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Filer:	Mandip K Samra
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down to 87 MW. In addition, the enhancements reduced emissions and lowered variable costs for the unit.

2.1.5 Major Mandates

2.1.5.1 Renewable Portfolio Standards

"The 100 Percent Clean Energy Act of 2018" (SB 100) revised existing laws concerning the California RPS Program[9] to mandate that 60% of the total retail sales of electricity in California will be generated from eligible renewable energy resources by the end of 2030. SB 100 also included a goal of providing 100% of the retail electricity sold in California with renewable and zero-carbon power sources. Eligible resources include solar, wind, geothermal, biomass, and small hydro generation facilities. This was done with the stated purposes of benefiting the state by, among other things: displacing fossil fuel consumption, diversifying energy generation, reducing air pollution, and meeting the state's climate change goals.

SB 1020, or the "Clean Energy, Jobs, and Affordability Act of 2022" added interim targets to the provisions of SB 100. SB 1020 required that by 2035, 90% of retail electricity sales would come from zero-carbon energy resources, with that requirement increasing to 95% by 2040.

In 2021, 36.8% of BWP's electricity came from eligible renewable resources.[10] In 2022 renewable resources grew to 38.5% of Burbank's total electricity supply and it is projected that in 2023 that it will increase to 41.25%.[11] As stated above, BWP must increase that amount to 60% by 2030.

2.1.5.2 Energy Efficiency

BWP has a long-standing commitment to energy efficiency as a part of its desire to maintain reliable, affordable, and sustainable electric service. BWP manages a comprehensive portfolio of efficiency programs for residential and commercial customers focusing on energy efficiency, peak load reduction, and greenhouse gas savings.[12] BWP uses its energy efficiency programs to both help it meet its own energy efficiency goals and to encourage its customers to make changes that benefit themselves. For example, when a customer replaces a single pane window with an energy-efficient one, the new window helps keep heat from escaping in the winter, the customer uses less energy to heat their home, and saves money on their electric bill.

More details on currently available energy efficiency programs sponsored by BWP are discussed in Section 2.4.2.

2.1.5.3 Demand Response

DR takes the form of economic programs that offer customers the opportunity to change their use of electricity in response to pricing signals from the wholesale energy market. DR programs seek to encourage customers to reduce energy usage during times of peak demand or when the electricity

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[9] Section 399.11 of the Public Utilities Code
[10] Burbank Water and Power, "2021 Power Content Label," https://www.burbankwaterandpower.com/electric/power-sources/power-content-information
[11] Burbank Water and Power, "IRP Community Meeting #1," April 20, 2023 https://www.burbankwaterandpower.com/images/2023/04/Resource%20Planning%20101%20Presentation%20Public%20Meeting%201%2004%2020%202023.pdf
[12] California Municipal Utilities Association, "Energy Efficiency in California's Public Power Sector," 2022, https://www.cmua.org/files/2022%20POU%20Energy%20Efficiency%20Report%20Final.pdf

supply is limited and energy prices are at their highest due to problems with generation or transmission infrastructure. BWP currently offers a voluntary demand response program, the "Cool Rewards" program, described in detail, below.[13]

For residential customers, BWP has implemented a "Cool Rewards" smart thermostat program. For customers that choose to enroll in the "Cool Rewards" program, in exchange for enrollment incentives and annual participation credits, BWP will be able to temporarily change the setpoint temperature of their thermostat to reduce the system demand from air conditioners and heat pumps during times of peak usage. BWP hopes to expand the program to commercial customers.

For customers in the large and extra-large service classes, BWP coordinates their voluntary participation with the Demand Side Grid Support (DSGS) program for the CEC. In that program, participants are compensated for upfront capacity commitments and per-unit reductions in net energy demand during extreme events. Internally, BWP itself is signed up as a DSGS provider and enrolled the Valley Pumping Plant as a DSGS participant. As a result, BWP can receive payments for qualifying demand reductions during DSGS events.

2.1.5.4 Energy Storage

The basic function of energy storage is to absorb energy when it is available but not needed, store it for a period of time with minimal losses, and then release it when it is needed. When included in the electric system, energy storage can serve a number of important roles in balancing generation and demand, especially as increasing amounts of intermittent renewable energy resources are brought onto the system. The applications of energy storage can be on a large, regional scale (e.g., within the bulk electric system) and at a more local scale (e.g., on the local distribution system or "behind the meter" on a customer's site).

Energy storage is a potential enabling tool to achieve BWP's commitment to provide reliable, affordable, and sustainable electric service to Burbank. For example, energy storage has the potential to help effectively integrate intermittent renewable energy resources (such as solar and wind energy) by better matching the output of those resources to Burbank's energy needs. To date, there are 21 customer-owned battery installations in Burbank which have a total power output of 150 kW and total energy storage capacity of 541 kWh.

