion of the distribution system to accommodate increased building and transportation electrification), and operational cost increases. CPAU is also in the midst of a capital-intensive project to convert all of its existing metering infrastructure to Advanced Metering Infrastructure (AMI), or "smart meters," with a planned completion date of July 2025. These investments are being funded through the City's existing Electric Special Projects (ESP) reserve fund.

CPAU is also currently evaluating the implementation of several new specialized rates, including: a commercial DC Fast Charging EV rate, a residential time of use rate, and a residential All Electric Rate. This effort is intended to see if these rates can be justified under cost of service principles and can better support transportation and building electrification. If we are able to find a way to improve the existing rate structure to better support transportation and building electrification goals, we will likely implement a new rate offering in the near future.

In order to ensure adequate revenue recovery, the Palo Alto City Council recently approved a 21% retail rate increase for FY 2024 (taking effect July 1, 2023), and adopted a Financial Plan that calls for additional 5% annual rate increases for FY 2025 through FY 2028, as illustrated in Figure 16. However, it should be noted that the City's current electric rates are far lower than the statewide average electric retail rates, and, under the recommended portfolio presented in Section V of this report, staff projects that they will remain so. In fact, even under the worst-case scenarios staff evaluated the City's retail electric rates remain lower than the projected statewide average rates.

Figure 16: CPAU Revenues, Expenses, and Rate Changes through FY 2028



VII. Transmission & Distribution Systems

C. *Transmission System*

At the transmission level, CPAU staff has two main focuses during the IRP planning period: (1) determining the optimal utilization of the COTP asset when Palo Alto's long-term layoff of this resource ends on February 1, 2024, as discussed above in the Existing Resource Portfolio section; and (2) pursuing an additional interconnection point with PG&E's transmission system. The new interconnection point with PG&E is being sought in order to provide redundancy, and therefore increased local reliability, in the event that an outage affects the three current interconnection lines – as happened in February 2010.[23] To minimize the possibility of a City-wide outage caused by an interconnection line outage, it is in the City's interest to find a physically diverse connection to the PG&E transmission system for power supply to the City. Staff has been investigating options for an alternative connection to the transmission grid for numerous years.[24]

D. *Distribution System*

Palo Alto's electric distribution system is directly interconnected with the transmission system of Pacific Gas and Electric Company (PG&E) by three 115 kV lines, which have a delivery point at Palo Alto's Colorado substation. Palo Alto's distribution system consists of the 115 kV to 60 kV delivery point, two 60 kV switching stations, nine distribution substations, approximately 12 miles of 60 kV sub transmission lines, and approximately 469 miles of 12 kV and 4kV distribution lines – including 223 miles of overhead lines and 245 miles of underground lines.

In 2018 CPAU staff completed a high-level distribution system assessment report to begin the process of understanding the distribution system upgrades that will be required to integrate increasing penetration levels of distributed energy resources, particularly electric vehicles. A detailed assessment of electric distribution system upgrade needs to accommodate City's ambitious building electrification and transportation electrification goals was undertaken in 2023. The assessment projected the need to plan the CPAU distribution system for an average residential customer capacity demand of 6 kVA, up from the current planning paradigm of 2 kVA per customer, in order to accommodate future electrification efforts. Based on this assessment, efforts are underway to upgrade the following infrastructure elements:

- Distribution transformers and secondary conductors
- 12 kV Circuit Ties
- Substation Transformers

The upgrades are expected to cost $220 to $306 million over the next decade.

[23] Although three lines would normally provide redundancy and back-up power delivery to the City, all three lines run in a common corridor on the bay side of the City, a corridor that is in close proximity to the Palo Alto Airport. The common corridor and proximity to an airport means that the City's power supply is susceptible to single events that can affect all three lines, as happened in February of 2010 when a small aircraft hit the power lines resulting in a city-wide power outage for over 10 hours.

[24] See this January 2016 staff report for additional background on the efforts to secure an additional transmission interconnection point: https://www.cityofpaloalto.org/civicax/filebank/documents/50608.

VIII. Low-income Assistance Programs

CPAU has three programs to provide financial assistance to low-income customers:

- Residential Energy Assistance Program (REAP): This program provides qualifying low-income residents with free energy and water efficiency measures such as LED lighting, heating system upgrades, weather stripping and shell insulation. More recently, high efficiency toilets, heat pump water heaters, and air source heat pump systems are added to the measure list. This program has equal focus on efficiency and comfort, so there may not be reported energy savings for a customer project.
- Rate Assistance Program (RAP): This program provides a 25% discount for electric and gas charges for income-qualified customers. Applicants can qualify based on medical or financial need.
- ProjectPLEDGE: This program provides a one-time contribution of up to $750 applied to the utilities bill of qualifying residential customers. Eligibility criteria include experiencing recent employment and/or health emergency events. Administered by CPAU, this program is funded by voluntary customer contributions.

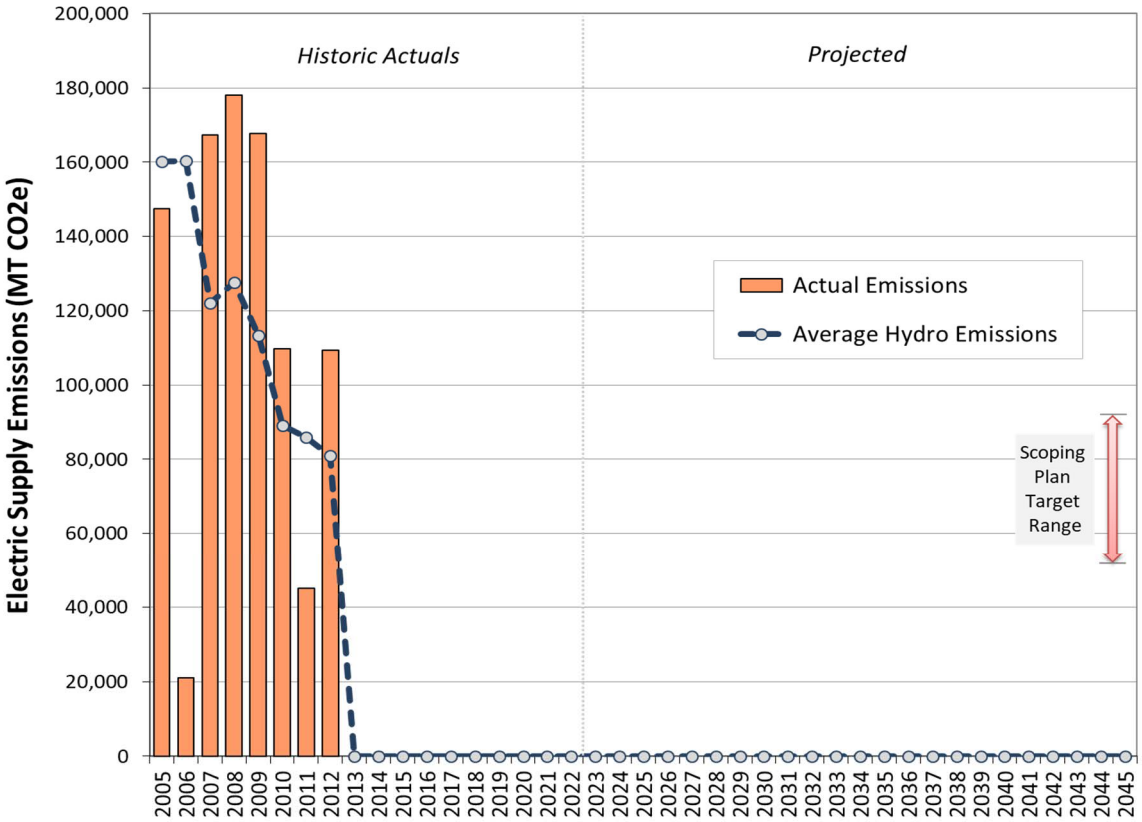
IX. Localized Air Pollutants

The City currently offers various building electrification and transportation electrification program services to both residential and nonresidential customers. By lowering consumption of gasoline and natural gas use in buildings, these programs contribute not only to achieving the City's aggressive GHG emissions reduction goal, but also reducing localized air pollutants including NOx, SOx and other particulate matter. Detailed descriptions of these programs are provided in Section IV.A.

X. GHG Emissions Projections

CARB's 2017 Scoping Plan identified GHG emissions targets for the entire state, as well as individual economic sectors, including the electricity industry. The Scoping Plan established an overall electric sector GHG target for 2030 of 30 to 53 million metric tonnes (MMT) of CO2e, of which Palo Alto's pro rata share (based on load) is 0.174%, or 52,049 to 92,103 MT CO2e. As Figure 17 indicates, given its electric supply portfolio consisting entirely of carbon-free resources (hydroelectric, wind, solar, and biogas), Palo Alto is on track to emit far less than even the most aggressive end of the target range identified in the CARB Scoping Plan.

Figure 17: CPAU Electric Supply Emissions (2005-2045)



XI. Next Steps and Path Forward

E. *Future Analytical Efforts*

The City will have until June 30, 2024 to make a decision to reduce or reject its allocated share of the future Western contract, which would be 98% of the City's current share and provides over 30% of the City's total electric supply under average conditions. The additional analysis regarding this decision should include:

1. An examination of the City's net load forecast and associated uncertainties, with particular emphasis on how it may be affected by customer electrification and adoption of DERs (Demand Response, Energy Efficiency, Solar PV, and storage) in order to avoid stranding assets.
2. An update and extension of CPAU's supply portfolio analysis, including updates to hourly LMP forecasts and the costs, assumptions, and uncertainties associated with all resource options.
3. Analysis of the projected costs, output, and flexibility of the renewed Western contract, to reduce and estimate the amount of uncertainty around this resource.

Aside from the Western contract decision, staff will be actively following state regulators' activities related to electric supply portfolio GHG emissions accounting and allocation of statewide GHG emissions reduction targets, as well as efforts to promote greater regionalization of the bulk transmission system in the western US.

And of course, staff will continue its activities in pursuit of lowering the overall cost to serve customer loads. These include continuing to optimize the use of the City's Calaveras resource, evaluating the benefits of the NCPA pool, and/or the procurement of alternative scheduling services for its renewable resources.

F. *Key Issues to Monitor & Attempt to Influence*

In the course of developing this IRP, CPAU staff has identified a number of important issues and sources of uncertainty to closely monitor and attempt to positively influence over the course of the planning period. Some of the primary issues and uncertainties that staff will be focused on include:

- Cost and operations of Western hydroelectric resource: environmental restoration cost, water delivery timing and priorities, Western transmission upgrade needs, environmental regulations affecting water releases, and long-term climate change
- Frequency and magnitude of economic curtailment of solar PV resources
- Renewing the FERC license of the Calaveras hydroelectric project
- Seasonal and daily variation in CAISO energy market prices, given the overall generation profile of CPAU's resource portfolio
- Changes in overall energy market prices and changes in carbon allowance prices associated with State's cap-and-trade program
- Increased market prices related to load-following capacity and ancillary services
- Customer load profiles changes and potential loss of customer loads available for the City to serve
- New legislative and regulatory mandates

XII. Appendices

G. *Key Supplemental Reports and Documents*

14. NCPA-CAISO Metered Sub-System Agreement
15. FY 2024 Electric Utility Financial Plan
16. Ten-Year Electric Energy Efficiency Goals (May 2021)
17. City of Palo Alto Utilities 2020 Energy Storage Report (AB2514)
18. Distributed Energy Resources Plan (2017)
19. 2021 RPS and Carbon Neutral Plan Update (October 2022)
20. Impact of Electrification on Electric Resiliency (November 2021)
21. S/CAP Goals and Key Actions (2022)
22. S/CAP Work Plan for 2023-2025 (June 2023)
23. EV Programs Status Update (August 2022)
24. FY 2021 Demand Side Management Annual Report (June 2023)
25. Electric Distribution Infrastructure Modernization Update (June 2023)
26. Palo Alto Earth Day Report 2023

H. ***RPS Procurement Plan***

CITY OF PALO ALTO UTILITIES

CITY OF PALO ALTO'S

RENEWABLE PORTFOLIO STANDARD PROCUREMENT PLAN

Version 4
December 2020

REVISION HISTORY

Version	Date	Resolution	Description
4	12/07/20	9929	Updated to reflect Senate Bill 100 (2018) requirements
3	12/03/18	9802	Updated to reflect Senate Bill 350 (2015) requirements
2	11/12/13	9381	Updated to reflect adoption of final CEC regulations, effective 10/1/13, permitting the City to adopt rules for Excess Procurement, Compliance Delay, Cost Limitations, Portfolio Balancing Reductions, and Historic Carryover. Other non-substantive clean up.
1	12/12/11	9215	Original version per Senate Bill X1 2 (2011) requirements

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INTRODUCTION

This document presents the City of Palo Alto Utilities' (CPAU) Renewable Portfolio Standard Procurement Plan (RPS Procurement Plan), as required for compliance with Senate Bill (SB) 100.[25] This legislation, which was signed into law in the 2018 Session of the Legislature, modified the state's renewable portfolio standard (RPS) program and set forth RPS requirements applicable to all load-serving entities in the state. Pursuant to Public Utility Code § 399.30(a) and Section 3205 of the California Energy Commission's (CEC) "Enforcement Procedures for the Renewables Portfolio Standard for Local Publicly Owned Electric Utilities"[26] (RPS Regulations), each POU must adopt and implement a renewable energy resources procurement plan (RPS Procurement Plan). SB X1 2, signed into law in 2011, directed the CEC to adopt regulations specifying procedures for enforcement of the RPS for Publicly Owned Utilities.

This RPS Procurement Plan replaces the RPS Procurement Plan approved by the Palo Alto City Council (City Council) on December 3, 2018 (Resolution No. 9802, Staff Report No. 9761) and is consistent with the provisions set forth in the CEC's RPS Regulations, which have been adopted by the CEC and approved by the Office of Administrative Law, with an effective date of April 12, 2016.[27]

CPAU's RPS Procurement Plan consists of:

A. Purpose of the plan;

B. Plan Elements;

C. Measures that address each of the optional provisions set forth in §399.30(d) and RPS Regulations Section 3206; and

D. Additional provisions.

Where appropriate, this RPS Procurement Plan includes section citations to the Public Utilities Code (PUC) and the CEC's RPS Regulations.

A. PURPOSE OF THE PLAN (PUC § 399.30(A))

In order to fulfill unmet long-term generation resource needs, the City Council adopts and implements this RPS Procurement Plan. This Plan requires the utility to procure a minimum quantity of electricity products from eligible renewable energy resources, including renewable energy credits (RECs), as a

[25] SB 100 (2018) was signed by California's Governor on September 10, 2018, and made significant revisions to Public Utilities Code sections 399.11-399.32, the California Renewable Portfolio Standard Program.

[26] California Code of Regulations, Title 20, Division 2, Chapter 13, Sections 3200 - 3208 and Title 20, Division 2, Chapter 2, Section 1240.

[27] At the time of writing for this edition of CPAU's RPS Procurement Plan, the RPS Regulations had not been updated with SB 350 and subsequent legislative requirements. Where both Public Utility Codes and RPS Regulations are cited but the RPS Regulations are outdated, CPAU's RPS Procurement Plan will reflect the more current Public Utility Codes.

specified percentage of CPAU's total kilowatt-hours of electrical energy sold to its retail end-use customers, during each compliance period, to achieve the targets specified in SB 100 and the RPS Regulations. This RPS Procurement Plan establishes the framework for achieving the minimum requirements under SB 100 and the RPS Regulations, and does not include or preclude actions taken by CPAU to achieve the City Council's goals.

B. PLAN ELEMENTS

CPAU will comply with the requirements for renewables procurement targets set forth in SB 100 and the applicable enforcement procedures codified in the CEC's RPS Regulations, including implementation of the following Plan Elements:

1. Compliance Period Definitions

CPAU has adopted the relevant compliance period definitions identified in PUC § 399.30(b).

2. Procurement Requirements

CPAU shall meet or exceed the following procurement targets of renewable energy resources for each compliance period per PUC §§ 399.30(c)(1) and (2) and the CEC's RPS Regulations:

Compliance Period 1 Target ≥ 20% × (CPAU Retail Sales$_{2011}$_+ CPAU Retail Sales$_{2012}$ + CPAU Retail Sales$_{2013}$).

Compliance Period 2 Target ≥ 20% × CPAU Retail Sales$_{2014}$ + 20% × CPAU Retail Sales$_{2015}$ + 25% × CPAU Retail Sales$_{2016}$

Compliance Period 3 Target ≥ 27% × CPAU Retail Sales$_{2017}$ + 29% × CPAU Retail Sales$_{2023}$ + 31% × CPAU Retail Sales$_{2019}$ + 33% × CPAU Retail Sales$_{2020}$

Compliance Period 4 Target ≥ 35.75% × CPAU Retail Sales$_{2021}$ + 38.5% × CPAU Retail Sales$_{2022}$ + 41.25% × CPAU Retail Sales$_{2023}$ + 44% × CPAU Retail Sales$_{2024}$

Compliance Period 5 Target ≥ 46% × CPAU Retail Sales$_{2025}$ + 50% × CPAU Retail Sales$_{2026}$ + 52% × CPAU Retail Sales$_{2027}$

Compliance Period 6 Target ≥ 54.67% × CPAU Retail Sales$_{2028}$ + 57.33% × CPAU Retail Sales$_{2029}$ + 60% × CPAU Retail Sales$_{2030}$

For every subsequent three-year Compliance Period (e.g., 2031-2033), CPAU shall procure renewable energy resources equivalent to at least sixty percent (60%) of retail kilowatt-hour sales during that Compliance Period.

The procurement targets listed for each individual year above are soft targets. That is, by the end of each Compliance Period, CPAU's RPS total for the period has to equal the sum of the annual targets, but the targets do not have to be achieved in each individual year.