In late 2022, BWP announced that it was pursing the first utility-scale long-duration energy storage project for the City of Burbank as a part of a "solar plus storage" facility located at the BWP EcoCampus.[14] In that application, a 75 kW / 500 kWh iron flow battery is connected to a 265 kW solar array. BWP will partner with ESS Inc., to install this battery. BWP was awarded a grant for $125,000 through the American Public Power Association (APPA) Demonstration of Energy and Efficiency Development (DEED) program in 2022.

[13] Burbank Water and Power, Staff Report, August 22, 2023, https://burbank.granicus.com/MetaViewer.php?view_id=42&clip_id=10217&meta_id=416494

[14] Press Release: "BWP Partners with ESS Inc. to Bring the First Utility-Scale Battery Storage to Burbank", published November 4, 2022, https://www.burbankca.gov/newsroom/-/newsdetail/20124/press-release-bwp-partners-with-ess-inc.-to-bring-the-first-utility-scale-battery-storage-to-burbank

2.1.5.5 Transportation Electrification and Electric Vehicles

Transportation electrification is the strategy to use electricity to provide for people's transportation needs rather than petroleum-based fuels such as gasoline, diesel, and natural gas. BWP plays a key role in facilitating the adoption of transportation electrification through education and program development that helps customers overcome barriers to the adoption of electric vehicles. Transportation electrification is further discussed in Section 2.4.4.

2.2 PREVIOUS INTEGRATED RESOURCE PLANS

Burbank previously completed IRPs in 2015 and 2019. Both these documents can be accessed through the BWP website.[15]

2.2.1 Major Changes Since Burbank's Last IRP

Since Burbank's last IRP was completed, both the energy market and broader economic conditions have seen significant changes.[16] Updated forecasts for fuel costs, availability of different energy generation and storage technologies, and other market conditions all informed the assumptions made for this new IRP.

2.2.1.1 Energy Price Increases

The prices for renewable energy have increased by 35-60% since the last IRP was filed and the prices have continued to increase, even following the development of the 2024 IRP. This is due to a number of factors: tariff disputes on certain solar products originating outside the United States, new Federal tax incentives for domestic production and installation of renewables, global supply chain issues, historically high inflation, the lingering effects of the COVID-19 pandemic, an increased demand on renewables through Environmental, Social and Governance (ESG) policies at large companies and an increased mandate for the use of renewable energy in California have all combined to drive up the costs.

Natural gas costs have increased dramatically from an average of $3.01/MMBTU in 2020 to an average of $7.06/MMBTU in 2023. Market energy prices have also seen significant increases. Electricity that was, on average, $47.61/MWh in 2020 has been, on average, $61.66/MWh in 2023.

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[15] 2015 Burbank IRP:
https://www.burbankwaterandpower.com/images/administrative/downloads/IRP_Presented_to_CityCouncil_Opt.pdf
2019 Burbank IRP:
https://www.burbankwaterandpower.com/images/administrative/downloads/CityCouncilApproved_2019_Integrated_Resource_Plan_DIGITAL.pdf

[16] Burbank Water and Power, "Fiscal Year 2023-24 Proposed Budget," BWP Board Presentation, April 6, 2023, https://www.burbankwaterandpower.com/images/budget/april-2023-budget-files/Proposed%20Utility%20Fiscal%20Year%202023-24%20and%202024-25%20Budgets%20for%20BWP%20Board.pdf

Table 2-1 Historical Natural Gas and Energy Prices[17]

Year	Natural Gas Prices [$/MMBTU]	Energy Prices [$/MWh]
2020	$3.01	$47.61
2021	$6.99	$61.81
2022	$9.27	$96.28
2023 (through end of September)	$7.06	$61.66

The 2023 natural gas and energy prices provided in Table 2-1 were current as of the end of September 2023.

2.2.1.2 Other Changes

The 2019 IRP report included the consideration of compressed air energy storage (CAES) located at IPP in Utah. During the intervening years it has been determined that such an energy storage project would not yet be economically feasible at IPP. As such, consideration for that CAES project has been removed from this IRP analysis. Developments at IPP and the plans to convert it to hydrogen fuel were added to this IRP and are discussed in Section 2.5.4.

Additionally, changes to market conditions have continued to occur during and after the analyses that were completed for this 2024 IRP. System demand, REC prices, project costs, and the availability of new fuel types have been observed to change since the assumptions were set at the beginning of the IRP development. Due to the timing of some of these changes, they are not all reflected in the results of this IRP.

Table 2-2 Changes to Market Conditions Post-2024 IRP Development

Item	Changes to Market Conditions
Demand	Higher energy demand than anticipated (potentially 30% higher than the forecast)
Renewable Energy Credits (RECs)	RECs were modeled at $44/REC for Portfolio Content Category 1 resources. They are now trading at $80/REC (this increases costs by over $60 million by 2030)
Intermountain Power Project (IPP)	IPP was modeled at a total cost of $4.286 billion. Recent estimates show an increase of $400 million, bringing the cost to $4.686 billion (this increases BWP's annual debt service share by $587,000 a year)
Renewable Natural Gas (RNG)	RNG contracts are not available in the supply needed for the Magnolia Power Project and Lake One unit. This makes any scenarios that rely on RNG unrealistic in the short term.

[17] Burbank Water and Power, Stakeholder Technical Advisory Group Meeting #9, October 12, 2023

2.3 COMMUNITY OUTREACH

Public input is a fundamental part of the integrated resource planning process and a utility's IRP should reflect the needs and desires of the community it serves. In this context, BWP set out to interact with Burbank residents and businesses to determine their perspectives on Burbank's energy future.

A detailed description of the public education and outreach that took place as a part of this IRP process is documented in Section 5 below.

2.4 EXISTING CITY POLICIES AND PROGRAMS

2.4.1 Renewable Portfolio Standards

In 2007, Burbank became the first city to commit to a 33% renewable power supply portfolio standard. Since then, BWP has undertaken several initiatives to bring renewable resources into its power supply portfolio. By 2015, 34% of Burbank's power supply came from renewable resources, five years ahead of schedule. It is forecasted that in 2023, renewables will make up 41.25% of Burbank's power supply.[18]

Like conventional generation resources, different types of renewable resources have different characteristics. Solar and wind are intermittent, only generating when the sun shines or the wind blows, respectively. Geothermal, biogas and to an extent, small hydroelectric are baseload and can operated around the clock.

Subsequent to Burbank making its commitment to renewable energy in 2007, the "33% by 2020" mandate was codified in California law and regulation as the RPS. In particular, the CEC adopted rules for RPS compliance to which BWP (and all California utilities) must comply. Under the RPS program, renewable energy is measured in Renewable Energy Credits (RECs). One REC represents one MWh of renewable energy.

The RPS rules divide renewable resources into three Portfolio Content Categories (also known as "buckets"), each with its own requirements.

- Portfolio Content Category 1 (PCC1) – A renewable energy generator directly connected to or delivering to a California Balancing Authority, such as LADWP, without substituting electricity from another source,
- Portfolio Content Category 2 (PCC2) – Allows energy and RECs not delivered to a California Balancing Authority. This includes energy received as a swap from previously generated energy into a California Balancing Authority within the same calendar year as the RPS-eligible generator.
- Portfolio Content Category 3 (PCC3) – RECs only, without energy.

[18] Burbank Water and Power, "IRP Community Meeting #1," April 20, 2023 https://www.burbankwaterandpower.com/images/2023/04/Resource%20Planning%20101%20Presentation%20Public%20Meeting%201%2004%2020%202023.pdf

In addition, pursuant to its own local mandate, BWP procured renewable energy supplies before the Portfolio Content Category system was enacted. This energy is referred to as "grandfathered" or "PCC0" renewable energy.

The RPS program requires a certain amount of compliance in a given year and also sets limits on how much of each Portfolio Content Category may be counted against a utility's RPS requirements in a given year. BWP's current Renewable Energy Resources Procurement Plan is discussed below in Section 3.6.

In 2015, SB 350 established an increased RPS requirement of 50% by 2030. Then in 2018, SB 100 further increased the RPS to 60% by 2030, with a target of 100% clean energy by 2045. The Base Case used in this IRP reflects the SB100 requirements of 60% RPS by 2030 and the goal of 100% clean energy by 2045. As a city, Burbank is pursuing an aspiration goal of becoming 100% GHG free by 2040. That goal exceeds the California state target for 100% clean energy by 2045.

SB 1020, or the "Clean Energy, Jobs, and Affordability Act of 2022" built on preexisting energy legislation and added interim zero-carbon targets. SB 1020 required that by 2035 and 2040, 90% and 95%, respectively, of retail electricity sales would have to come from zero-carbon energy resources.

Renewable resources have historically benefited from certain tax benefits under federal law, including investment tax credits (ITCs) and production tax credits (PTCs). ITCs are a one-time tax credit that is based on the dollar amount of the investment made into a project. ITCs are earned when the qualifying facility is put into service. PTCs are based on the amount of electrical generation that occurs at a qualifying facility. The owners can claim a tax credit on every kilowatt-hour of generation that occurs for a set period of time.