3. Portfolio Content Categories (PCC)

CPAU adopts the definitions for qualifying electric products and Portfolio Content Categories (PCC) per Sections 3202 and 3203 of the CEC's RPS Regulations.

a. *How CPAU Plans to Achieve its RPS Requirements per Section 3205(a)(1) of the CEC's RPS Regulations*

CPAU's RPS portfolio will include grandfathered contracts (commonly referred to as "PCC 0"), which are executed prior to June 1, 2010, and PCC 1 eligible resources, which are typically directly or dynamically connected to a California balancing authority. CPAU's RPS portfolio may also include PCC 2 eligible resources that are scheduled into a California balancing authority, and PCC 3 eligible resources, which are typically unbundled renewable energy credits (RECs). PCC 0 resources are defined in Section 3202(a)(2) of the CEC's RPS Regulations, while PCC 1, 2, and 3 resources are defined in Section 3203 of the CEC's RPS Regulations. CPAU shall determine the category to which each procured resource belongs.

In its 2011 through 2017 RPS Compliance Reports, CPAU listed a total of five PCC 0 contracts. All five of these contracts extend through the end of Compliance Period 3, and all have achieved commercial operation. On their own, these PCC 0 contracts were sufficient to enable CPAU to meet its Compliance Period 1 and 2 RPS targets.

CPAU has currently executed six contracts for PCC 1 resources, all of which have commenced operation. With these six PCC 1 resources, along with its five PCC 0 contracts, CPAU forecasts that its renewable energy supplies will be well in excess of its procurement requirements through at least Compliance Period 6.

4. Portfolio Balancing Requirements

In satisfying the procurement requirements listed in section B.3 of this RPS Procurement Plan, CPAU shall also satisfy the legally-required portfolio balancing requirements specifying the limits on quantities for PCC 1 and PCC 3 per PUC § 399.30(c)(3), §§ 399.16(c)(1) and (2). CPAU shall apply the formulae specified in Section 3204(c) of the CEC's RPS Regulations to determine these portfolio balance requirements. Renewable energy procured from PCC 0 contracts shall be excluded from these portfolio balancing requirement formulae.

5. Long-Term Contract Requirement

In meeting the RPS procurement requirements identified in section B.3 of this RPS Procurement Plan, CPAU is subject to long-term contract requirements. Consistent with Public Resources Code

§ 399.13(b), CPAU may enter into a combination of long- and short-term contracts for electricity and associated renewable energy credits. Beginning January 1, 2021, at least 65 percent of CPAU's procurement that counts toward the RPS requirement of each compliance period shall be from its contracts of 10 years or longer or in its ownership or ownership agreements for eligible renewable energy resources.

6. Reasonable Progress

CPAU shall demonstrate that it is making reasonable progress towards ensuring that it shall meet its compliance period targets during intervening years per PUC §§ 399.30(c)(2).

C. OPTIONAL COMPLIANCE MEASURES

As permitted by Section 3206(a) of the CEC's RPS Regulations, the City Council hereby adopts rules permitting the use of each of the following five optional compliance measures included in the CEC's RPS Regulations: Excess Procurement, Delay of Timely Compliance, Cost Limitations, Portfolio Balance Requirement Reduction, and Historic Carryover. The City Council also hereby adopts rules permitting the use of the Large Hydro Exemption as described in PUC § 399.30(l).

1. Excess Procurement (PUC §399.13(a)(4)(B))

a. *Adoption of Excess Procurement Rules*

The City Council has elected to adopt rules permitting CPAU to apply excess procurement in one compliance period to a subsequent compliance period, as described in Section 3206(a)(1) of the CEC's RPS Regulations.

b. *Limitations on CPAU's Use of Excess Procurement*

CPAU shall be allowed to apply Excess Procurement from one compliance period to subsequent compliance periods as long as the following conditions are met:

1. Excess Procurement shall only include generation from January 1, 2011 or later.

2. Eligible resources must be from Content Category 1 or Grandfathered Resources to be Excess Procurement. Resources from Content Category 2 or Content Category 3 will not count towards Excess Procurement.

c. *Excess Procurement Calculation*

CPAU shall calculate its Excess Procurement according to formulae in section 3206 (a)(1)(D) of the CEC's RPS Regulations.

d. *City Council Review*

CPAU's use of the Excess Procurement to apply towards CPAU's RPS procurement target in any compliance period will be reviewed by the City Council during its annual review as per section D.3 of this RPS Procurement Plan.

2. Waiver of Timely Compliance (§ 399.30(d)(2), § 399.15(b)(5))

a. *Adoption of Waiver of Timely Compliance Rules*

The City Council has elected to adopt rules permitting it to make a finding that conditions beyond CPAU's control exist to delay timely compliance with RPS procurement requirements, as described in Section 3206(a)(2) of the CEC's RPS Regulations.

b. *Waiver of Timely Compliance Findings*

The City Council may make a finding, based on sufficient evidence presented by CPAU staff, and as described in this Section C.2, that is limited to one or more of the following causes of delay, and shall demonstrate that CPAU would have met its RPS procurement requirements but for the cause of the delay:

(1) *Inadequate Transmission*

i. There is inadequate transmission capacity to allow for sufficient electricity to be delivered from CPAU's proposed eligible renewable energy resource projects using the current operational protocols of the California Independent System Operator's Balancing Authority Area.

ii. If the City Council's delay finding rests on circumstances related to CPAU's transmission resources or transmission rights, the City Council may find that:

a) CPAU has undertaken, in a timely fashion, reasonable measures under its control and consistent with its obligations under local, state, and federal laws and regulations, to develop and construct new transmission lines or upgrades to existing lines intended to transmit electricity generated by eligible renewable energy resources, in light of its expectation for cost recovery.

b) CPAU has taken all reasonable operational measures to maximize cost-effective purchases of electricity from eligible renewable energy resources in advance of transmission availability.

(2) *Permitting, interconnection, or other factors that delayed procurement or insufficient supply*.

i. Permitting, interconnection, or other circumstances have delayed procured eligible renewable energy resource projects, or there is an insufficient supply of eligible renewable energy resources available to CPAU.

ii. In making its findings relative to the existence of this condition, the City Council's deliberations shall include, but not be limited to the following:

a) Whether CPAU prudently managed portfolio risks, including, but not limited to, holding solicitations for RPS-eligible resources with outreach to market participants and relying on a sufficient number of viable projects;

b) Whether CPAU sought to develop its own eligible renewable energy resources, transmission to interconnect to eligible renewable energy resources, or energy storage used to integrate eligible renewable energy resources.

c) Whether CPAU procured an appropriate minimum margin of procurement above the minimum procurement level necessary to comply with the renewables portfolio standard to compensate for foreseeable delays or insufficient supply;

d) Whether CPAU has taken reasonable measures, under its control to procure cost-effective distributed generation and allowable unbundled renewable energy credits;

e) Whether actions or events beyond CPAU's control have adversely impacted timely deliveries of renewable energy resources including, but not limited to, acts of nature, terrorism, war, labor difficulty, civil disturbance, or market manipulation;

(3) *Unanticipated curtailment of eligible renewable energy resources if the delay would not result in an increase in greenhouse gas emissions.*

(4) *Unanticipated increase in retail sales due to transportation electrification.* In making a finding that this condition prevents timely compliance, the City Council shall consider both of the following:

(i) Whether transportation electrification significantly exceeded forecasts in CPAU's service territory based on the best and most recently available information filed with the State Air Resources Board, the Energy Commission, or another state agency.

(ii) Whether CPAU took reasonable measures to procure sufficient resources to account for unanticipated increases in retail sales due to transportation electrification.

c. *Procedures upon Approving Waiver:*

In the event of a Waiver of Timely Compliance due to any of the factors set forth above, CPAU shall implement the following procedures:

(1) Establish additional reporting for intervening years to demonstrate that reasonable actions under the CPAU's control are being taken (§399.15(b)(6)).

(2) Require a demonstration that all reasonable actions within the CPAU's control have been taken to ensure compliance in order to grant the waiver (§ 399.15(b)(7)).

3. Cost Limitations for Expenditures (PUC § 399.30(d), § 399.15(c))

a. *Cost Limitations for Expenditures*

The City Council has elected to adopt rules for cost limitations on the procurement expenditures used to comply with CPAU's procurement requirements, as described in Section 3206(a)(3) of the CEC's RPS Regulations. These cost limitation rules are intended to be consistent with PUC §399.15(c).

b. *Considerations in Development of Cost Limitation Rules*

In adopting cost limitation rules, the City Council has relied on the following:

1) This Procurement Plan;

2) Procurement expenditures that approximate the expected cost of building, owning, and operating eligible renewable energy resources;

3) The potential that some planned resource additions may be delayed or canceled; and

4) Local and regional economic conditions and the ability of CPAU's customers to afford produced or procured energy products. These economic conditions may include but are not limited to unemployment, wages, cost of living expenses, the housing market, and cost burden of other utility rates on the same customers. The City Council may also consider cost disparities between customer classes within Palo Alto, and between Palo Alto customers and other Publicly Owned Utility and Investor Owned Utility customers in the region.

c. *Cost Limitations*

Since 2002, the City of Palo Alto's RPS policy has required that CPAU pursue a target level of renewable purchases while "[e]nsuring that the retail rate impact for renewable purchases does not exceed 0.5 ¢/kWh on average," i.e., the cumulative incremental cost of all renewable resources over and above the estimated cost of an equivalent volume and shape of alternative non-RPS resources shall not cause a retail rate impact in excess

of 0.5 ¢/kWh on average. This limit was first established by the City Council in October 2002 based on public input, and the goal of balancing resource reliability and cost considerations in the consideration of investment in renewable and energy efficiency resources.

d. *Actions to be Taken if Costs Exceed Adopted Cost Limitation*

If costs are anticipated to exceed the cost limitations set by the City Council, staff will present proposals to the City of Palo Alto's Utilities Advisory Commission to either reduce the RPS requirements or increase the cost limitation. Staff and the Commission's recommendations will then be taken to the City Council for action.

4. Portfolio Balance Requirement Reduction (PUC § 399.16(e))

a. *Adoption of Portfolio Balance Requirement Reduction Rules*

The City Council has elected to adopt rules that allow for the reduction of the portfolio balance requirement for PCC 1 for a specific compliance period, consistent with PUC §399.16(e), as described in Section 3206(a)(4) of the CEC's RPS Regulations.

b. *Portfolio Balance Requirement Reduction Rules*

CPAU may reduce the portfolio balance requirement for PCC1 for a specific compliance period, consistent with PUC §399.16 (e) and the following:

1. The need to reduce the portfolio balance requirements for PCC 1 must have resulted because of conditions beyond CPAU's control, as provided in Section 3206(a)(2) of the CEC's RPS Regulations.

2. CPAU may not reduce its portfolio balance requirement for PCC 1 below 65 percent for any compliance period after December 31, 2016.

3. Any reduction in portfolio balance requirements for PCC 1 must be adopted at a publicly noticed meeting, providing at least 10 calendar days' notice to the CEC, and include an updated renewable energy resources procurement plan detailing the portfolio balance requirement changes.

5. Historic Carryover

a. *Adoption of Historic Carryover Rules*

The City Council has elected to adopt rules to permit its use of Historic Carryover, as defined in Section 3206(a)(5) of the RPS Regulations, to meet its RPS procurement targets.

Current calculations indicate that CPAU has Historic Carryover due to CPAU's early investment in renewable energy resources.

b. *Historic Carryover Procurement Criteria*

CPAU's use of Historic Carryover is subject to section 3206 (a)(5) of the CEC's RPS Regulations, including the following:

1) Procurement generated before January 1, 2011 may be applied to CPAU's RPS procurement target for the compliance period ending December 31, 2013, or for any subsequent compliance period; and

2) The procurement must also meet the criteria of Section 3202 (a)(2) of the CEC's RPS Regulations; and

3) The procurement must be in excess of the sum of the 2004-2010 annual procurement targets defined in Section 3206(a)(5)(D) of the CEC's RPS Regulations; and

4) The procurement cannot have been applied to the RPS of another state or to a voluntary claim.

5) The Historic Carryover must be procured pursuant to a contract or ownership agreement executed before June 1, 2010.

6) Both the Historic Carryover and the procurement applied to CPAU's annual procurement targets must be from eligible renewable energy resources that were RPS-eligible under the rules in place for retail sellers at the time of execution of the contract or ownership agreement, except that the generation from such resources need not be tracked in the Western Renewable Energy Generation Information System.

c. *Historic Carryover Formula*

CPAU will calculate its Historic Carryover according to formulae in section 3206 (a)(5)C) and (D) of the CEC's RPS Regulations.

d. *Historic Carryover Claims*

The number of RECs qualifying for Historic Carryover is dependent upon the acceptance by the CEC of CPAU's applicable procurement claims for January 1, 2004 – December 31, 2010, which are due to the CEC within 90 calendar days after the effective date of the CEC's RPS Regulations (October 30, 2013). The Historic Carryover submittal shall also include baseline calculations, annual procurement target calculations, and any other pertinent data.

e. *Council Review*

CPAU's use of the Historic Carryover to apply towards CPAU's RPS procurement target in any compliance period will be reviewed by the City Council during its annual review as per section D.3 of this RPS Procurement Plan.

6. Large Hydro Exemption (PUC § 399.30(l))

a. *Adoption of Large Hydro Exemption Rules*

The City Council has elected to adopt rules permitting CPAU to reduce its annual RPS procurement requirements, as described in PUC §399.30(l).

b. *Limitations on CPAU's Use of the Large Hydro Exemption*

CPAU shall be allowed to invoke the Large Hydro Exemption as long as the following conditions are met:

1. During a year within a compliance period, CPAU shall have received greater than 40% of its retail sales from large hydroelectric generation, which is defined as electricity generated from a hydroelectric facility that is not an eligible renewable energy resource.
2. The large hydroelectric generation is produced at a facility owned by the federal government as a part of the federal Central Valley Project or a joint powers agency.
3. Only large hydroelectric generation that is procured under an existing agreement effective as of January 1, 2015, or an extension or renewal of that agreement, shall counted in the determination that CPAU has received more than 40% of its retail sales from large hydroelectric generation in any year.

c. *Large Hydro Exemption Calculation*

CPAU's annual RPS procurement target for a year in which the Large Hydro Exemption is invoked shall equal the lesser of (a) the portion of CPAU's retail sales unsatisfied by its large hydroelectric generation or (b) the annual RPS procurement soft target for that year, as listed in section B.2 of this RPS Procurement Plan. CPAU's RPS procurement requirement for the compliance period that includes said year shall be adjusted to reflect any reduction in CPAU's annual RPS procurement target pursuant to this section.

d. *City Council Review*

CPAU's use of the Large Hydro Exemption to reduce its annual RPS procurement target in any compliance period will be reviewed by the City Council during its annual review as per section D.3 of this RPS Procurement Plan.

D. ADDITIONAL PLAN COMPONENTS

1. Exclusive Control (PUC § 399.30(n))

In all matters regarding compliance with the RPS Procurement Plan, CPAU shall retain exclusive control and discretion over the following:

a. The mix of eligible renewable energy resources procured by CPAU and those additional generation resources procured by CPAU for purposes of ensuring resource adequacy and reliability.

b. The reasonable costs incurred by CPAU for eligible renewable energy resources owned by it.

2. Deliberations & Reporting (PUC § 399.30(e), § 399.30(f))

a. *Deliberations on Procurement Plan* (§399.30(f)):

(1) *Public Notice*: Annually, CPAU shall post notice of meetings if the CPA Council will deliberate in public regarding this RPS Procurement Plan.

(2) *Notice to the California Energy Commission (CEC)*: Contemporaneous with the posting of a notice for such a meeting, CPAU shall notify the CEC of the date, time and location of the meeting in order to enable the CEC to post the information on its Internet website.

(3) *Documents and Materials Related to Procurement Status and Plans:* When CPAU provides information to the CPA Council related to its renewable energy resources procurement status and future plans, for the City Council's consideration at a noticed public meeting, CPAU shall make that information available to the public and shall provide the CEC with an electronic copy of the documents for posting on the CEC's website.

b. *Compliance Reporting* (Section 3207 of the CEC RPS Regulations)

(1) CPAU shall submit an annual report to the CEC by July 1. The annual reports shall include the information specified in Section 3207(c) of the CEC RPS Regulations.

(2) By July 1, 2021; July 1, 2025; July 1, 2028; July 1, 2031; and by July 1 of every third year thereafter, CPAU shall submit to the CEC a compliance report that addresses the annual reporting requirements of the previous section, and information for the preceding compliance period as specified in Section 3207(d) of the CEC RPS Regulations.

3. Annual Review

CPAU's RPS Procurement Plan shall be reviewed annually by the City Council in accordance with CPAU's RPS Enforcement Program.

4. Plan Modifications/Amendments

This RPS Procurement Plan may be modified or amended by an affirmative vote of the City Council during a public meeting. Any City Council action to modify or amend the plan must be publicly noticed in accordance with Section D.2.a.

Effective Date: This plan shall be effective on December 7, 2020.

APPROVED AND ADOPTED this 7th day of December, 2020.

I. *Standardized IRP Tables*

i. Capacity Resource Adequacy Table (CRAT)

State of California
California Energy Commission
Standardized Reporting Tables for Public Owned Utility IRP Filing
Capacity Resource Accounting Table
Form CEC 109 (May 2017)

Scenario Name: Expected

Yellow fill relates to an application for confidentiality.
Data input by User are in dark green font.

Units = MW

	PEAK LOAD CALCULATIONS		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	Forecast Total Peak-Hour 1-in-2 Demand		185	155	166	165	164	163	162	161	160	158	156	155	153	151
2	[Customer-side solar: nameplate capacity]		15	17	19	21	22	24	25	27	29	32	34	37	41	44
2a	[Customer-side solar: peak hour output]		12	14	15	16	17	18	20	21	23	25	27	29	32	34
3	[Peak load reduction due to thermal energy storage]		0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	[Light Duty PEV consumption in peak hour]		1	1	1	2	2	3	4	5	6	7	8	9	10	11
5	Additional Achievable Energy Efficiency Savings on Peak				0	0	0	0	0	0	0	0	0	0	0	0
6	Demand Response / Interruptible Programs on Peak				0	0	0	0	1	2	2	3	4	5	6	7
7	**Managed Peak Demand (1-5-6)**		**185**	**155**	**166**	**165**	**164**	**163**	**161**	**160**	**158**	**155**	**152**	**150**	**147**	**144**
8	Planning Reserve Margin	15%			25	25	25	25	24	24	24	23	23	22	22	22
9	Firm Sales Obligations															
10	**Total Peak Procurement Requirement (7+8+9)**		**185**	**155**	**190**	**190**	**189**	**188**	**186**	**184**	**182**	**179**	**175**	**172**	**169**	**166**

EXISTING AND PLANNED CAPACITY SUPPLY RESOURCES

	Utility-Owned Generation and Storage (not RPS-eligible): [list resource by name]	Fuel	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
11a	Collierville	Hydroelectric			57	57	57	57	57	57	57	57	57	57	57	57
11g																
	Long-Term Contracts (not RPS-eligible): [list contracts by name]	Fuel														
11h	Western Base Resource Generation	Hydroelectric			191	183	175	175	175	175	175	175	175	175	175	175
11	**Total peak dependable capacity of existing and planned supply resources (not RPS-eligible) (sum of 11a...11n)**		**0**	**0**	**247**	**240**	**232**	**232**	**232**	**232**	**232**	**232**	**232**	**232**	**232**	**232**
	Utility-Owned RPS-eligible Resources: [list resource by plant or unit]	Fuel														
12a	New Spicer Hydroelectric	Hydroelectric	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12n																
	Long-Term Contracts (RPS-eligible): [list contracts by name]	Fuel														
12o	PROJECT #1 - HIGHWINDS	Wind			10	10	12	10	10	10	10	10	10	0	0	0
12p	PROJECT #2 - SHILOH #1	Wind			12	12	10	0	0	0	0	0	0	0	0	0
12q	Santa Cruz (Buena Vist Landfill)	Landfill Gas			2	2	2	2	2	2	2	0	0	0	0	0
12r	Ox Mountain (Half Moon Bay)	Landfill Gas			5	5	5	5	5	5	5	5	5	5	0	0
12...	Keller Canyon	Landfill Gas			2	2	2	2	2	2	2	2	2	2	2	0
12...	Johnson Canyon (Ameresco)	Landfill Gas			1	1	1	1	1	1	1	1	1	1	1	1
12...	San Joaquin (Ameresco)	Landfill Gas			4	4	4	4	4	4	4	4	4	4	4	4
12...	EE Kettleman Land	Solar			0	0	0	0	0	0	0	0	0	0	0	0
12...	Elevation Solar C	Solar			34	34	34	34	34	34	0	0	0	0	0	0
12...	Western Antelope Blue Sky Ranch B	Solar			17	17	17	17	17	17	17	17	17	17	17	17
12...	Frontier Solar	Solar			0	0	0	0	0	0	0	0	0	0	0	0
12...	Hayworth Solar	Solar			22	22	22	22	22	22	22	22	22	22	22	22
12...	Wilsona Solar	Solar			0	0	0	0	0	0	0	0	0	0	0	0
12...	Palo Alto CLEAN Projects	Solar			1	1	1	1	1	1	1	1	1	1	1	1
12	**Total peak dependable capacity of existing and planned RPS-eligible resources (sum of 12a...12n)**		**1**	**1**	**29**	**29**	**29**	**17**	**17**	**17**	**17**	**16**	**16**	**6**	**1**	**1**
13	**Total peak dependable capacity of existing and planned supply resources (11+12)**		**1**	**1**	**277**	**269**	**261**	**249**	**249**	**249**	**249**	**248**	**248**	**238**	**233**	**233**

GENERIC ADDITIONS

	NON-RPS ELIGIBLE RESOURCES: [list resource by name or description]	Fuel			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
14a	None															
14	**Total peak dependable capacity of generic supply resources (not RPS-eligible)**				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	RPS-ELIGIBLE RESOURCES: [list resource by name or description]	Fuel														
15a																
15	**Total peak dependable capacity of generic RPS-eligible resources**				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
16	**Total peak dependable capacity of generic supply resources (14+15)**				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

CAPACITY BALANCE SUMMARY

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
17	**Total peak procurement requirement (from line 10)**	185	155	190	190	189	188	186	184	182	179	175	172	169	166
18	**Total peak dependable capacity of existing and planned supply resources (from line 13)**	1	1	277	269	261	249	249	249	249	248	248	238	233	233
19	**Current capacity surplus (shortfall) (18-17)**	(184)	(154)	86	79	72	61	64	66	68	69	73	66	64	67
20	**Total peak dependable capacity of generic supply resources (from line 16)**			0	0	0	0	0	0	0	0	0	0	0	0
21	**Planned capacity surplus/shortfall (shortfalls assumed to be met with short-term capacity purchases) (19+20)**	(184)	(154)	86	79	72	61	64	66	68	69	73	66	64	67

ii. Energy Balance Table (EBT)

State of California
California Energy Commission
Standardized Reporting Tables for Public Owned Utility IRP Filing
Energy Balance Table
Form CEC 110 (May 2017)

Scenario Name: Expected

Units = MWh

Yellow fill relates to an application for confidentiality.

				Historical Data													
	NET ENERGY FOR LOAD CALCULATIONS			**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
1	Retail sales to end-use customers		3%			913,986	911,077	907,555	904,572	903,149	902,329	902,293	902,447	902,638	903,238	903,835	905,452
2	Other loads			600		27,438	27,332	27,227	27,960	27,914	27,887	27,908	27,911	27,916	27,934	27,952	28,001
3	Unmanaged net energy for load					941,423	938,410	934,782	932,532	931,063	930,216	930,201	930,358	930,553	931,173	931,787	933,453
4	Managed retail sales to end-use customers	No AAEE	0%			913,986	911,077	907,555	904,572	903,149	902,329	902,293	902,447	902,638	903,238	903,835	905,452
5	Managed net energy for load					941,423	938,410	934,782	932,532	931,063	930,216	930,201	930,358	930,553	931,173	931,787	933,453
6	Firm Sales Obligations		0			0	0	0	0	0	0	0	0	0	0	0	0
7	**Total net energy for load (5+6)**					**941,423**	**938,410**	**934,782**	**932,532**	**931,063**	**930,216**	**930,201**	**930,358**	**930,553**	**931,173**	**931,787**	**933,453**
8	[Customer-side solar generation]					18,005	20,277	22,674	24,065	25,620	27,360	29,304	31,474	33,897	36,599	39,614	42,975	46,719	50,890
9	[Light Duty PEV electricity procurement requirement]					7,316	9,510	11,967	14,704	17,685	20,933	24,444	28,246	32,275	36,579	41,144	46,008	51,073	56,406
10	[Other transportation electricity ~~consumption~~/procurement requirement]							0	0	0	0	0	0	0	0	0	0	0	0
11	[Other electrification/fuel substitution; ~~consumption~~/procurement requirement]	HPWH& HPSH						146	288	476	730	1,049	1,423	1,876	2,431	3,083	3,831	4,639	5,507
	EXISTING AND PLANNED GENERATION RESOURCES																		
	Utility-Owned Generation Resources (not RPS-eligible):																		
	[list resource by name]					**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
12a	Collierville	Hydroelectric				241,017	92,779	115,701	131,668	131,668	131,668	131,668	131,668	131,668	131,668	131,668	131,668	131,668	131,668
	Long-Term Contracts (not RPS-eligible):																		
	[list contracts by name]																		
12h	Western Base Resource Generation	Is auto-updating				541,539	411,405	409,511	385,814	364,289	364,289	364,289	364,289	364,289	364,289	364,289	364,289	364,289	364,289
12	**Total energy from existing and planned supply resources (not RPS-eligible) (sum of 12a...12n)**					**782,556**	**504,184**	**525,212**	**517,482**	**495,957**	**495,957**	**495,957**	**495,957**	**495,957**	**495,957**	**495,957**	**495,957**	**495,957**	**495,957**
	Utility-Owned RPS-eligible Generation Resources:																		
	[list resource by plant or unit]																		
13a	New Spicer Hydroelectric	Hydroelectric				5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	Long-Term Contracts (RPS-eligible):																		
	[list contracts by name]																		
13i	PROJECT #1 - HIGHWINDS	Wind				48,207	42,664	42,668	42,754	42,721	42,708	42,672	42,711	42,671	42,709	42,722	12,615	0	0
13j	PROJECT #2 - SHILOH #1	Wind				64,513	57,281	57,290	57,425	57,366	0	0	0	0	0	0	0	0	0
13k	Santa Cruz (Buena Vist Landfill)	Landfill Gas				9,853	8,961	8,961	8,986	8,961	8,961	8,961	8,985	8,961	1,449	0	0	0	0
13l	Ox Mountain (Half Moon Bay)	Landfill Gas				43,880	42,459	42,459	42,575	42,459	42,459	42,459	42,570	42,459	42,459	42,459	42,575	13,959	0
13m	Keller Canyon	Landfill Gas				14,894	13,827	13,827	13,865	13,827	13,827	13,827	13,863	13,827	13,827	13,827	13,865	9,205	0
13n	Johnson Canyon (Ameresco)	Landfill Gas				10,433	9,200	9,200	9,225	9,200	9,200	9,200	9,224	9,200	9,200	9,200	9,225	9,200	9,200
13...	San Joaquin (Ameresco)	Landfill Gas				30,283	27,468	27,468	27,544	27,468	27,468	27,468	27,540	27,468	27,468	27,468	27,544	27,468	27,468
13...	EE Kettleman Land	Solar				53,056	52,791	52,527	52,264	52,003	51,743	51,484	51,227	50,971	50,716	50,462	50,210	49,959	49,709
13...	Elevation Solar C	Solar				100,695	100,191	99,690	99,192	98,696	98,203	97,712	97,223	96,737	96,253	95,772	95,293	94,817	94,343
13...	Western Antelope Blue Sky Ranch B	Solar				50,367	50,115	49,864	49,615	49,367	49,120	48,874	48,630	48,387	48,145	47,904	47,665	47,426	47,189
13...	Frontier Solar	Solar				52,338	52,077	51,816	51,557	51,299	51,043	50,788	50,534	50,281	50,030	49,780	49,531	49,283	49,037
13...	Hayworth Solar	Solar				63,402	63,085	62,770	62,456	62,144	61,833	61,524	61,216	60,910	60,606	60,302	60,001	59,701	59,402
13...	Wilsona Solar	Solar				0	0	0	0	45,136	74,774	74,400	74,028	73,658	73,290	72,924	72,559	72,196	71,835
13...	Palo Alto CLEAN Projects	Solar				2,062	2,052	2,042	2,031	2,021	2,011	2,001	1,991	1,981	1,971	1,961	1,951	1,942	1,932
13...	Small Part of Western Area Power Association	Hydroelectric				5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
13	**Total energy from RPS-eligible resources (sum of 13a...13n, and 13z)**					**553,984**	**532,171**	**530,582**	**529,489**	**572,668**	**543,350**	**541,370**	**539,743**	**537,511**	**528,123**	**524,782**	**493,034**	**445,156**	**420,115**
13z	**Undelivered RPS energy**					**279,647**	**180,530**	**286,651**	**280,085**	**283,889**	**267,401**	**268,341**	**268,959**	**263,937**	**260,465**	**260,927**	**248,251**	**231,363**	**223,885**
14	**Total energy from existing and planned supply resources (12+13)**					**1,336,540**	**1,036,355**	**1,055,794**	**1,046,970**	**1,068,625**	**1,039,307**	**1,037,327**	**1,035,700**	**1,033,468**	**1,024,080**	**1,020,739**	**988,991**	**941,114**	**916,073**
	GENERIC ADDITIONS																		
	NON-RPS ELIGIBLE RESOURCES:																		
	[list resource by name or description]							**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
15a																			
15	**Total energy from generic supply resources (not RPS-eligible)**							**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	RPS-ELIGIBLE RESOURCES:																		
	[list resource by name or description]																		
16a																			
16e																			
16	**Total energy from generic RPS-eligible resources**							**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
17	**Total energy from generic supply resources (15+16)**							**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
17z	**Total energy from RPS-eligible short-term contracts**																		
	ENERGY FROM SHORT-TERM PURCHASES																		
						2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
18	**Short term and spot market purchases:**					**81,940**	**79,524**	**154,110**	**182,370**	**160,888**	**170,642**	**172,094**	**173,495**	**177,953**	**184,029**	**188,028**	**207,719**	**239,323**	**258,553**
	ENERGY BALANCE SUMMARY																		
						2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
19	**Total energy from supply resources (14+17+17z)**					**1,336,540**	**1,036,355**	**1,055,794**	**1,046,970**	**1,068,625**	**1,039,307**	**1,037,327**	**1,035,700**	**1,033,468**	**1,024,080**	**1,020,739**	**988,991**	**941,114**	**916,073**
19a	**Undelivered RPS energy (from 13z)**					**279,647**	**180,530**	**286,651**	**280,085**	**283,889**	**267,401**	**268,341**	**268,959**	**263,937**	**260,465**	**260,927**	**248,251**	**231,363**	**223,885**
20	**Short term and spot market purchases (from 18)**					**81,940**	**79,524**	**154,110**	**182,370**	**160,888**	**170,642**	**172,094**	**173,495**	**177,953**	**184,029**	**188,028**	**207,719**	**239,323**	**258,553**
21	**Total delivered energy (19-19a+20)**					**1,138,833**	**935,349**	**923,253**	**949,255**	**945,624**	**942,548**	**941,081**	**940,236**	**947,485**	**947,643**	**947,840**	**948,459**	**949,074**	**950,741**
22	**Total net energy for load (from 7)**					**941,423**	**941,423**	**941,423**	**938,410**	**934,782**	**932,532**	**931,063**	**930,216**	**930,201**	**930,358**	**930,553**	**931,173**	**931,787**	**933,453**
23	**Surplus/Shortfall (21-22)**					**197,409**	**(6,075)**	**(18,170)**	**10,845**	**10,842**	**10,016**	**10,018**	**10,020**	**17,284**	**17,286**	**17,287**	**17,287**	**17,287**	**17,288**

iii. GHG Emissions Accounting Table (GEAT)

State of California
California Energy Commission
Standardized Reporting Tables for Public Owned Utility IRP Filing
GHG Emissions Accounting Table
Form CEC 111 (May 2017)

Scenario Name: Expected

Yellow fill relates to an application for confidentiality.

Emissions Intensity Units = mt CO2e/MWh
Yearly Emissions Total Units = Mmt CO2e

GHG EMISSIONS FROM EXISTING AND PLANNED SUPPLY RESOURCES

Utility-Owned Generation (not RPS-eligible):

	[list resource by name]	Emissions Intensity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1a	#REF!	0			0	0	0	0	0	0	0	0	0	0	0	0

Long-Term Contracts (not RPS-eligible):

	[list contracts by name]	Emissions Intensity														
1h	Western Base Resource Generation	0			0	0	0	0	0	0	0	0	0	0	0	0
1n																
1	**Total GHG emissions of existing and planned supply resources (not RPS-eligible) (sum of 1a...1n)**		0	0	0	0	0	0	0	0	0	0	0	0	0	0

Utility-Owned RPS-eligible Generation Resources:

	[list resource by plant or unit]	Emissions Intensity														
2a	New Spicer Hydroelectric	0			0	0	0	0	0	0	0	0	0	0	0	0

Long-Term Contracts (RPS-eligible):

	[list contracts by name]	Emissions Intensity														
2h	PROJECT #1 - HIGHWINDS	0														
2i	PROJECT #2 - SHILOH #1	0														
2j	Santa Cruz (Buena Vist Landfill)	0														
2k	Ox Mountain (Half Moon Bay)	0														
2l	Keller Canyon	0														
2m	Johnson Canyon (Ameresco)	0														
2n	San Joaquin (Ameresco)	0														
2...	EE Kettleman Land	0														
2...	Elevation Solar C	0														
2...	Western Antelope Blue Sky Ranch B	0														
2...	Frontier Solar	0														
2...	Hayworth Solar	0														
2...	Wilsona Solar	0														
2...	Palo Alto CLEAN Projects	0														
2...	Small Part of Western Area Power Association	0														
2	**Total GHG emissions from RPS-eligible resources (sum of 2a...2n)**		0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	**Total GHG emissions from existing and planned supply resources (1+2)**		0	0	0	0	0	0	0	0	0	0	0	0	0	0

EMISSIONS FROM GENERIC ADDITIONS

NON-RPS ELIGIBLE RESOURCES:

	[list resource by name or description]	Emissions Intensity			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4a																
4b																
4	**Total GHG emissions from generic supply resources (not RPS-eligible)**				0	0	0	0	0	0	0	0	0	0	0	0

RPS-ELIGIBLE RESOURCES:

	[list resource by name or description]	Emissions Intensity														
5a																
5b																
5	**Total GHG emissions from generic RPS-eligible resources**				0	0	0	0	0	0	0	0	0	0	0	0
6	**Total GHG emissions from generic supply resources (4+5)**				0	0	0	0	0	0	0	0	0	0	0	0

GHG EMISSIONS OF SHORT TERM PURCHASES

		Emissions Intensity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
7	**Short term and spot market purchases:**	0.428	35,070	34,036	65,959	78,054	68,860	73,035	73,656	74,256	76,164	78,764	80,476	88,904	102,430	110,661

TOTAL GHG EMISSIONS

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
8	**Total GHG emissions to meet net energy for load (3+6+7)**	35,070	34,036	65,959	78,054	68,860	73,035	73,656	74,256	76,164	78,764	80,476	88,904	102,430	110,661

EMISSIONS ADJUSTMENTS

8a	**Undelivered RPS energy (MWh from EBT)**	279,647	180,530	286,651	280,085	283,889	267,401	268,341	268,959	263,937	260,465	260,927	248,251	231,363	223,885
8b	**Firm Sales Obligations (MWh from EBT)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8c	**Total energy for emissions adjustment (8a+8b)**	279,647	180,530	286,651	280,085	283,889	267,401	268,341	268,959	263,937	260,465	260,927	248,251	231,363	223,885
8d	**Emissions intensity (portfolio gas/short-term and spot market purchases)**	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428
8e	**Emissions adjustment (8Cx8D)**	119,689	77,267	122,687	119,877	121,505	114,448	114,850	115,114	112,965	111,479	111,677	106,251	99,023	95,823

PORTFOLIO GHG EMISSIONS

8f	**Portfolio emissions (8-8e)**	-84,619	-43,231	-56,728	-41,822	-52,645	-41,413	-41,193	-40,859	-36,801	-32,715	-31,201	-17,348	3,407	14,838