Table 2-3 Current Renewable Generation

Resource Name	Resource Type	BWP Capacity [MW]	Start Date	End Date
Copper Mountain Solar 3	Solar PV	40	2012	2033
Desert Harvest Solar 2	Solar PV	22	2021	2046
Milford Wind I	Wind	10	2009	2029
Pebble Springs Wind	Wind	10	2009	2027
Tieton Dam	Small Hydro	6.8	2009	N/A
Don A. Campbell	Geothermal	2.49	2013	2033
Ameresco Chiquita	Landfill Gas	1.7	2010	2026

2.4.2 Energy Efficiency

BWP is committed to modernizing its infrastructure to both meet the needs of its customers and to help Burbank achieve its clean energy goals. As discussed in Section 3.11 below, as a part of that modernization, the distribution system is continuing to receive upgrades from 4 kV to 12 kV. This increase in distribution system voltage will allow greater amounts of power to reach customers and will also help to decrease system loses and increase the overall efficiency of the system.

Beyond the upgrades to the distribution system, BWP offers numerous energy efficiency programs that result in cost savings for its customers and lowered greenhouse gas emissions through reduced energy consumption.

2.4.2.1 Residential Programs

- Home Rewards Rebates Program: BWP provides rebates for purchasing and installing ENERGY STAR® rated appliances and high-efficiency measures.

- Home Improvement Program: BWP offers energy-water surveys and efficiency measure installations to all Burbank single-family residential, multi-family residential, and multi-family common area customers. Some of the HIP's services include direct installation services of LED lighting, smart power strips, smart thermostats, air conditioning tune-ups, air sealing, attic insulation, duct sealing, and water efficiency measures for low-income single-family and multi-family common area customers, and properties within the disadvantaged community areas of Burbank.

- LED Distribution Program: BWP distributes LED light bulbs to residents at numerous events throughout the community, as wells as through energy programs and surveys.

- Livingwise® Program: This program provides energy and water educational services, materials, and conservation kits to sixth-grade students attending public school in Burbank.

- OPower Web Portal: This online portal offers residential customers web access to view their electric usage information in hourly, daily, weekly, and monthly intervals and help them better understand their energy use and reduce their electricity consumption.

- Residential Building Electrification Rebate Program: This pilot program seeks to encourage customers to invest in the replacement of equipment that burns natural gas with more efficient electric alternatives that have zero on-site emissions. This program will provide rebates for the installation of equipment such as heat pumps and electric cooktops and ovens.

2.4.2.2 Commercial, Industrial, & Agricultural Programs

- Business Rebates: Burbank businesses that retire their inefficient equipment and install new energy-efficient products are awarded rebates.

- Business Bucks Program: The program offers an energy efficiency survey and helps retrofit small and mid-sized businesses.

- Upstream HVAC Program: The program provides rebates to wholesale distributors to encourage stocking and promotion of high-efficiency HVAC equipment.

- LED Street Lighting Project: In accordance with the Street Lighting Master Plan, BWP is replacing high-pressure sodium (HPS) street light luminaires with light-emitting diodes (LED) luminaires. Replacement is carried out on a maintenance basis, and LEDs are installed as the HPS luminaires burn out. LED replacements consume approximately 60% less energy. To date, 92% of the total street light luminaires have been converted to LEDs, translating to an annualized energy savings of 5,383 MWh or a 58.08% reduction in energy consumption. LED conversions have also reduced the evening load by 1,247 kW, shortening the "neck of the duck curve" and reducing the energy generation BWP needs.

2.4.2.3 Other Efficiency Related Programs

- Energy-Saving Trees Program: This program with the Arbor Day Foundation provides up to three complimentary shade trees to residential customers and up to 15 trees for commercial customers. The program also includes an interactive website with instructional videos to ensure that the trees are properly sited and planted. When properly sited, mature shade trees provide shade that helps reduce air conditioning costs.

2.4.3 Demand Side Management

Demand-side management (DSM) is similar to demand response (See Section 2.1.5.3), but instead of responding to real-time events in the wholesale energy market, DSM seeks to shift the use of energy away from times of peak demand to reduce overall energy costs. Time-of-Use (TOU) rates can be a tool to help implement DSM. TOU rates can offer cost savings by encouraging customers to shift energy use from high to low demand times, optimizing system offerings, and reducing operating costs. In a similar vein, Advanced Metering Infrastructure (AMI) also lends itself to demand-side programs, allowing customers to see and control their energy use and BWP to develop and implement programs to incentivize energy use reduction during critical periods. Ultimately, these strategies will help to reduce peak demands on distribution facilities, prolong distribution asset life, and defer capital investment in new generation and transmission assets.