GHG EMISSIONS IMPACT OF TRANSPORTATION ELECTRIFICATION

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
9	**GHG emissions reduction due to gasoline vehicle displacement by LD PEVs**	0.02	0.03	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
10	**GHG emissions increase due to LD PEV electricity loads**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	**GHG emissions reduction due to fuel displacement - other transportation electrification**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	**GHG emissions increase due to increased electricity loads - other transportation electrification**	0	0	0	0	0	0	0	0	0	0	0	0	0	0

iv. RPS Procurement Table (RPT)

State of California
California Energy Commission
Standardized Reporting Tables for Public Owned Utility IRP Filing
RPS Procurement Table
Form CEC 112 (May 2017)

Units = MWh

	RPS ENERGY REQUIREMENT CALCULATIONS	**Beginning balances Start of 2017**	**Compliance Period 3: 2017**	**2018**	**2019**	**2020**		**Compliance Period 4: 2021**	**2022**	**2023**	**2024**	
1	(Managed) Retail sales to end-use customers (From EBT)		913,986	913,986	913,986	911,077		907,555	904,572	903,149	902,329	
2	Green pricing program/hydro exclusion		28,201	28,201	28,201	28,201		28,201	28,201	28,201	28,201	
3	Soft target (%)		27.00%	29.00%	31.00%	33.00%		34.75%	36.50%	38.25%	40.00%	
4	Required procurement for compliance period		1,061,982					1,309,770				
	Category 0, 1 and 2 RECs											
5	Excess balance/historic carryover at beginning/end of compliance period	626,376					756,746					0
6	RPS-eligible energy procured (copied from EBT)		553,984	532,171	530,582	529,489		572,668	543,350	541,370	539,743	
6A	Amount of energy applied to procurement obligation		239,162	256,878	0	0		0	0	105,139	316,907	
7	Net purchases of Category 0, 1 and 2 RECs		0	0	(530,582)	(529,489)		(572,668)	(543,350)	(436,231)	(222,836)	
7A	Carryover and REC purchases applied to procurement obligation		0	0	314,822	144,922		272,831	287,131	196,784	0	
8	Net change in balance/carryover (6+7-6A-7A)		314,822	275,293	(314,822)	(144,922)		(272,831)	(287,131)	(196,784)	0	
	Category 3 RECs											
9	Excess balance/historic carryover at beginning/end of compliance period	0					0					0
10	Net purchases of Category 3 RECs		0	0	106198	0		32744	32744	32744	32744	
11	Carryover and REC purchases applied to procurement obligation		0	0	106198	0		32744	32744	32744	32744	
12	Net change in REC balance/carryover		0	0	0	0		0	0	0	0	
13	Total generation plus RECs (all Categories) applied to procurement requirement (6A + 7A + 11)		1,061,982					1,309,770				
14	Over/under procurement for compliance period (11 - 4)		-					-				

	RPS ENERGY REQUIREMENT CALCULATIONS	**Compliance Period 5: 2025**	**2026**	**2027**		**Compliance Period 6: 2028**	**2029**	**2030**
1	(Managed) Retail sales to end-use customers (From EBT)	902,293	902,447	902,638		903,238	903,835	905,452
2	Green pricing program/hydro exclusion	28,201	28,201	28,201		28,201	28,201	28,201
3	Soft target (%)	41.67%	43.33%	45.00%		46.67%	48.33%	50.00%
4	Required procurement for compliance period	1,136,541				1,270,199		
	Category 0, 1 and 2 RECs							
5	Excess balance/historic carryover at beginning/end of compliance period				0			438,625
6	RPS-eligible energy procured (copied from EBT)	537,511	528,123	524,782		493,034	445,156	420,115
6A	Amount of energy applied to procurement obligation	331,491	346,067	360,752		375,636	390,450	405,881
7	Net purchases of Category 0, 1 and 2 RECs	(206,020)	(182,056)	(164,029)		(117,398)	(54,707)	(14,234)
7A	Carryover and REC purchases applied to procurement obligation	0	0	0		0	0	0
8	Net change in balance/carryover (6+7-6A-7A)	0	0	0		0	0	0
	Category 3 RECs							
9	Excess balance/historic carryover at beginning/end of compliance period				0			
10	Net purchases of Category 3 RECs	32744	32744	32744		32744	32744	32744
11	Carryover and REC purchases applied to procurement obligation	32744	32744	32744		32744	32744	32744
12	Net change in REC balance/carryover	0	0	0		0	0	0
13	Total generation plus RECs (all Categories) applied to procurement requirement (6A + 7A + 11)	1,136,542				1,270,199		
14	Over/under procurement for compliance period (11 - 4)	1				0		

Integrated Resource Plan (IRP)
Objective and Strategies

IRP Objective

To provide safe, reliable, environmentally sustainable and cost-effective electricity supplies and services to all customers.

IRP Strategies

1. **Pursue an Optimal Mix of Supply-side and Demand-side Resources:** When procuring to meet demand, pursue an optimal mix of resources that meets the IRP Objective, with cost-effective energy efficiency, distributed generation, and demand-side resources as preferred resources. Consider portfolio fit and resource uncertainties when evaluating cost-effectiveness.
2. **Maintain a Carbon Neutral Supply:** Maintain a carbon neutral electric supply portfolio to meet the community's greenhouse gas (GHG) emission reduction goals.
3. **Actively Manage Portfolio Supply Cost Uncertainties:** Structure the portfolio or add mitigations to manage short-term risks (e.g. market price risk and hydroelectric variability) and build flexibility into the portfolio to address long-term risks (e.g. resource availability, customer load profile changes, and regulatory uncertainty) through diversification of suppliers, contract terms, and resource types.
4. **Manage Electric Portfolio to Ensure Lowest Possible Ratepayer Bills:** Pursue resources in a least-cost, best-fit approach in an effort to ensure ratepayer bills remain as low as possible, while achieving other Council-adopted sustainability, rate, and financial objectives.
5. **Partner with External Agencies to Implement Optimization Opportunities:** Actively engage and partner with external agencies to maximize resource value and optimize operations.
6. **Manage Supplies to Meet Changing Customer Loads and Load Profiles:** Maintain electric supply resource flexibility in anticipation of potential changes in customer loads due to distributed energy resources, efficiency, electrification, or for other reasons. At the same time, use retail rates and other available tools to influence customer load changes in a manner that minimizes overall costs and achieves other Council objectives.
7. **Ensure Reliable and Low-cost Transmission Services:** Work with the transmission system operator to receive reliable service in a least-cost manner.
8. **Support Local Electric Supply Resiliency:** Coordinate supply portfolio planning with utility-wide efforts to support local measures and programs that enhance community electric supply resiliency.
9. **Comply with State and Federal Laws and Regulations:** Ensure compliance with all statutory and regulatory requirements for energy, capacity, reserves, GHG emissions, distributed energy resources, efficiency goals, resource planning, and related initiatives.

Utilities Advisory Commission
Staff Report

From: Dean Batchelor, Director Utilities
Lead Department: Utilities

Meeting Date: October 11, 2023
Staff Report: 2306-1602

TITLE
Update and Discussion on Undergrounding of the Electrical Distribution System and Electrification Goals

RECOMMENDATION
This report is for information and discussion only with no recommended action

BACKGROUND
History of the Undergrounding Program

The underground program in Palo Alto began in 1965 with the completion of the first underground district on Oregon Expressway. Since that time, 44 Underground Districts have been completed under Rule and Regulation 17 - Conversion of Electric and Communication Facilities to Underground. (Attachment A)[1] Is the Underground Conversion Project map showing completed and proposed Underground Districts.

The main purpose of the program was to remove overhead electric and telecommunication lines to improve the visual appearance of the City.

Forming Underground Districts

Underground Districts are formed by a vote of Council to enact an ordinance amending the Municipal Code to establish the borders of the underground district. This process is outlined in the City of Palo Alto Municipal Code Section 12.16 – Underground Utilities. At the time the underground district is formed, the Municipal Code establishes when all overhead facilities must be undergrounded and removed. There are exceptions to the undergrounding that are specified Section 12.16.050 of the Municipal Code (Exceptions) (includes overhead transmission facilities, streetlights, etc.)

[11] Attachment A – Map https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/reports/city-manager-reports-cmrs/attachments/10-11-2023-id-2306-1602-attachment-a-map.pdf

Types of Underground Districts

There are three types of underground districts established in Rule and Regulation 17: Areas of General Public Interest and Benefit (Section B), Areas of Primarily of Local Public Benefit (Section C), and Areas Insufficient Public Benefit to Qualify Under Section B or Section C.

General Public Interest and Benefit Undergrounding (Section B)

The typical process for a General Public Benefit undergrounding project is for staff to review areas for undergrounding that would qualify as general benefit project and make a proposal for the budget process. Staff then inform the residents affected of the intent to form an underground district and holds a public meeting to explain the project and answer questions from the public. After the meeting, staff conducts an informal survey to ascertain the interest of the community. The results of the survey are provided to the Council at the time of underground district formation where the Council will enact an ordinance determining that the project is a General Benefit Underground District. The City is responsible for funding and construction of facilities in the street and the homeowner is responsible for the service connection on the property.

Most underground districts have been formed as general benefit projects.

Primarily of Local Public Benefit (Section C)

This type of underground district is initiated by a request from a community representative on behalf of a group of residents. The residents are responsible for creating an assessment district to fund their portion of the district. Council will determine if the district meets the criteria for this type of underground district and amend the Municipal Code by passing an ordinance. Residents are responsible for 50% of the cost of infrastructure in the street excluding the cost of transformers and equipment.

Insufficient Public Benefit to Qualify Under Section B or Section C

This type of underground district is initiated by a request from a community representative on behalf of a group of residents or from an individual. The Utility Director reviews and approves this type of underground district. The residents are responsible for creating an assessment district to fund their portion of the district. Residents are responsible for funding at least 75% of the infrastructure in the street excluding transformers and equipment. The share borne by CPAU is determined by the Electrical Engineering Manager based on their calculation of the benefit to CPAU.

Ownership of Poles and Third-Party Attachments

Most of the approximately 6000 poles in the City are jointly owned by the City and AT&T. Approximately 200 poles are jointly owned by the City, AT&T, and PG&E. The ownership in these poles is governed by two joint pole agreements that were established in the early 20th Century. Each pole has allocated space as follows: joint use area at the bottom of the pole, communication attachments in the middle, and electrical space at the top of the pole.

Comcast is attached to the poles in the AT&T communication space through an agreement with AT&T. Other third-party attachments, such as wireless communication facilities, gain access to the poles through a master license agreement with the City, when the facilities are in the electric owned space on the pole, or through AT&T if they are attached in the communications space on the pole.

Impact of the Formation of Underground Districts on AT&T and Third Parties

When the City creates an underground district all parties on the pole are required to underground their facilities and the poles must be removed. AT&T financial participation in an underground district is governed by Rule 32 established by the California Public Utilities Commission. If a proposed project has been determined by AT&T to meet the requirements for full participation in an underground district, AT&T funds the cost of the undergrounding of their lines. If the project does not meet the requirement for full funding the cost must be funded either by the resident or the City. At this time, only small sections of the pole lines in the City would meet the tariff requirements for full AT&T participation. [2]

Third parties that do not have ownership rights to the pole and are not regulated by CPUC rules are responsible for funding their own costs arising out of an undergrounding project.

Joint Construction of Underground Facilities

The installation of underground infrastructure for all utilities is coordinated between the affected parties through a Joint Trench Master Agreement. To facilitate the joint trenching process, the City coordinates the amendment of the master agreement. The City typically takes the lead and coordinates the design of the conduit infrastructure facilities, awards the contract and manages the construction of the infrastructure facilities. The cost is then allocated to each party in the joint trench based on the percentage of the trench allocated to each party.

Underground districts require extensive staff resources to coordinate due to the following: at least three utility companies are involved in the design, property owners must construct the service infrastructure, and the difficulties of installing electrical equipment in the Public Right-of-Way in the front of residential properties. An Underground District takes a minimum of three years from inception to pole removal, and sometimes can take over five years to reach completion.

Electrical Distribution System

The electric distribution system is comprised of 116 miles of overhead and 195 miles of underground circuits. Ten miles of the overhead circuits in the fire risk areas of the foothills are currently being undergrounded to reduce the risk of electrical ignition of wildfire and to eliminate the need for Public Safety Power Shutoffs (PSPS).

[2] Rule 32 https://www.cityofpaloalto.org/files/assets/public/v/4/community-services/parks-and-open-space/2021/open-space-and-park-regulations-revisions_posted-04.25.23.pdf

After completion of the Foothills undergrounding there will be approximately 106 miles of overhead distribution lines in the heavily developed residential areas of Palo Alto.

For reference, the estimated number of residential units in the City is 28,500. Of these units, approximately 62% (16,700) of the units are single family residential. It is estimated that 12% (2,000) of the City's residential structures are currently served from undergrounded facilities leaving 14,000 structures with overhead service. The total estimated number of residential, multifamily residential, and commercial structures that would need to be undergrounded in the City is approximately 18,000.

ANALYSIS

Estimated Cost and Timeline to Underground 106 Miles of Overhead Lines

Based on estimates provided by the CPUC on undergrounding costs, the current estimate for developed residential areas is between $4 to $6 million per mile for the electrical system conversion. This results in a cost of between $425 and $640 million to convert the entire overhead system to underground. In addition to these costs, there would be the cost of the conversion of AT&T's network and the cost of installing services on the customer's property. It is estimated that the cost of undergrounding AT&T's facilities is 30% of the electrical costs, resulting in costs ranging from $125 to $190 Million. Costs for homeowner conversion are estimated to be $6,000 to $10,000 per home, resulting in an additional $95 to $160 Million. This would result in a total cost impact on the community of between $645 and $990 Million.

The costs of undergrounding projects have been increasing rapidly, especially in California, where the investor-owned utilities are installing thousands of miles of underground facilities in fire prone rural areas. In addition, Palo Alto is in a high cost of living area and has tight controls on construction impacts to the community which increases design and construction costs. These factors will continue to put upward pressure on undergrounding costs.

The estimated number of homes that the City Utilities Department could convert to underground on an annual basis is approximately 1000 homes. Based on the estimated 18,000 residential, multi-family, and commercial structures the estimated timeline for completion of this project would be at least 18 years. The estimate of 1000 homes per year is based on the following: the amount of engineering work that would be required to coordinate with third parties and design underground electrical systems, time required to coordinate with individual residents on the installation of services and on the location of pad-mounted equipment, and the acceptable level of the construction impacts on residents.

The earliest estimated date to complete an accelerated undergrounding project would be 2048 due to the grid modernization, and bond financing processes.

Status of the Underground Program

In 2010 a report went to Utilities Advisory Commission (UAC) regarding alternatives that could be taken to accelerate the Underground Program. This ultimately led to a UAC recommendation

to form an advisory group for community engagement that went to the Finance Committee which recommended consideration from the Council. This recommendation was sent to the City Council on March 18, 2013 in CMR #3529. This recommendation was rejected by a vote of the Council. This resulted in the general underground program continuing in areas where AT&T could get reimbursement under the CPAU Rule 32.

The latest Underground District Map is shown in Attachment A[3]. This map shows the areas that were undergrounded during new/conversion construction, areas undergrounded through an undergrounding district, and the proposed projects currently being considered for undergrounding. It is likely that the near-term undergrounding projects will be delayed due to heavy workload related to electrification, fiber to the premises, and new customer work.

Electrification and Undergrounding

The City Council has established a sustainability goal to reduce emissions 80% below 1990 levels by 2030 (the "80x30" goal) and achieve carbon neutrality by 2030. To reach this goal, residents must convert the energy source for their homes from gas to electric and replace gas power vehicles with electric powered vehicles. To accommodate the conversion to electric energy sources, the electric utility needs to double distribution transformer capacity, increase the size of secondary conductors, increase substation capacity and increase system interconnections to improve reliability on the network. The estimated cost of the work to upgrade the existing overhead and underground systems, circuit ties, and electric substations is between $200 and $300 million. The overhead electric system portion of the upgrade is estimated to be between $150 and $220 Million.

The Utilities Department is currently developing plans to upgrade the entire overhead distribution system by the end of 2026. This will eliminate most system loading restrictions on 88% of the residents that choose to convert their homes and vehicles to electric energy sources.

The remainder of the homes that are in underground areas will have system capacity increased by the end of 2030. The delayed timeline for the 12% of customers on the underground system is due to increased design and construction requirements to upgrade the existing underground systems.

In the case where the overhead system was converted to underground as part of the transition to all-electric homes, the system capacity on the entire system would not be available until at least 2041. In addition, to reach full electrification this change would increase utility costs to between $495 and $770 million in the short -term.

In the long-term, the coordination of undergrounding and electrification could result in savings of between $150 and $220 Million due to the elimination of the overhead upgrades to accommodate electrification.

[3] Attachment A – Map https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/reports/city-manager-reports-cmrs/attachments/10-11-2023-id-2306-1602-attachment-a-map.pdf

The Council adopted policies to prioritize the climate protection goal of reducing carbon emissions by 2030. Undergrounding of electric facilities cannot be combined with electrification in time to meet the 2030 goal for carbon emissions due to the large increase in work scope. In addition, the cost of City-wide undergrounding will require an expansion of funding sources to finance the project. Due to the current policies in place, staff are focusing on completing the work to support the climate protection goals of the City. Undergrounding of the electric facilities is a program that has wide support in the community. The existing policy should be reviewed in the future to determine if the City-wide undergrounding program should be revised to facilitate faster implementation.

STAKEHOLDER ENGAGEMENT

Over the years, staff has presented reports to the UAC and City Council on the various aspects of the undergrounding program. Table 1 lists the most recent reports and subject of each.