2.4.4 Transportation Electrification and Electric Vehicles

Electric vehicles are an essential part of BWP's strategy to reduce GHG emissions and further accommodate integration of clean energy. BWP is promoting the use of transportation electrification as a demand resource to help achieve new environmental goals, integrate renewable energy, and maintain grid reliability. BWP can benefit from transportation electrification through better grid utilization by incentivizing EV charging in lower cost hours when energy usage is typically low or mitigating the effects of rooftop solar generation by managing EV demand during the day. Per SB 676, BWP plans to and has implemented electrification grid integration strategies that work best for its ratepayers. BWP continues to improve upon its electrification strategy to enhance adoption of electric vehicles across the BWP territory.

BWP is pursing the installation of BWP-owned EV chargers in high-density residential areas and in public parking lots. BWP is also committed to making public charging easy. Burbank now has 93 EV charging ports at 22 sites with plans to install an additional 116 ports by 2032. During the same period, BWP also anticipates providing rebates for the installation of another 779 privately-owned charging ports. BWP is also looking into providing technical assistance to help facilitate private workplace and fleet charging for interested businesses. BWP's plans for the expansion of EV charging facilities are based on the Integrated Energy Policy Report (IEPR) forecast for future EV adoption and specific information about the actual number of EVs within its service territory.

In FY 2023 BWP continued implementing a Used EV Rebate Program, Residential EV Charger Rebate Program, and Commercial EV Charger Rebate Program.

- Used EV Rebates: The program offers residential customers a $1,000 rebate towards a pre-owned EV purchase to support the adoption of EVs. The program is designed for customers who prefer pre-owned EVs or have income constraints to acquire a new EV.

- Residential Charging Station Rebates: Residential customers who install a Level 2 (240V) EV charger are eligible for a rebate from BWP. Residential customers can get rebates of up to $500 for a smart charger and up to $1,250 with an electric panel upgrade. Customers living

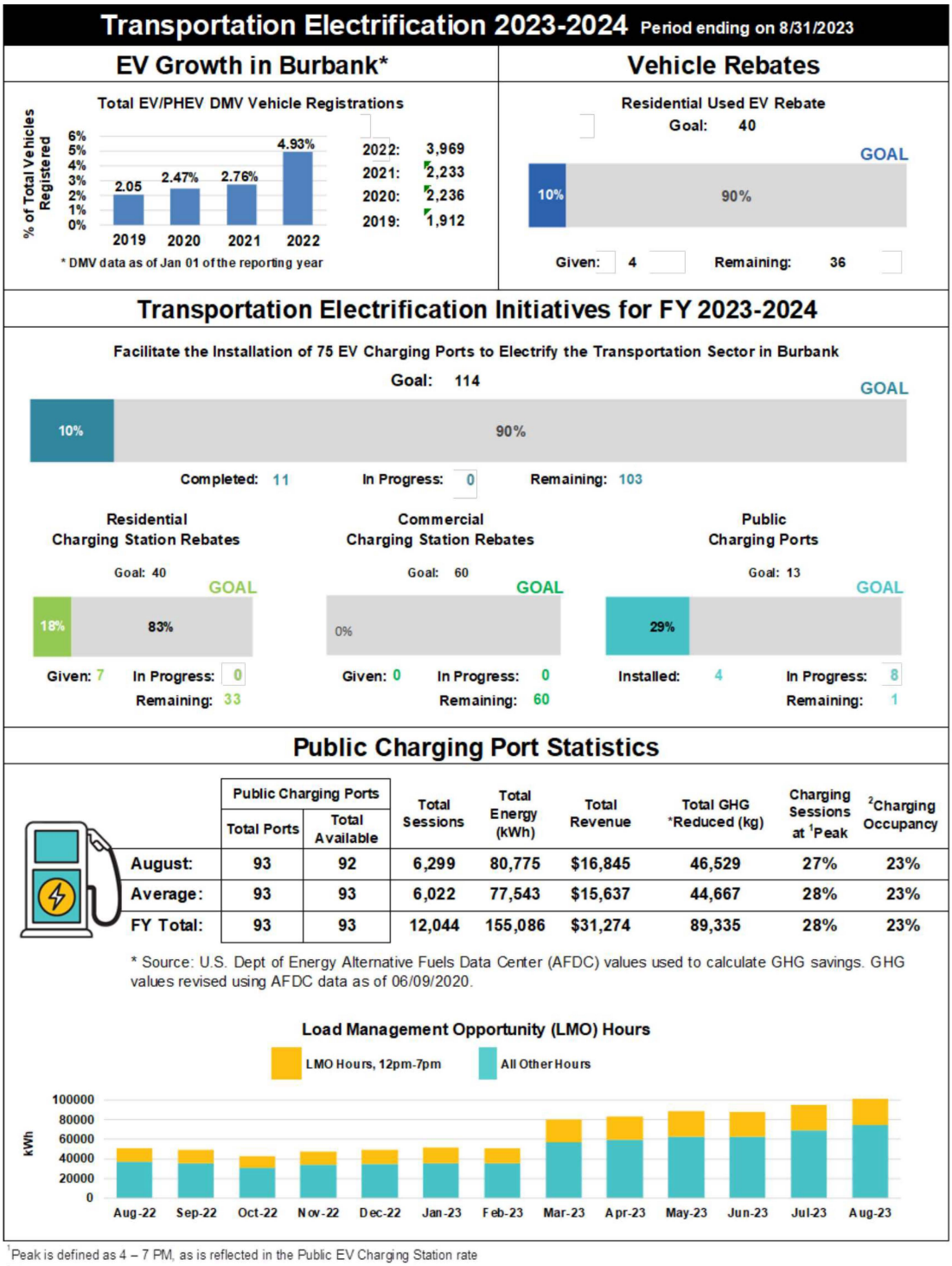
in a Disadvantaged Community (DAC) area of Burbank can qualify for increased rebate amounts of up to $600 for a smart charger and up to $1,500 with an electric panel upgrade. and commercial customers can get a rebate for up to $2,000 per charging station for their business.

- Commercial Charging Station Rebates: Commercial customers in Burbank are eligible to receive rebates per charge port, up to the amounts in the following table.

Table 2-4 Commercial Charging Station Rebates in Burbank

	DACs and/or Public Access	Multi-family Residences	Other
Without Utility Infrastructure Upgrade			
Level 1	N/A	$3,500	N/A
Level 2 / DC Fast Charger	$4,000	$4,000	$1,800
With Utility Infrastructure Upgrade			
Level 2 / DC Fast Charger	$7,500	$7,500	$3,500

For its part, BWP is at the forefront of fleet EV adoption as a fundamental component of its commitment to sustainability. Sixty percent of BWP's fleet cars are either all-electric, plug-hybrid, or hybrid and four hybrid bucket trucks are in service. Three propane-fueled forklifts have been replaced with all-electric forklifts and additional electric vehicles are on order.



	Public Charging Ports		Total Sessions	Total Energy (kWh)	Total Revenue	Total GHG *Reduced (kg)	Charging Sessions at [1]Peak	[2]Charging Occupancy
	Total Ports	Total Available						
August:	93	92	6,299	80,775	$16,845	46,529	27%	23%
Average:	93	93	6,022	77,543	$15,637	44,667	28%	23%
FY Total:	93	93	12,044	155,086	$31,274	89,335	28%	23%

* Source: U.S. Dept of Energy Alternative Fuels Data Center (AFDC) values used to calculate GHG savings. GHG values revised using AFDC data as of 06/09/2020.

[1]Peak is defined as 4 – 7 PM, as is reflected in the Public EV Charging Station rate

[2]Charging Occupancy is defined as the percentage of time EV's are charging at stations for all available hours in a given month across all charging stations

Figure 2-1 Transportation Electrification Statistics[19]

[19] Burbank Water and Power, Monthly Operations Report, October 2023.

2.4.5 Disadvantaged Communities

Historically, communities were defined as "disadvantaged" using socio-economic factors such as income, education, and occupation. The State of California has added to the definition to include exposure to environmental pollutants.

BWP offers programs for customers who meet income qualifications such as discounted electric rates, assistance to make a one-time payment, and energy efficiency programs. California law encourages utilities to include programs for disadvantaged communities in their plans. The following BWP programs are available to customers located in disadvantaged communities:

- Burbank Utility Service Subsidy (BUSS) Program: Offers an ongoing 12% discount to income-qualified residents.
- Lifeline Program: Offers a reduced electric rate and an exemption from the monthly Customer Service Charge for income-qualified customers.
- Life Support Program: Offers customers that require the use of Life Support Equipment in their home an exemption from the utility user tax.
- Project Share Program: Offers income qualified customers a one-time yearly stipend towards their electric utility bill.
- Home Improvement Program (HIP): Offers energy and water surveys and efficiency measure installations to all Burbank single-family residential, multi-family residential, and multi-family common area customers. Some of the HIP's services include direct installation services of LED lighting, smart power strips, smart thermostat, air conditioning tune-ups, air sealing, attic insulation, duct sealing, and water efficiency measures for low-income single-family and multi-family common area customers, and properties within the disadvantaged community areas of Burbank.

In addition, BWP operates 77 of its electric vehicle charging ports within disadvantaged communities and provides additional rebates for residential[20] and commercial[21] customers in disadvantaged communities that install their own electric vehicle charging stations.