Prepared for	Meeting Date	Title	Staff Report Links
Utilities Advisory Commission	January 16, 2016	Report on Current Status of the Electric Overhead to Undergrounding Conversion Program	https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2016/01-13-2016-special-meeting/item-2_underground-conversion-program-update-jrm-edits-1-4-16-page-2-revised.pdf
City Council	March 18, 2013	Community Engagement on Citywide Electric Undergrounding	https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/reports/city-manager-reports-cmrs/year-archive/2013/final-staff-report-id-3529_community-engagement-on-citywide-electric-undergrounding.pdf
Finance Committee	December 18, 2012	Community Engagement on Citywide Electric Undergrounding	https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/reports/city-manager-reports-cmrs/year-archive/2012/staff-report-id-3247_community-engagement-on-city-wide-elec-undergrounding.pdf
Utilities Advisory Commission	September 5, 2012	Recommendation on an Advisory Body Structure to Solicit Public Input on the City of Palo Alto Utilities' Electric Undergrounding Policy	https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2012/09-05-2012-meeting/item-1_6051763-uac-rpt-electric-undergrounding-policy-final.pdf
Finance Committee	November 15, 2011	Update Report on Electric Undergrounding	https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/reports/city-manager-reports-cmrs/year-archive/2011/id-2096-3.pdf
Utilities Advisory Commission	September 7, 2011	Report on the Status and Future Alternatives to Consider for Completion of the	https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2011/09-07-11-meeting/item-1_uac-rpt-undergrounding-sept-2011_3-3-6.pdf

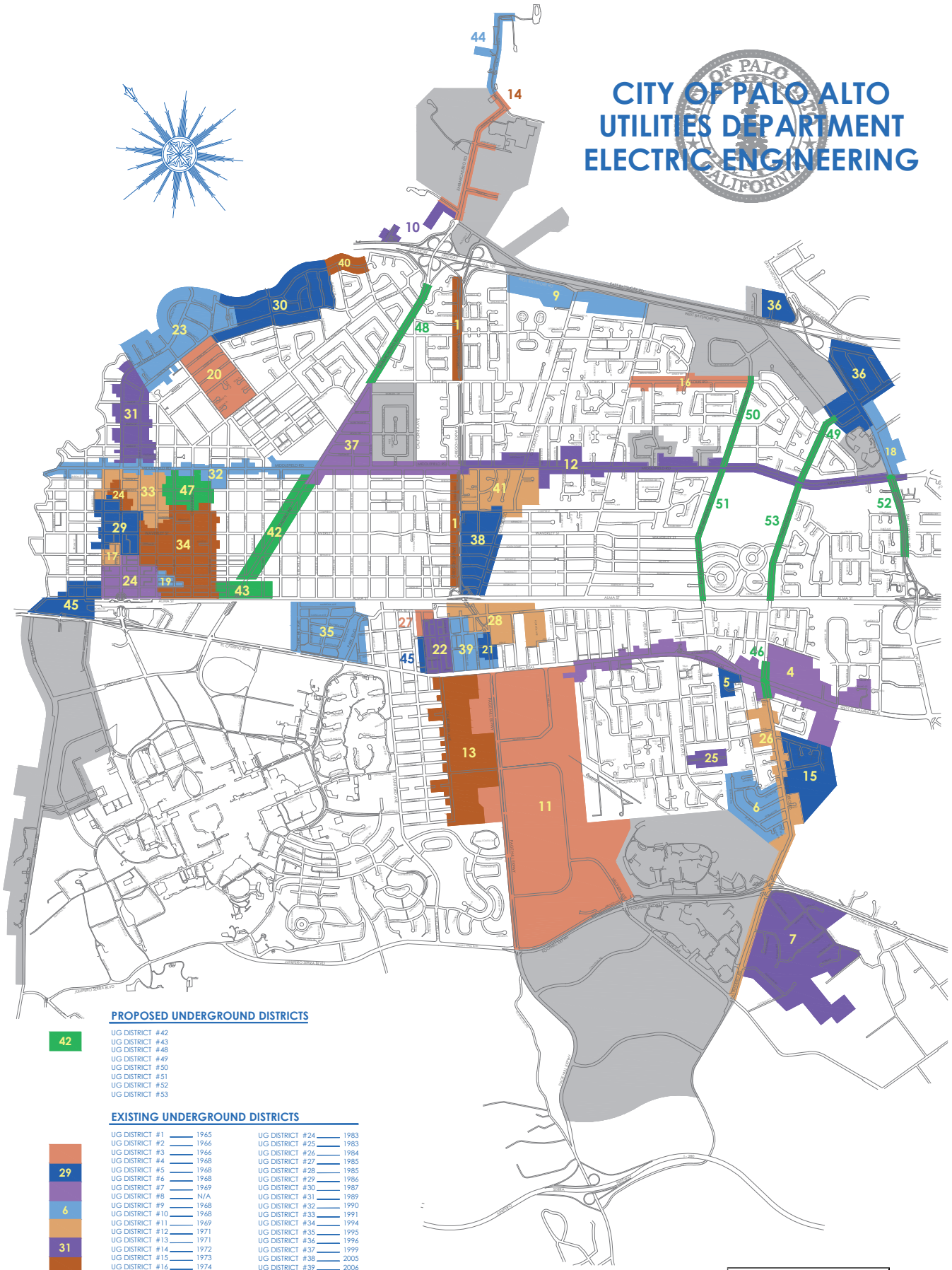
		Electric Overhead to Underground Conversion Program	
Utilities Advisory Commission	January 6, 2010	Report on Current Status and Future Alternatives to Consider for the Continuing of the Electric Overhead to Undergrounding Conversion Program	https://www.cityofpaloalto.org/files/assets/public/v/1/agendas-minutes-reports/agendas-minutes/utilities-advisory-commission/archived-agenda-and-minutes/agendas-and-minutes-2010/01-06-2010-meeting/item-3_elec-ovrhead-undergrnding-convrn-prgrm.pdf

ATTACHMENTS
Attachment A: Map

APPROVED By:
Dean Batchelor, Director of Utilities
Tomm Marshall, Assistant Director of Electric

UNDERGROUND CONVERSION PROJECT

CITY OF PALO ALTO
UTILITIES DEPARTMENT
ELECTRIC ENGINEERING



PROPOSED UNDERGROUND DISTRICTS

42

UG DISTRICT #42
UG DISTRICT #43
UG DISTRICT #48
UG DISTRICT #49
UG DISTRICT #50
UG DISTRICT #51
UG DISTRICT #52
UG DISTRICT #53

EXISTING UNDERGROUND DISTRICTS

29
6
31

UG DISTRICT #1 ____ 1965
UG DISTRICT #2 ____ 1966
UG DISTRICT #3 ____ 1966
UG DISTRICT #4 ____ 1968
UG DISTRICT #5 ____ 1968
UG DISTRICT #6 ____ 1968
UG DISTRICT #7 ____ 1969
UG DISTRICT #8 ____ N/A
UG DISTRICT #9 ____ 1968
UG DISTRICT #10 ____ 1968
UG DISTRICT #11 ____ 1969
UG DISTRICT #12 ____ 1971
UG DISTRICT #13 ____ 1971
UG DISTRICT #14 ____ 1972
UG DISTRICT #15 ____ 1973
UG DISTRICT #16 ____ 1974
UG DISTRICT #17 ____ 1974
UG DISTRICT #18 ____ 1977
UG DISTRICT #19 ____ 1979
UG DISTRICT #20 ____ 1979
UG DISTRICT #21 ____ 1982
UG DISTRICT #22 ____ 1981
UG DISTRICT #23 ____ 1982
UG DISTRICT #24 ____ 1983
UG DISTRICT #25 ____ 1983
UG DISTRICT #26 ____ 1984
UG DISTRICT #27 ____ 1985
UG DISTRICT #28 ____ 1985
UG DISTRICT #29 ____ 1986
UG DISTRICT #30 ____ 1987
UG DISTRICT #31 ____ 1989
UG DISTRICT #32 ____ 1990
UG DISTRICT #33 ____ 1991
UG DISTRICT #34 ____ 1994
UG DISTRICT #35 ____ 1995
UG DISTRICT #36 ____ 1996
UG DISTRICT #37 ____ 1999
UG DISTRICT #38 ____ 2005
UG DISTRICT #39 ____ 2006
UG DISTRICT #40 ____ 2005
UG DISTRICT #41 ____ 2008
UG DISTRICT #44 ____ 2004
UG DISTRICT #45 ____ 2010
UG DISTRICT #46 ____ 2021
UG DISTRICT #47 ____ 2020

AUG 2023

CITY OF PALO ALTO

Electric Distribution Undergrounding Program

www.cityofpaloalto.org

Current Underground Policy

- Last Council review of the underground polity was in 2013.
- At that time, Council left the existing policy unchanged.
- Utility Rule and Regulation 17 and of the Municipal Code Section 12.16 govern the process.
- Undergrounding areas where AT&T will participate in the costs.

Utility Statistics Related to Undergrounding

- **116 Miles of Overhead Circuits.**
- **195 Miles of Underground Circuits.**
- **2,000 SFR served from the underground facilities.**
- **14,000 SFR units served by overhead facilities.**
- **18,000 total housing units in the City would need to be undergrounded.**

Cost of Undergrounding/Timeline

- **Cost of Electric - $425-$640 Million**
- **Cost of Telecommunications - $125-$190 Million**
- **Cost of Homeowner Services - $95-$160 Million.**
- **Total Cost - $645- $990 Million.**
- **18 Years (1000 homes per year)**

Undergrounding/Electrification

- **The City Council's SCAP goal is to achieve wide scale electrification by 2030.**
- **Upgrades to the OH system to be completed by 2027.**
- **Undergrounding would delay electrification upgrades until 2041.**

Utilities Advisory Commission
Staff Report

From: Dean Batchelor, Director Utilities
Lead Department: Utilities

Meeting Date: October 11, 2023
Staff Report: 2308-1887

TITLE
Informational Report on FY 2022 Demand Side Management

RECOMMENDATION
The Fiscal Year 2022 Demand Side Management Report presents the achievements of Demand Side Management (DSM) programs implemented by the City of Palo Alto Utilities (CPAU) during Fiscal Year (FY) 2022. This is for the Commission's information and no action is required.

EXECUTIVE SUMMARY
The FY 2022 DSM Report summarizes the achievements of CPAU's customer efficiency and sustainability programs. CPAU is committed to supporting environmental sustainability through conservation of electric, gas and water resources. Additionally, CPAU promotes distributed renewable generation, building electrification, and electric vehicles using incentives and educational programs. CPAU accomplishes these goals by delivering a wide range of customer programs and services as described in this report.

The Fiscal Year 2022 DSM Report has been reformatted to highlight key performance indicators in the major areas of focus for the City of Palo Alto's sustainability efforts. In future years these DSM reports will be included as an attachment to the Q2 Utilities Quarterly Update provided to the Utilities Advisory Commission in April each year. The Utilities Quarterly Updates include program progress updates and an appendix describing each program's attributes.

Due to staffing constraints, the publication of this report was delayed, but staff anticipates that the FY 2023 DSM report will be published on schedule with the release of the FY 2024 Q2 Utilities Quarterly Report.

STAKEHOLDER ENGAGEMENT

CPAU's program offerings are developed with input from community members, third party subject matter experts, and feedback provided from the UAC and Council.

ENVIRONMENTAL REVIEW

The Demand Side Management Report is not subject to review under the California Environmental Quality Act since the UAC's receipt of this report will have no foreseeable direct or indirect physical change in the environment and therefore does not meet the definition of a Project under Public Resources Code 21065.

ATTACHMENTS

Attachment A: FY22 Demand Side Management Report

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Fiscal Year 2022 Demand Side Management Report

Executive Summary

This Demand Side Management (DSM) Report for Fiscal Year (FY) 2022 is a public document summarizing the achievements of the City of Palo Alto Utilities' (CPAU) customer efficiency and sustainability programs. CPAU is committed to supporting environmental sustainability through conservation of electric, gas and water resources. Additionally, CPAU promotes distributed renewable generation, building electrification, and electric vehicles using incentives and educational programs. CPAU accomplishes these goals by delivering a wide range of customer programs and services as described in this report and strives to do so while remaining in touch with customer needs.

The Fiscal Year 2022 DSM Report has been reformatted to highlight key performance indicators in the major areas of focus for the City of Palo Alto's sustainability efforts. In future years these DSM reports will be included as an attachment to the Q2 Utilities Quarterly Update provided to the Utilities Advisory Commission in April each year. The Utilities Quarterly Updates include program progress updates and an appendix describing each program's attributes.

Summary Goals and Achievements

CPAU offers incentives and education programs for customers to encourage energy and water efficiency – Table ES.1 summarizes FY 2022 efficiency goals and achievements. The energy and water efficiency savings achieved through the City's energy reach code and green building ordinance are included in the table.

Palo Alto updated its 10-year electric efficiency goals in 2021[1], decreasing electric efficiency targets compared to the previous trend anticipating that savings levels would slowly recover following the economic downturn. For FY 2022, CPAU fell short of meeting its electric efficiency goal. There are many factors that contributed to the decline in energy savings and below-target efficiency achievements, including lingering effects from the Covid-19 pandemic as well as program vendor changes.

CPAU has previously adopted gas efficiency goals to reduce gas use; these goals ranged from 0.5% to 1.1% gas use reduction per year. These goals are no longer relevant and are superseded by the Sustainability and Climate Action Plan (S/CAP) goal for the building sector. Water efficiency goals are in transition as the State is expected to issue new urban water use objectives in compliance with water conservation legislation[2] passed in 2019. The State-mandated water use targets will inform the City's water conservation goals.

[1] Electric Efficiency Goals: https://www.cityofpaloalto.org/files/assets/public/agendas-minutes-reports/reports/city-manager-reports-cmrs/year-archive/2021/id-12068.pdf

[2] Water Efficiency Legislation Fact Sheet: https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/6.7.18_water_efficiency_bill_fact_sheet_FNL_updated_5.21.20.pdf

Table ES.1: Efficiency Goals vs. Achievements

Resource	FY 2022 Savings Goals (% of Load)	FY 2022 Savings Achieved (% of Load)	FY 2022 Savings Achieved
Electricity	0.50%	0.14%	1,141 MWh
Gas	N/A	0.02%	6,149 Therms
Water	N/A	1.31%	58,400 CCF

CPAU is committed by its own policies and State law to implementing all cost-effective energy and water efficiency measures (i.e. those that are less expensive than supply-side resources). Table ES.2 summarizes the cost of efficiency over the last three years compared to the projected cost of supply resources. The rolling 3-year average is a suitable metric to track the cost effectiveness of efficiency portfolios, as it accounts for yearly variations in program engagement and funding.

The current 3-year average cost for each efficiency portfolio is below the cost of supply resources, demonstrating the cost effectiveness of all efficiency portfolios. The gap between the portfolio-level cost of efficiency and the cost of supply resources exists even while the portfolio supports high-touch programs such as the Home Efficiency Genie, a customer service program that provides great educational value to Palo Alto residents but delivers only modest energy efficiency savings. The gap also leaves room for increasing customer incentives while maintaining overall portfolio cost effectiveness.

Table ES.2: Actual Levelized Efficiency Costs vs. Projected Supply Costs

		FY 2020 Efficiency	FY 2021 Efficiency	FY 2022 Efficiency	3-yr Average Efficiency	Future Supply
Electricity	$/kWh	$0.06	$0.03	$0.05	$0.05	$0.13
Gas	$/Therm	$0.45	$0.51	$1.66	$0.87	$1.35
Water	$/CCF	$2.67	$2.73	$0.51	$1.97	$6.42

Electric Efficiency

CPAU offers both residential and non-residential programs that target electric efficiency improvements for customers. Every year CPAU's energy efficiency program details are published by the California Municipal Utilities Association (CMUA)[3] as required by California Senate Bill 1037. Table 1 contains a high-level summary of FY 2022 electric program savings and expenditures, as well as the electric efficiency savings target set in CPAU's 10-year energy efficiency goals.

[3] SB 1037 Status Reports: https://www.cmua.org/sb1037-reports

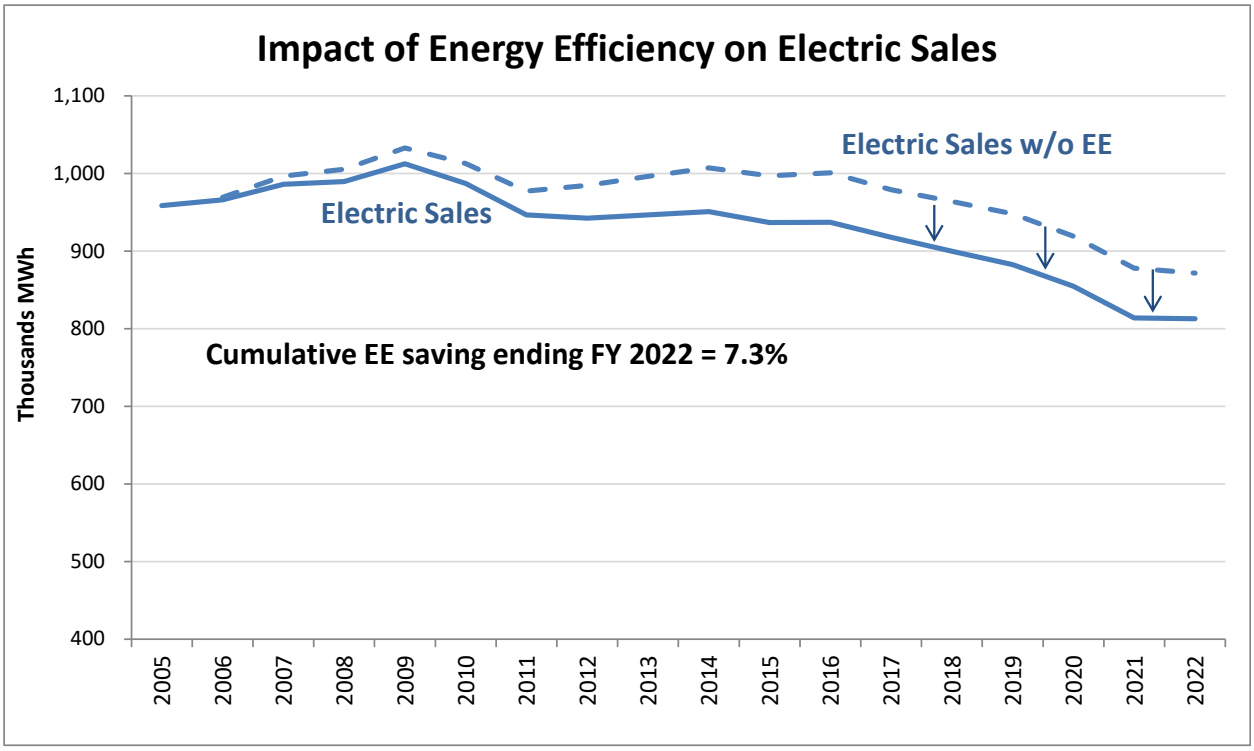
Table 1: Electric Efficiency Metrics

Electric Efficiency	
MWh Reduced	1,141
$ Spent	$821,672
Cost of Efficiency ($/kWh)	$0.05
Total MWh Load	812,841
Savings (% of Load)	0.14%
Savings Goal (% of Load)	0.50%

CPAU fell short of its FY 2022 electric efficiency savings goal for a variety of reasons, the most impactful of which being the lack of large commercial efficiency projects. Large commercial electric efficiency projects can take a year or more to be completed, and businesses were less receptive to undertaking new projects due to the economic uncertainty caused by Covid-19 in 2020 and 2021.

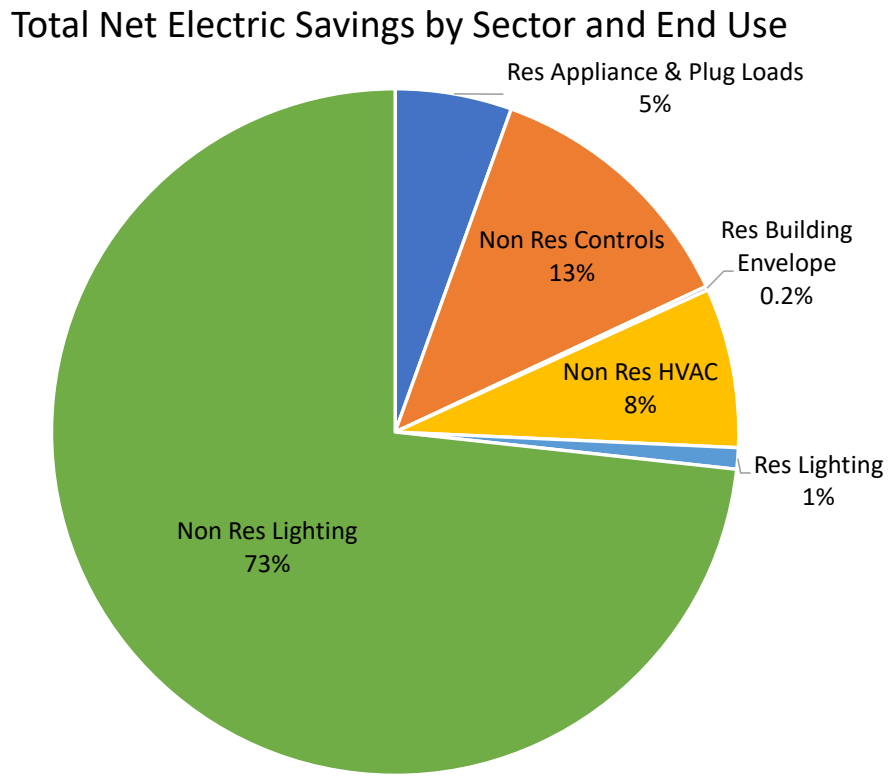
Figure 1 shows the historical trend of annual electricity sales and the cumulative net savings from electric efficiency.

Figure 1: Cumulative Net Electric Efficiency Savings



In FY 2022, almost 75% of CPAU's electric efficiency program savings came from non-residential lighting efficiency projects that participated in either the Commercial Advantage Program or the Commercial and Industrial Energy Efficiency Program, as shown in Figure 2. Around 93% of customer electric efficiency savings were in the commercial or industrial sectors.

Figure 2: Composition of Net Electric Efficiency Savings in FY 2022



Gas Efficiency and Electrification

CPAU has previously adopted gas efficiency goals to reduce gas use; these goals ranged from 0.5% to 1.1% gas use reduction per year. These goals are no longer relevant as they are superseded by the S/CAP goal to reduce GHG emissions from the direct use of natural gas in Palo Alto's building sector by at least 60% below 1990 levels by 2030. Rather than continuing gas efficiency rebates and services to support the installation of new gas equipment that would remain in place for the next decade or longer, CPAU replaced traditional gas efficiency rebates with technical assistance and rebates to help customers with the electrification of gas equipment. Building envelope improvements will remain a program priority to ensure comfort for building occupants and to avoid oversizing of all-electric heating, ventilation and air conditioning (HVAC) equipment

Table 2 contains a summary of FY 2022 program gas savings through electrification or efficiency projects. CPAU is focusing initial residential electrification efforts on water heating due to its relatively low impact on the electric grid as Palo Alto continues to upgrade the distribution system in preparation for increased electric load. The majority of the other gas savings are coming from either retro-commissioning of commercial building HVAC systems or from code enforcement in Palo Alto.

In FY 2022, the cost per metric ton (MT) of GHG avoided was $312, compared to CPAU's long term goal of spending less than $200/MT GHG avoided. The cost was high in FY 2022 due to low gas reduction relative to the fixed costs of program operation. CPAU anticipates that the cost per MT GHG avoided will stay high

or even increase in the near future due to expensive programs that are designed to kickstart the electrification market in Palo Alto. For reference, the current cost of direct air carbon capture can be more than $600/MT CO2[4], so even expensive preventative measures can be more cost effective than the carbon sequestration alternative.

Table 2: Gas Efficiency and Electrification Metrics

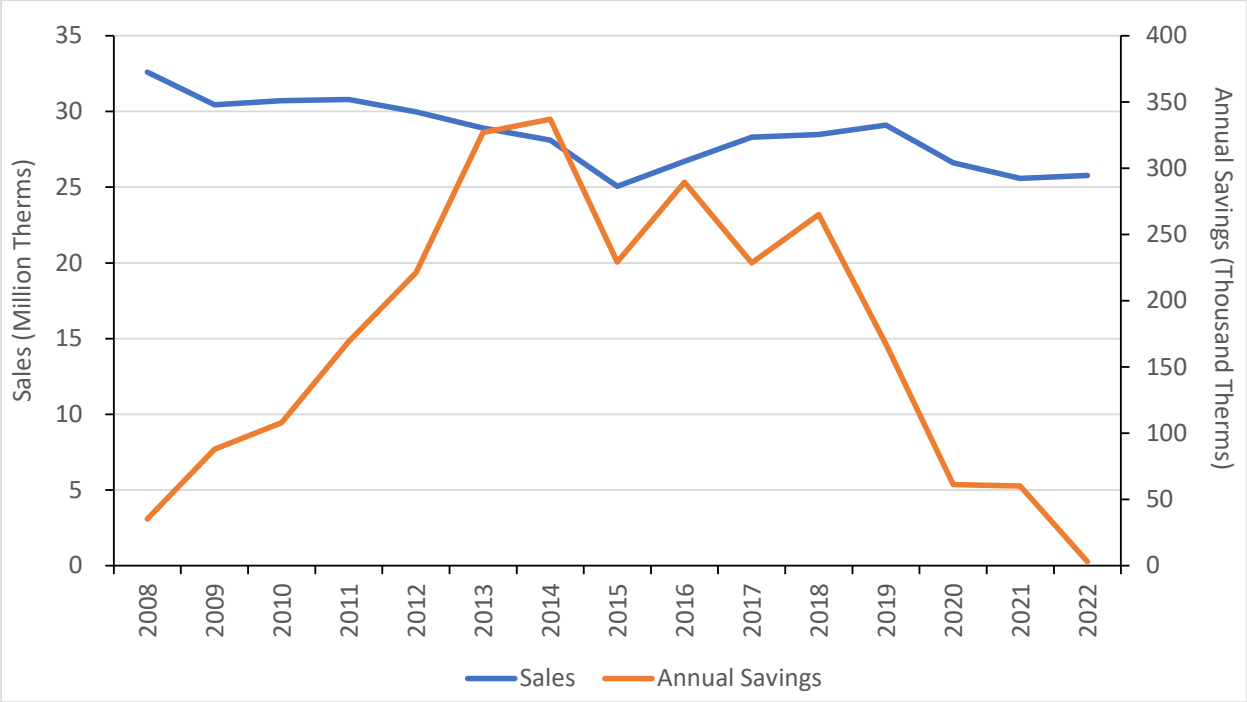
Gas Efficiency and Electrification	
Therms Reduced	6,149
HPWHs Installed	21
Metric Tons GHG Avoided	480
$ Spent	$150,045
Cost of Efficiency ($/Therm)	$1.66
$/Metric Tons GHG Avoided	$312
Total Therms Load	25,768,100
Savings (% of Load)	0.02%
Savings Goal (% of Load)	N/A

The cost of efficiency, measured in average dollars spent per therm reduced through CPAU programs, was higher in FY 2022 than it has been in the last few years due to relatively low total therm reductions compared against the more static administrative and overhead costs of running these programs.

Figure 3 depicts the City's historical gas usage and savings. Gas sales may fluctuate year-to-year depending on the weather and the resulting need for space heating, but long-term gas sales in Palo Alto are trending down.

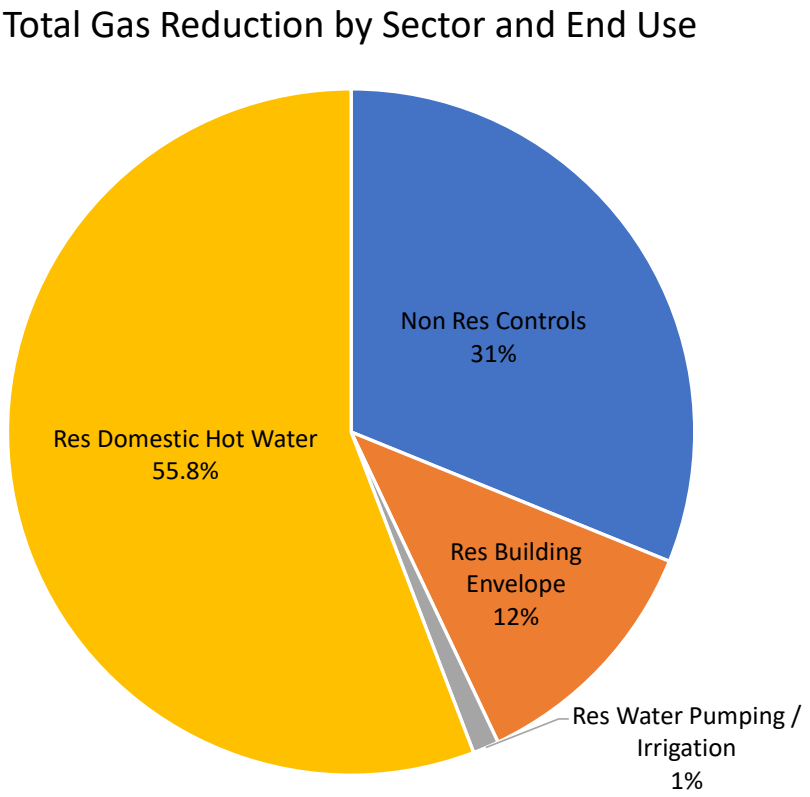
[4] Business Insider, "The world's biggest carbon-removal plant just opened. In a year, it'll negate just 3 seconds' worth of global emissions.": https://www.businessinsider.com/carbon-capture-storage-expensive-climate-change-2021-9

Figure 3: Historical Gas Usage and Savings



As illustrated in Figure 4, more than half of CPAU's gas reductions in FY 2022 can be attributed to the electrification of residential water heaters through CPAU's rebate program. Another third of gas reductions are a result of Energy Management Systems (EMS) installed in commercial buildings through the Business Advantage Program.

Figure 4: Composition of Natural Gas Use Reduction in FY 2022



During FY 2022, CPAU issued an RFP to solicit program vendors to administer residential efficiency and electrification programs. In FY 2023 CPAU signed agreements with two contractors, CLEAResult and Synergy.

Water Efficiency

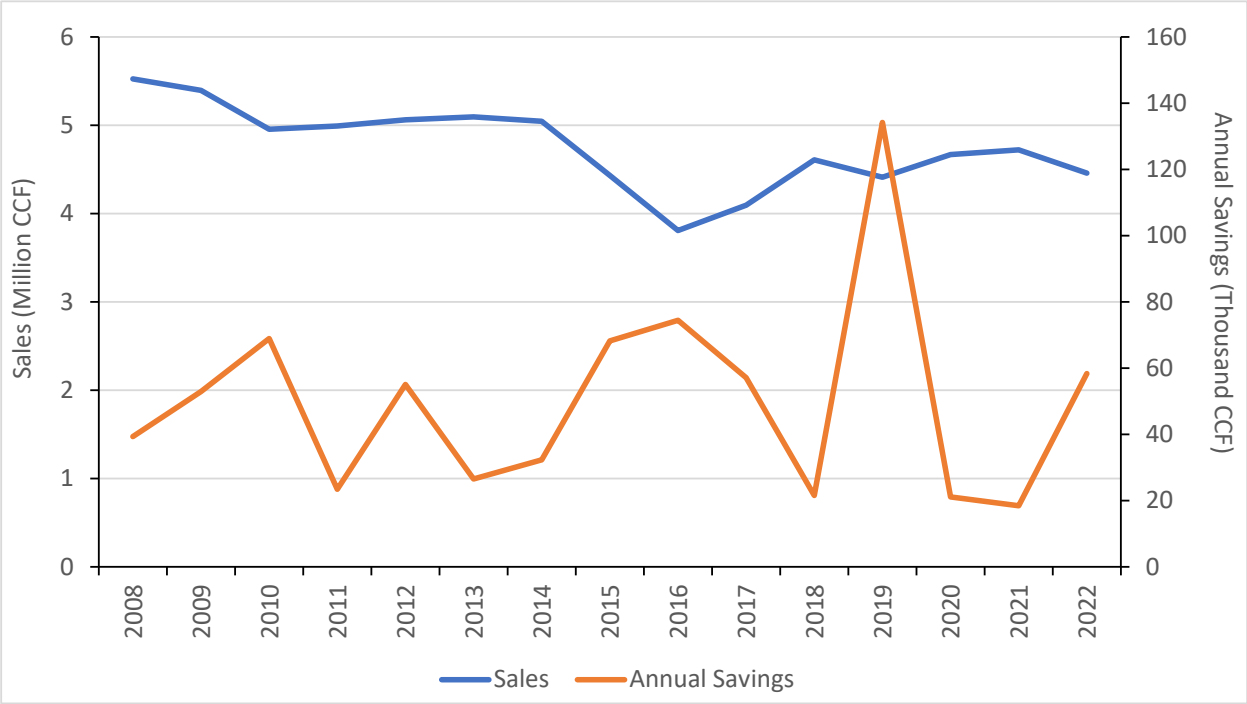
The City partners with the Santa Clara Valley Water District (Valley Water) to provide water conservation rebate programs and resources. Valley Water administers the programs for Palo Alto customers, and CPAU provides additional funds to increase rebate amounts. CPAU markets and promotes the programs through all media channels. The State adopted the Water Conservation as a Way of Life legislation in 2018 that establishes unique efficiency goals for each Water Supplier. The State Water Resources Control Board (SWRCB) is still finalizing the regulatory framework. Once the guidelines are adopted, CPAU will be able to calculate a water use target that takes into account residential indoor and outdoor use, commercial irrigation use, and water loss. Palo Alto's S/CAP includes a goal of completing a One Water Plan to evaluate alternative water supplies and additional conservation measures to make the City's water supply more resilient. The plan is underway and is anticipated to be adopted in December 2023. Table 3 summarizes FY 2022 water program costs and savings.

Table 3: Water Efficiency Metrics

Water Efficiency	
CCF Water Reduced	58,400
$ Spent	29,513
Cost of Efficiency ($/CCF)	0.51
Total CCF Load	4,458,594
Savings (% of Load)	1.31%
Savings Goal (% of Load)	N/A

Figure 5 illustrates the City's historical total water usage and savings. In FY 2022 CPAU programs yielded higher than average water savings and total usage was around 250,000 CCF lower than FY 2021. Palo Alto's water usage continues to trend downward as the city navigates water efficiency and drought restrictions.

Figure 5: Historical Water Usage and Savings



Electric Vehicles

Powering transportation through Electric Vehicles (EVs), as opposed to fossil fuel-powered vehicles, can significantly reduce GHG emissions and climate pollution. As of 2021, on-road transportation accounted for 52% of the city's greenhouse gas emissions. A key S/CAP priority is to influence the adoption of EVs registered in Palo Alto by ensuring adequate EV charging infrastructure throughout the city, with equitable access for multifamily and lower income residents, as well as workplaces, public parking lots and retail

areas. Correspondingly, cross-departmental work is progressing on proposals for curbside charging, fleet electrification and permit streamlining.

The 2022 S/CAP includes GHG emissions reduced by at least 65% below 1990 levels by 2030 in the transportation sector. This is proposed to be achieved by:

a. Increasing EVs registered in Palo Alto from around 4,500 (2019) to 28,000 (44% of vehicles)
b. Develop a public and private charging network to support these levels of EV penetration

Table 4 summarizes EV uptake and the City's contributions to EV charger availability as of FY 2019 and 2022. Estimates are also provided for the GHG emission reduction attributed to electric vehicle operation in Palo Alto.