2.5 BURBANK WATER AND POWER'S EXISTING RESOURCES

Burbank is currently adequately resourced to meet its demand and any growth or new requirements over the next several years. Growth can also be addressed through the use of energy efficiency, more efficiency rate design, demand-side management, and new sources of renewable energy.

2.5.1 How is Power Produced?

A reliable power system does not depend on a single power generation resource or a single method of producing power. Rather, a reliable power system uses diversity of resources, technologies,

[20] Burbank Water and Power, Residential EV Charger Rebate, https://www.burbankwaterandpower.com/electric-vehicles/residential-ev-charger-rebate
[21] Burbank Water and Power, Commercial EV Charger Rebate, https://www.burbankwaterandpower.com/leadthecharge

customer activities, fuels, and power plant operating characteristics to maintain reliable electric service at all times.

Integration of different fuels and technologies produce the least-cost, highest reliability power production mix. Power production costs change because the input fuel costs – including natural gas, coal, and nuclear fuel – change over time. The uncertainty of the future costs of these fuels translates into uncertainty for the production cost of electricity. This is known as production cost risk. Like a balanced financial investment portfolio of stocks and bonds, a diversified energy supply portfolio is the most cost-effective tools available to manage production cost risk – particularly during periods of technological and cost uncertainty. In addition, a diverse power generation technology mix is essential to cost-effectively integrating renewable energy.

Conventional methods of power generation use coal, natural gas, nuclear, or water (i.e., hydroelectric power plants) to produce electricity. Power can also be produced from renewable sources, including wind, solar, geothermal energy, and landfill gas.

Both conventional and renewable energy resources are important, and BWP relies on a mix of both conventional and renewable generation. Each type of generator has its own role to play in BWP's supply portfolio.

For example, take solar generation. Once a solar plant is built, the energy produced has no fuel costs and no emissions. But if there is cloud cover or it is nighttime, no solar power is produced. That is why conventional, dispatchable sources are still important since they can generate power on demand.

2.5.2 Baseload, Load-Following, Peaking, and Intermittent Power Resources

Some power plants, like coal-fired, nuclear, and geothermal, can run near continuously, day and night, and in all types of weather. Facilities like that are called "baseload" power plants. Other power plants, usually fueled with natural gas, can more easily adjust their output as loads change throughout the day. For that reason, they are called "load-following" power plants. For BWP, Magnolia can serve both baseload and load-following roles. "Peaking" power plants also primarily use natural gas but can include energy storage as well. These types of facilities are quick-starting, quick-ramping power plants or energy storage resources that supply power when loads exceed the output of the baseload and load-following power plants, or when load is changing quickly. Peaking plants are also used to help integrate intermittent renewable energy like wind and solar.

2.5.2.1 Baseload Resources

Baseload resources help serve the steady load that BWP must always meet. As such, a baseload resource can run for months on end without interruption. When operated this way, baseload resources produce reliable, cost-effective power. Baseload resources can use natural gas, coal, nuclear fuel, water (in the form of hydroelectric power), landfill gas, or geothermal energy.

Baseload resources are slower to increase and decrease power output, or "ramp." In this way baseload resources are the freight locomotives of power generation – the best option for long, steady hauls. However, recent technological updates to the Magnolia Power Project coordinated through General Electric, have allowed the unit to operate at lower minimum power levels and ramp up and down more quickly. These updates allow the Magnolia Power Project to better support intermittent renewable energy resources, such as wind and solar.

More recent development in energy supply have resulted in a decreasing emphasis on traditional baseload resources. Instead, the use of large quantities of intermittent renewable resources such as wind and solar facilities, are providing large portions of the energy previously provided by baseload power plants. This change in the energy markets has also accentuated the need for fast-reacting, flexible resources to integrate increasing amounts of renewable energy in a reliable manner.

2.5.2.2 Load-Following Resources

While the generation from baseload resources can be predictable, load may not be. As people and businesses go about their days, load increases and decrease minute-by-minute and hour-by-hour. Load-following resources increase and decrease their output with it. Like some baseload power plants, load-following resources are usually fueled with natural gas, but they are designed to ramp more quickly. This is usually done with some cost in efficiency. As such, load-following resources can be thought of as the 18-wheelers of power generation – not as efficient as baseload resources, but able to drive in the "heavy traffic" of changing loads.

Hydroelectric resources play a load-following role in the power system, as they can start, stop, and ramp relatively quickly. Emerging energy storage resources can also fill a load-following role.

2.5.2.3 Peaking Resources

Peaking resources are the sprinters of the group – power plants than can be switched on and ramped up quickly when power is needed, usually within minutes.