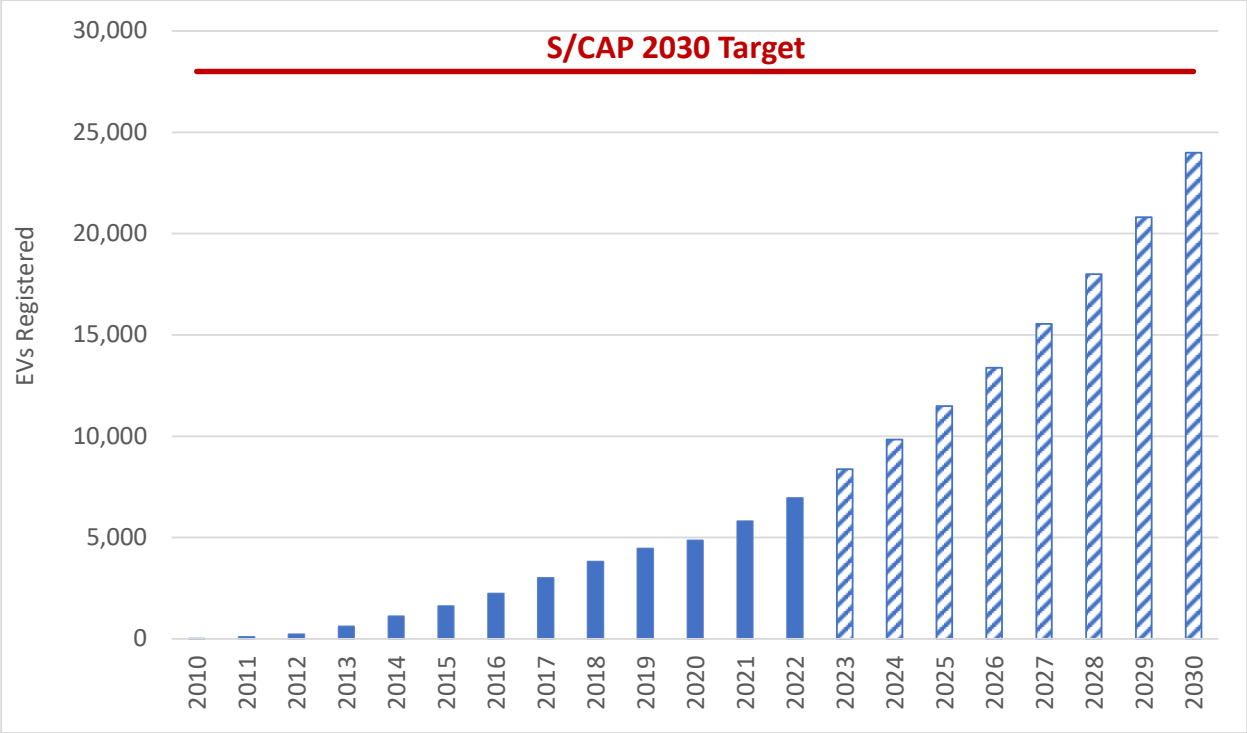
Table 4: Electric Vehicle and Charger Metrics

Electric Vehicles	**FY 2019**	**FY 2022**
Estimated Electric Vehicles Registered	4,454	6,955
Annual Vehicle Emission Savings (MT GHG)	21,610	33,744
EV Charger Installations Rebated		
Level 2	22	92
DCFC	0	2
Multifamily Development EV Charger Projects Completed	5	6
Cumulative Multifamily Units Provided Access to EV Charging	296	323
Number of City-Owned EV Chargers	56	124
FY 2022 Utilization of City-Owned EV Chargers (kWh)	393,081	384,430
MT GHG Savings from City-Owned EV Charger Utilization	440	430

The average utilization rates of city-owned EV chargers are still lower than pre-COVID levels illustrated by the FY 2019 statistics, but the total utilization is rising back to earlier levels as the city installs more public chargers.

Figure 6 highlights the evolution of EV adoption in Palo Alto compared to our S/CAP transportation electrification target.

Figure 6: EV Adoption and Forecast vs. 2030 Target



Solar and Storage

Solar-plus-storage systems generally consist of a solar array connected to a battery storage system. These systems allow solar energy to be deployed both day and night, making the electricity grid more resilient to changes in demand. Rooftop solar-plus-storage systems also provide resiliency by providing backup power during power outages or public safety power shutoff events. CPAU offers a solar calculator tool to help residents evaluate the economics of purchasing a solar or solar-plus-storage system for their home. The City also participates in BayArea SunShares – a group-buy program that offers discounts and vetted contractors for installing rooftop solar and battery storage systems. Table 5 summarizes Palo Alto's 2019 and 2022 participation in SunShares.

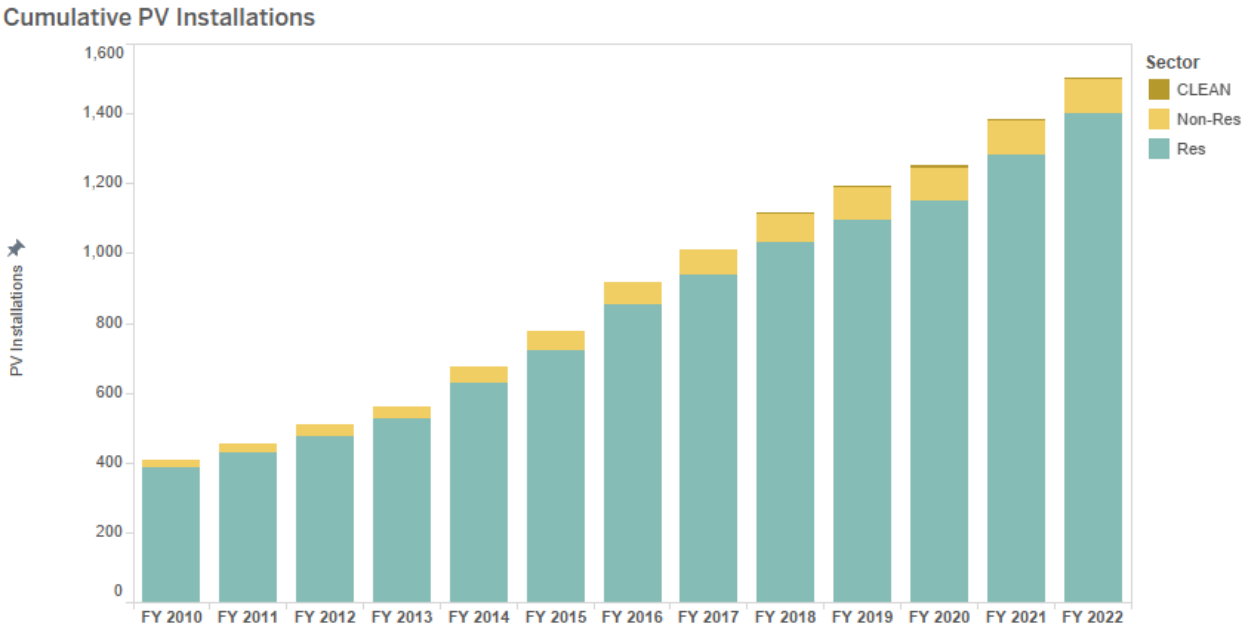
Table 5: SunShares Metrics

Solar and Storage	FY 2019	FY 2022
SunShares Installations		
Solar	28	23
Solar + Storage	2	8
Storage	0	1

At the end of FY 2022, Photovoltaic (PV) installations in Palo Alto totaled 1,504, with 1,400 residential, 98 non-residential, and 6 Clean Local Energy Accessible Now (CLEAN) projects since CPAU began supporting local solar PV installations in FY 2000. These customer-side generation systems represent 17.7 megawatts

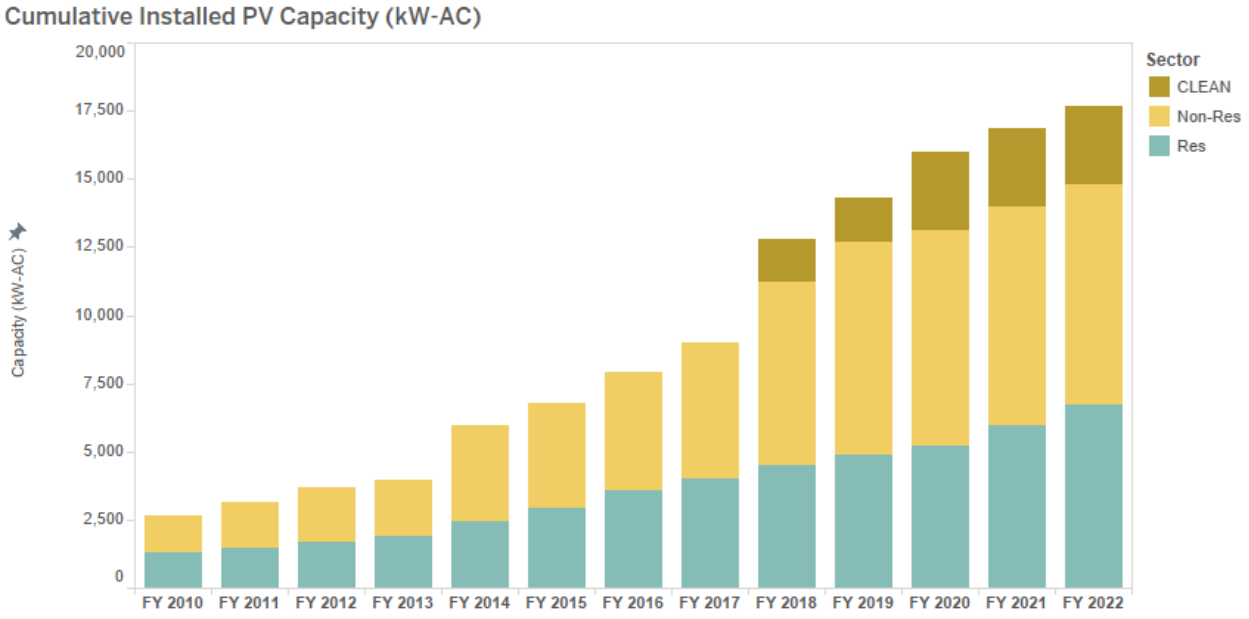
(MW) of generating capacity and are not included in CPAU's Renewable Portfolio Standard (RPS) supply requirements. In FY 2022, CPAU customers installed 120 new solar systems (118 residential and 2 non-residential) with a total 827 kW of additional capacity.

Figure 7: Photovoltaic (PV) Cumulative Installations



Sector													
Res	385	428	477	525	629	722	854	940	1,031	1,097	1,152	1,282	1,400
Non-Res	24	27	31	35	45	55	61	72	82	91	93	96	98
CLEAN									5	5	6	6	6
Total	409	455	508	560	674	777	915	1,012	1,118	1,193	1,251	1,384	1,504

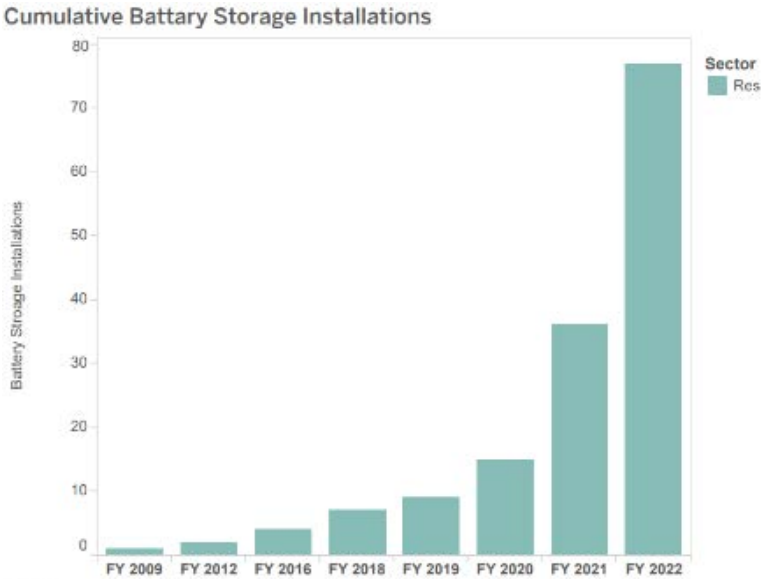
Figure 8: PV Cumulative System Capacity (kW)



Sector													
Res	1,285	1,469	1,672	1,887	2,449	2,927	3,566	4,002	4,496	4,887	5,197	5,985	6,740
Non-Res	1,384	1,682	2,007	2,061	3,494	3,874	4,359	5,003	6,715	7,809	7,924	8,011	8,084
CLEAN									1,588	1,588	2,841	2,841	2,841
Total	2,669	3,152	3,679	3,948	5,943	6,801	7,925	9,005	12,799	14,284	15,962	16,838	17,665

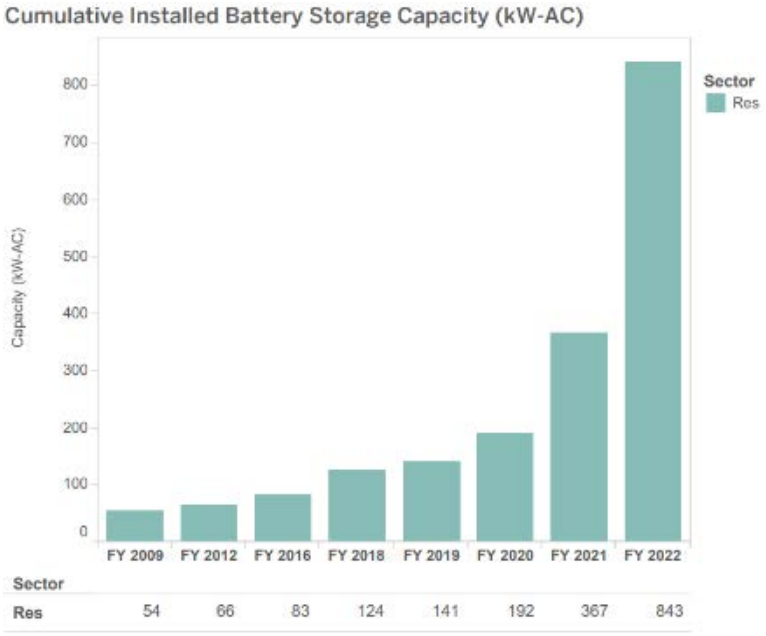
As of the end of FY 2022, there were 77 battery storage installations with a total capacity of 843 kW, all of which were in the residential sector. In FY 2022, CPAU customers installed 41 new storage systems with a total 476.2 kW of additional capacity.

Figure 9: Battery Storage Cumulative Installations



Sector								
Res	1	2	4	7	9	15	36	77

Figure 10: Battery Storage Cumulative System Capacity (kW)



Sector								
Res	54	66	83	124	141	192	367	843

Appendix A: Program Descriptions

The programs offered by CPAU are designed to assist all customer groups achieve efficiency savings in electricity, natural gas and water in a cost-effective manner.

Residential Programs

- **Home Efficiency Genie**
  The Home Efficiency Genie (HEG) has become CPAU's flagship residential program. Launched in June 2015, the program enables our residents to call the 'Genie' to get free utility bill reviews and phone consultations. For a fee, residents also have the option to receive an in-depth home efficiency assessment which includes air leakage testing, duct inspections, insulation analysis, energy modeling and a one-on-one review of assessment reports with an energy expert. This package is also followed up with guidance and support throughout home improvement projects. The HEG program has a high educational component for Palo Alto residents, which likely leads to additional savings that staff cannot track and include in this program's savings totals.

- **MultiFamily Residence Plus+ Program**
  This CPAU program focuses on multifamily buildings, especially below-market rate apartment complexes, providing free, direct installation of energy efficiency measures to multifamily residences with 4 or more units including hospices, care centers, rehab facilities and select small and medium commercial properties.

- **Residential Energy Assistance Program (REAP)**
  REAP provides weatherization and equipment replacement services at no cost to low-income residents and those with certain medical conditions. This program has equal focus on efficiency and comfort, and therefore it is not included in the cost effectiveness calculation used in reporting. The program provides LED lighting, heating system upgrades, insulation for walls and roofs and weather-stripping for doors and windows.

- **Refrigerator Recycling Program**
  The Refrigerator Recycling Program was launched in March 2019 in collaboration with City of Santa Clara and funded by the Bay Area Air Quality Management District. Recycling old refrigerators and freezers saves energy, helps curtail growing peak load demand, and prevents the release of greenhouse gases through proper disposal of refrigerants. This program came to a close at the end of December 2021 when the grant funding was depleted. Through the program, over 450 old refrigerators and freezers were collected in Palo Alto, and 2,475 metric tons of greenhouse gas emissions were avoided.

- **Do-It-Yourself Water-Wise Indoor Survey**
  Palo Alto residents can request a free indoor water survey kit that can help conserve water and save money on utility bills. Residents also become educated on opportunities for conservation in their homes, and they can request free tools to improve efficiency. The program is offered in partnership with the Valley Water.

- **Free Water-Wise Outdoor Survey**
  Palo Alto residents can schedule a free outdoor survey with a trained irrigation professional. The trained specialist will provide an on-site evaluation of the resident's irrigation system and provide recommended upgrades and repairs. The program is offered in partnership with the Valley Water.

- **Landscape Rebate Program (LRP)**
  The Landscape Rebate Program provides rebates for various irrigation hardware upgrades, including rain sensors, high-efficiency nozzles, dedicated landscape meters, and weather-based irrigation controllers, as well as landscape conversion rebates that encourage residential and commercial customers to replace high-water-use landscaping with low-water-use landscaping. During FY 2016 residents were eligible to receive rebates of $3.00/square foot ($2.00 from Valley Water and $1.00 from CPAU). A new agreement with Valley Water was signed in early 2017, continuing our partnership in the LRP. Residents are now eligible to receive rebates of $2/square foot of replaced landscaping ($1.00 from Valley Water and $1.00 from CPAU).

- **Educational Programs and Workshops**
  A variety of educational programs and workshops are held throughout the year. Typically, residential workshops on water and energy programs occur in the spring near Earth Day and in the "Summer Workshop Series." Many workshops focus on water efficiency, landscaping, energy efficiency, solar, home comfort and green building. CPAU is also invited to table at various events throughout the year to educate residents about the various programs we offer. Customers also receive timely E-newsletters on a variety of efficiency matters.

Business Programs

- **Business Advantage Program**
  The Business Advantage Program provides energy efficiency and economic relief to small and medium businesses impacted by COVID-19. Because heating and cooling accounts for up to 60% of a business's energy bill, the BAP targets HVAC reductions by controlling use. The Business Advantage Program offers a free Energy Management System (EMS) with "smart" thermostat, controller, zone temperature sensors, cloud-based energy management portal, and air filter for indoor air quality improvements. Additionally, the Program also provides free Merv-13 air filters to participants and will enable customers to implement American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) recommended actions that improve indoor air quality through hourly air circulation.

- **Commercial Advantage Program**
  Business customers are offered rebates for energy efficiency upgrades including lighting, motors, HVAC, and custom projects that target peak demand and energy reductions.

- **Commercial and Industrial Energy Efficiency Program (CIEEP)**
  The Commercial and Industrial Energy Efficiency Program (CIEEP) offers free site assessment to identify cost effective energy efficiency opportunities, as well as technical assistance and efficiency rebates to key account customers to implement energy efficiency projects. Typical EE

projects including lighting upgrades, lighting control including occupancy sensors, HVAC equipment upgrades, refrigeration system upgrades, etc.

- **Commercial and Industrial Water Efficiency Program**
  CPAU partners with the Valley Water to provide non-residential customers with free landscape irrigation audits, and direct installation of high-efficiency toilets and urinals. Rebates are available for facility process improvements, landscape conversions, irrigation hardware upgrades and weather-based irrigation controllers.

- **Landscape Survey and Water Budget Program**
  In collaboration with Valley Water, the City offers landscape irrigation surveys, water budgets and customized consumption reports for customers with large landscape sites through Waterfluence. Through a web portal, customers can access site-specific recommendations, verify water budget assumptions and request a free landscape field survey from an irrigation expert. This program has been in place since 2012 and to date there are 118 large landscape sites covered under this program.

- **PaloAltoGreen**
  This program enabled residents and businesses to pay a small premium for 100% renewable energy. In June 2014, Council terminated PaloAltoGreen for residential customers since the City's electric supplies are 100% carbon neutral. Commercial customers can still participate in this program by enrolling in the PaloAltoGreen 100% option or by purchasing blocks in 1,000 kWh increments. Participation enables commercial customers to be recognized under the U.S. EPA Green Power Leadership program or to earn Leadership in Energy and Environmental Design (LEED) Green Power credits.

- **Palo Alto Clean Local Energy Accessible Now (CLEAN) Program**
  Through the CLEAN (Clean Local Energy Accessible Now) program CPAU offers a feed-in tariff, wherein developers of renewable energy generation projects in Palo Alto can receive a long-term purchase agreement for the output of their projects. The generated electricity contribute towards fulfilling Palo Alto's Renewable Portfolio Standard (RPS) requirement. At the end of FY 2021, 2.8 MW were reserved of the program's 3 MW limit.

- **EV Charger Rebate Program**
  The California Air Resources Board (CARB) developed the Low Carbon Fuel Standard (LCFS) program in compliance with AB 32 (the Global Warming Solutions Act of 2006) to reduce the carbon intensity of transportation fuels used in California 10% by 2020. Electric utilities that provide electricity to charge electric vehicles (EVs) are eligible to receive LCFS credits. The City began participating in the program in April 2014 and CARB has been allocating LCFS credits to the City since then. Using funds from the sale of LCFS credits, CPAU launched an EV charger rebate program in FY 2017 to help build out EV infrastructure in anticipation of an increase in the number of EVs in Palo Alto from its current level of 2,500 to between 4,000 and 6,000 EVs by 2020. Staff determined that providing EVSE rebates for underserved segments of the market would be valuable, which would include multi-family and mixed-use buildings, schools and non-profits.

Programs for All Customer Segments

- **Solar Water Heating**

  CPAU began to offer rebates to residential and commercial customers that install solar water heating (SWH) systems in 2008. The SWH rebate program was mandated by CA AB 1470 and is administered by the Center for Sustainable Energy, which also administers SWH rebate programs in the San Diego area. Incentives are limited to solar water heating for domestic use; solar water heating systems for pools, spas, or space heat are not eligible. AB 797 (2017) extended the SWH mandate for two additional years, but the program expired on January 1, 2021.

- **Green Building Ordinance**

  In December 2019, City Council adopted an Energy Reach Code which requires additional energy efficiency savings beyond California's Title 24 building energy standards for non-residential mixed-fuel new construction projects. The City's Energy Reach Code has been in place since 2008 and has continued to evolve with California's building standards (Title 24). As a reach code specific to only the City of Palo Alto, energy savings from this code are savings that may be counted towards energy efficiency. CPAU is coordinating with Development Services to report the energy savings attributed to the Green Building Ordinance.

Appendix B: FY 2022 Achievements by DSM Program

Sector / Program	Gross Annual Savings (kWh)	Net Annual Savings (kWh)	Annual Savings (Therms)	Water Savings (CCF)
Non Residential	**1,069,407**	**855,526**	**1,372**	**68,631**
Commercial Advantage Program	160,096	128,077	0	0
Commercial and Industrial Energy Efficiency Program	362,182	289,746	0	0
Energy Reach Code/Green Building Ordinance	466,100	372,880	0	13,637
Small and Medium Business Program	81,029	64,823	1,372	0
Water Programs	0	0	0	54,994
Residential	**53,033**	**42,426**	**4,777**	**3,489**
Energy Reach Code/Green Building Ordinance	27,947	22,358	989	83
Home Efficiency Genie	5,332	4,266	30	0
Heat Pump Water Heater	(18,102)	(14,482)	3,171	0
Multi Family Plus	1,725	1,380	170	0
Residential Energy Assistance Program	4,675	3,740	417	0
Refrigerator Recycling	31,456	25,165	0	0
Water Programs	0	0	0	3,406
Grand Total	**1,122,440**	**897,952**	**6,149**	**72,120**

Appendix C: City Policies/Plans and State Mandates Impacting DSM Program Goals and Implementation

CITY POLICIES/PLANS

Title	Description
Resolution No. 9241	LEAP, the Long-term Electric Acquisition Plan (April 2012)
Resolution No. 9322	Carbon Neutral Plan for Electric Supply (March 2013)
Resolution No. 9402	Local Solar Plan (April 2014)
Staff Report 3706	Program for Emerging Technology (April 2013)
Staff Report 2552	GULP, the Gas Utility Long-term Plan (April 2012)
Staff Report 6851	2015 Urban Water Management Plan (May 2016)
Staff Report 7304	Sustainability and Climate Action Plan (November 2016)
Staff Report 7718	Update of Ten-Year Energy Efficiency Goals for 2018 to 2027 (March 2017)
Staff Report 9761	2018 Electric Integrated Resource Plan (EIRP)
Staff Report 12068	Updated 10 Year Energy Efficiency Goals for 2022 to 2031

STATE MANDATES

AB 209 (2022) Directs the California Energy Commission to develop and implement an Equitable Building Decarbonization Program, which includes a direct install program focused on low-to-moderate income households and a statewide incentive program to accelerate deployment of low-carbon building technologies. AB 179 (2022) provides CEC with $112 million for the Equitable Building Decarbonization Program for its first year (2022-2023), and up to $922 million in funding over the next four fiscal years.

SB 1206 (2022) Prohibits the sale or distribution of bulk hydrofluorocarbons (HFCs) or HFC blends that exceed by a specified global warming potential (GWP) threshold. Reclaimed refrigerants are exempt from this requirement. The GWP limits for bulk HFCs are:

≤ 2,200 beginning January 1st, 2025 (includes R-404A and R-507)

≤1,500 beginning January 1st, 2030 (includes R-410A)

≤750 beginning January 1st, 2033 (includes R-134A, R-448A/B, R-440A/B)

AB 1279 (2022) Codifies California's existing goal of carbon neutrality by 2045.

AB 33 (2021) Calls on the CEC to provide grants and loans to local governments, public institutions, and Native American tribes to advance energy efficiency, energy storage, and electric vehicle charging in existing and planned buildings.

EO N-7-20 (2020) **Governor Executive Order:** Establishes a statewide goal that 100% of in-state sales of new passenger cars and trucks will be zero-emissions by 2045, and that all operations of medium and heavy-duty vehicles in the State shall be zero-emissions by 2045 where feasible.

EO B-55-18 (2018) **Governor Executive Order:** Establishes a statewide carbon neutrality goal by 2045.

AB 3232 (2018) Requires all new buildings after 2030 to be zero-emissions buildings. Also requires the state to establish a strategy to reduce GHG emissions from existing buildings by 50 percent below the 1990 levels by January 1, 2030.

SB 606, AB 1668 (2018) Establish a new foundation for long-term improvements in water conservation and drought planning to adapt to climate change and the resulting longer and more intense droughts in California.

AB 797 (2017) Extends existing Solar Water Heating Programs and changes the terminology of "water heating" to "solar thermal."

EO B-37-16 (2016) **Governor Executive Order:** Establishes "Making Water Conservation a California Way of Life", with four primary goals: (1) use water more wisely, (2) eliminate water waste (water loss from distribution systems), (3) strengthen local drought resilience, and (4) improve agricultural water use efficiency and drought planning.

AB 802 (2015) Requires utilities to maintain records of the energy usage data of all buildings to which they provide service for at least the most recent 12-month period and, upon the request and authorization of the owner (or owner's agent), provide aggregated energy usage data to the owner in the ENERGY STAR Portfolio Manager.

AB 1164 (2015) Prohibits cities and counties from enacting or enforcing any ordinance or regulation prohibiting the installation of drought tolerant landscaping, synthetic grass, or artificial turf on residential property.

AB 1236 (2015)[5] Obliges cities and counties to adopt an ordinance, with certain specific elements, creating an expedited permitting process for electric vehicle charging stations. The ordinance was updated in 2022 (Ordinance 5539)[6].

SB 350 (2015) The Clean Energy and Pollution Reduction Act of 2015 sets targets for utilities of 50% renewable electricity retail sales and double the energy efficiency savings in electricity and natural gas, both by 2030. The law grants compliance flexibility for POUs that achieve 50% or more of retail sales from certain large hydroelectric power.

AB 2188 (2014) Requires a city and/or county to adopt an ordinance creating an expedited, streamlined permitting process for small residential rooftop solar energy systems. The ordinance was adopted in 2015 (Ordinance 5353)[7].

EO B-36-15 (2014) **Governor Executive Order:** Due to continued water shortages**,** on January 17, 2014, the Governor proclaimed a State of Emergency and directed state officials to take all necessary actions to make water immediately available. Part of the proclamation included a 20 percent water reduction goal. On April 1, 2015, the Governor issued an Executive Order (B-36-15) mandating the State Water Resource Control Board impose restrictions leading to a 25 percent reduction in potable water use through February 28, 2016.

SB 1420 (2014) Added a requirement to report on distribution system water loss to the UWMP.

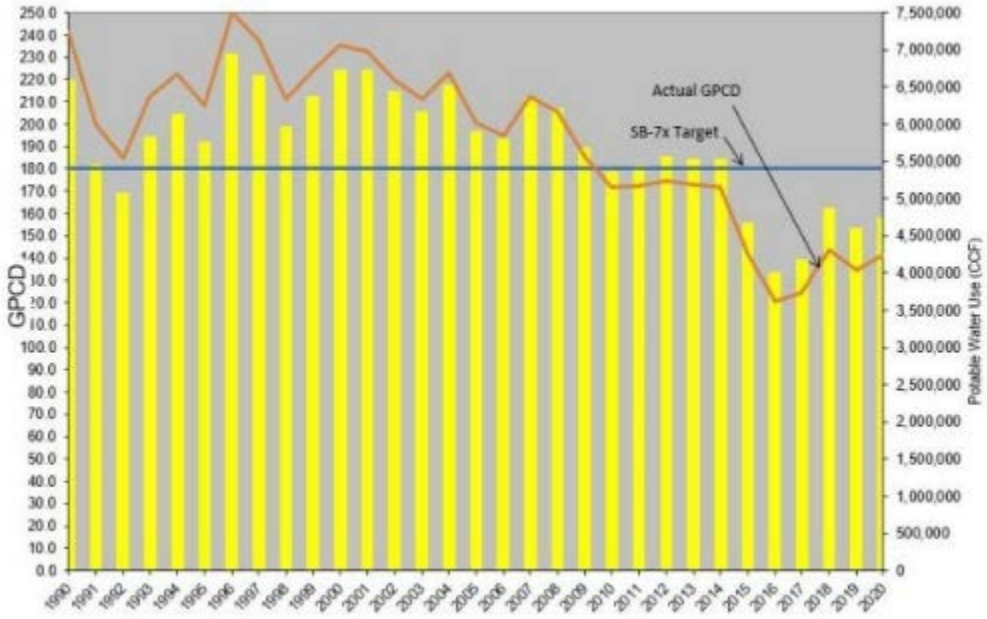
SB 73 (2013) The California Clean Energy Jobs Act, an initiative approved by the voters as Proposition 39 at the November 2012 statewide general election, establishes a Job Creation Fund with an annual budget of $550M to create clean energy jobs, including funding energy efficiency projects and renewable energy installations in public schools, universities, and other public facilities. The Job Creation Fund will be funded for four years, beginning in the 2013-2014 fiscal year.

[5] Staff Report 8023 EVSE - Residential Submittal (cityofpaloalto.org)
[6] Ordinance 5539 https://www.cityofpaloalto.org/files/assets/public/v/1/city-clerk/ordinances/ordinances-1909-to-present/2022/ord-5539.pdf
[7] Ordinance 5353 https://www.cityofpaloalto.org/files/assets/public/v/1/city-clerk/ordinances/ord-5353.pdf

AB 2227 (2012) AB 2227 changed the triennial energy efficiency target-setting schedule to a quadrennial schedule, beginning March 15, 2013 and every fourth year thereafter. The last EE goals update was due to be submitted to the California Energy Commission by March 15, 2017. The next EE goals update will need to be submitted by March 15, 2021.

AB 2514 (2010) Mandates a local publicly owned electric utility to determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems and to adopt an energy storage system procurement target, if appropriate, to be achieved by the utility by December 31, 2016, and a second target to be achieved by December 31, 2021.

SBx7-7 (2009) The Water Conservation Bill of 2009 requires water suppliers to reduce the statewide average per capita daily water consumption by 20% by December 31, 2020. To monitor the progress toward achieving the 20% by 2020 target, the bill also requires urban retail water providers to reduce per capita water consumption 10% by the year 2015.



"Making Conservation a California Way of Life" is the new generation legislation for water conservation. The targets under SBx7-7 were pretty easy to meet especially given the drought and the water use reductions that resulted. The new targets will include and indoor residential per capita use, outdoor residential use, water loss, and some C&I audit requirements. That is all currently under development.

AB 1103 (2007) Requires electric and gas utilities maintain records of the energy consumption data of all nonresidential buildings to which they provide service and that by January 1, 2009, upon authorization of a nonresidential building owner or operator, an electric or gas utility shall upload all of the energy consumption data for the specified building to the EPA Energy Star Portfolio Manager in a manner that preserves the confidentiality of the customer. This statute further requires a nonresidential building owner or operator disclose Energy Star Portfolio Manager benchmarking data and ratings, for the most recent 12-month period, to a prospective buyer, lessee, or lender. Enforcement of the latter requirement began on January 1, 2014.

AB 1470 (2007) Solar Water Heating and Efficiency Act of 2007. Requires the governing body of each publicly owned utility providing gas service to retail end-use gas customers, to adopt, implement, and finance a solar water heating system incentive program.

SB 1 (2006) The California State Legislature enacted SB 1 to encourage the installation of 3,000 megawatts (MW) of photovoltaic (PV) solar energy by the year 2017. SB 1 requires all publicly owned utilities to adopt, finance and implement a solar initiative program for the purpose of investing in and encourage the increased installation of residential and commercial solar energy systems. CPAU's share of the state goal is 6.5 MW. In 2007, CPAU increased the PV Partners program funding to meet SB1 requirements. CPAU has fully reserved all rebate funds as of April 2016.

AB 2021 (2006) Requires the CEC on or before November 1, 2007, and every 3 years thereafter, in consultation with the commission and local publicly owned electric utilities, to develop a statewide estimate of all potentially achievable cost-effective electricity and natural gas efficiency savings and establish statewide annual targets for energy efficiency savings and demand reduction over 10 years.

AB 1881 (2006) Requires cities and counties to implement a Water Efficient Landscape Ordinance which is "at least as effective as" the Department of Water Resources (DWR) Model Ordinance in reducing landscape water use. Requirements include enforcing water budgets, planting and irrigation system specifications to meet efficiency criteria.

SB 1037 (2005) Requires each local publicly owned electric utility, in procuring energy, to first acquire all available energy efficiency and demand reduction resources that are cost-effective, reliable, and feasible. Also requires each local publicly owned

electric utility to report annually to its customers and to the (CEC) its investment on energy efficiency and demand reduction programs.

AB 1890 (1996) Requires electric utilities to fund low-income ratepayer assistance programs, public purpose programs for public goods research, development and demonstration, demand- side management and renewable electric generation technologies

AB 797 (1983) The Urban Water Management Planning Act (AB 797) requires all California urban water retailers supplying more than 3,000 acre feet per year or providing water to more than 3,000 customers to develop an UWMP. The plan is required to be updated every five years and submitted to the Department of Water Resources before December 31 on years ending in 5 and 0.

Date: October 11, 2023

FORECAST
12-MONTH ROLLING CALENDAR

	Utilities Advisory Commission	City Council
October 2023	- Discussion and Update on Undergrounding Program - Approval of the Final 2023 Electric Integrated Resource Plan - FY22 DSM Report	* GMR 24 B (C) * 2022 Annual Power Source Disclosure and Power Content Label Reports (C)
November 2023	- Discussion and Update on Projects from 2015 to 2020 in WGW and Electric - Recommendation on California Oregon Transmission Project	* Approval of the Final 2023 Electric Integrated Resource Plan (FCM) * Solid Dieletric Switches REQ (C) * WWMP Consulting Services WGW Eng (C) * Ameresco PPA (C) * Recommendation on California Oregon Transmission Project (FCM)
December 2023	- Tesla Project - Reliability and Resiliency Strategic Plan Update - Preliminary Financial Forecast - Cross Bore Phase 3 - FY23 Utilities Informational Report	* Approval of the Final 2023 Electric Integrated Resource Plan (C) * Consultant Contract for S/CAP Funding Study (C) * Electrification Grant Award Notification (C) * AMI Grant Award Notification (C) * Adoption of Resolutions and Ordinances for Three Building Electrification Programs (C) * Reliability and Resiliency Strategic Plan Update (C) * Recommendation on California Oregon Transmission Project (C) * Approval of Consultant Contract for Reliability and Resiliency Strategic Plan (C)

To be Scheduled

- 60kV Breaker Contract (C) (*currently under review in the RFP process*)
- Educational Update on any Type of New Technology or Terminology
- Projects with a Resiliency Component
- Quarterly Reports (Q1-3 Info Rpts)(*Q4 Discussion Summary of the year*)
  - Financial Report
  - Utilities Programs Update
    - Informational EV Charger Installation Updates
    - Informational Bucket 1 REC Sales Updates
    - Informational Fiber Updates
- Recycled Water Purple Pipe
- GM Update: Fiber Hut Count (update June 2023)
- DER discussion
- Second transmission line update
- Resiliency update (September)