Peaking power plants have traditionally been fueled by natural gas. These facilities, usually based on the design of jet aircraft engines, are designed for maximum operational flexibility at the cost of efficiency. In contrast, baseload power plants are designed for efficiency at the cost of operational flexibility.

Hydroelectric resources can provide peaking services in the power system since they can start, stop, and ramp relatively quickly. Energy storage batteries can also operate as peaking resources with high levels of operational flexibility. Their primary applications include helping to integrate renewable resources.

2.5.2.4 Intermittent Resources

Conventional baseload, load-following, and peaking resources, despite their differences, are all dispatchable to one degree or another. Operators can change their output by controlling the rate at which fuel is used by the power plant. Intermittent resources have no such control and generally have lower production potential compared to conventional baseload resources. In order to account for these limitations, entities can over-procure intermittent resources to meet their demand. However, any over-procurement of intermittent resources needs to account for the hourly generation shape associated with the production of such resources both at daily and seasonal levels. For example, solar production is typically high during daytime hours and the summer season, whereas wind production is typically high during evening hours and the winter season. Therefore, entities would need to procure or over-procure a mix of intermittent resources with complimentary profiles (like wind and solar), to meet their around-the-clock demand.

For example, solar power plants, by virtue of using sunlight as fuel, only produce power when the sun is shining, but not when clouds pass over or at nighttime. In the same way, wind turbines only produce power when the wind is strong enough. The availability of wind and solar can only be predicted within a short time frame. Therefore, intermittent resources challenge efforts to balance generation and load in real-time.

2.5.3 Power Generated in Burbank

BWP's currently operating local generation resources are natural gas-fired facilities that were placed in service between 1959 and 2005.

Table 2-5 Existing Generation Facilities in Burbank

Name	Type	Power Load Type	Capacity (MW)	In-Service Date
Olive 1	Steam Turbine	Baseload (in dry-layup)	40*	1959
Olive 2	Steam Turbine	Baseload (in dry-layup)	50*	1964
Lake One	Combustion Turbine	Peaking	45	2002
Magnolia	Combined-Cycle	Baseload & Load Following	75.6** / 244	2005

**While in dry-layup, Olive 1 & 2 have a functional capacity of zero.*
***BWP has a 31% interest in the SCPPA-owned Magnolia plant that is located in Burbank.*

Olive 1 & 2 (Reserves)

The Olive 1 & 2 steam generating units are BWP's oldest exiting units, and went into service in 1959 and 1964, respectively. Starting in 2011 for Olive 1 and 2012 for Olive 2, both units have been in "dry-layup" for the long-term preservation of the boiler, condenser, turbine, and related piping. As a consequence of being in that state, a 274-day notice is required to restart a single unit and a 365-day notice is required to restart both units.[22]

BWP is investigating options to replace Olive 1 & 2 with combustion turbines similar to Lake One, internal combustion engines, renewables, storage (such as batteries), or a mix of technologies that could yield the flexibility required to operate in the future.

Lake One (Peaking)

The Lake One unit is a 47 MW General Electric LM-6000 simple-cycle combustion turbine that became operational in 2002. At the time it was placed in-service, the Lake One unit represented the "best in class" in combustion service technology.

Lake One is operated as a peaking unit. It often generates electricity during hot summer days when loads are high. When sitting idle during period of lower demand, it serves as a reserve unit.

[22] Burbank Water and Power, Staff Report, dated February 2, 2023, page 35, https://www.burbankwaterandpower.com/images/administrative/downloads/BWP_MonthlyOpsReport_February2023.pdf

(Lake One, *Photo Source: BWP*)

Magnolia Power Project (Baseload / Load-Following)

In 2002, BWP participated in the construction of combined-cycle generating plant that was built in and operated by Burbank and is known as the Magnolia Power Project or just "Magnolia." In September 2005, when this unit went into service, it used what was considered "best in class" natural gas combined-cycle technology. This unit can be used either for baseload or load-following power.

Magnolia is based on a General Electric 7FA combustion turbine. The term combined-cycle refers to how the plant recycles the waste heat from the combustion turbine by using it to boil water to create steam in order to power a steam turbine. The nominal output of the plant is 242 MW, but for limited periods of time it can be augmented with supplemental firing (similar to afterburners on jet aircraft) and steam injection to produce up to 310 MW.

Burbank is the operating agent for Magnolia and operates the plant. Burbank has an entitlement to 31% of its output. This equals approximately 75 MW (or up to 95 MW during times when supplemental firing and steam injection are used). The ability to ramp Magnolia up and down quickly, can be shown below in Figure 2-2. During the heat dome event on September 8, 2022, Magnolia was able to ramp up and down in coordination with intermittent resources and respond to price signals from the energy market.