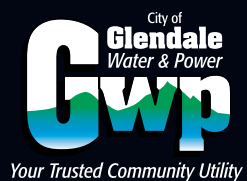




GLENDALE WATER & POWER
UTILITY MODERNIZATION REPORT 2020
STEPHEN M. ZURN, GENERAL MANAGER



Utilities are at the beginning of a fundamental transformation. Technological innovation promises dramatic changes for the current electric and water utility structure. Innovations open up opportunities for greater energy source diversity and ubiquity, incorporating energy storage, solar power, virtual power plants and customer participation price setting, and reshaping how customers both consume energy resources and interact with their utilities. Technology enables customers to understand their water usage and conserve water, and allows the utility to leverage data to improve water quality and manage infrastructure.

The grid of the future beckons: low-carbon power sources integrated seamlessly into a more reliable and secure network, but also capable of operating independently; a system where new, competitive forces keep minimizing costs while offering new products and services at all levels. With applications before and behind the meter, network intelligence strategies involving advanced metering infrastructure (AMI) and other technologies are carrying the promise of unprecedented volumes of data about customer habits, asset health, system outages and other anomalies.

The advancement of AMI is breathing new life into the utility and our efforts to communicate with our customers and how they are responding and conserving. Customers are more empowered and more technologically savvy and utility systems are digitized, giving customers more control and functionality over their usage because they have the tools to see their near real-time water usage. Focusing on all aspects of utility operations, especially technology, infrastructure, and regulatory policies, we have improved our grid reliability and resiliency. Utilities that embrace modernization will have the knowledge and tools to engage customers and offer the accessibility their customers are growing to expect.

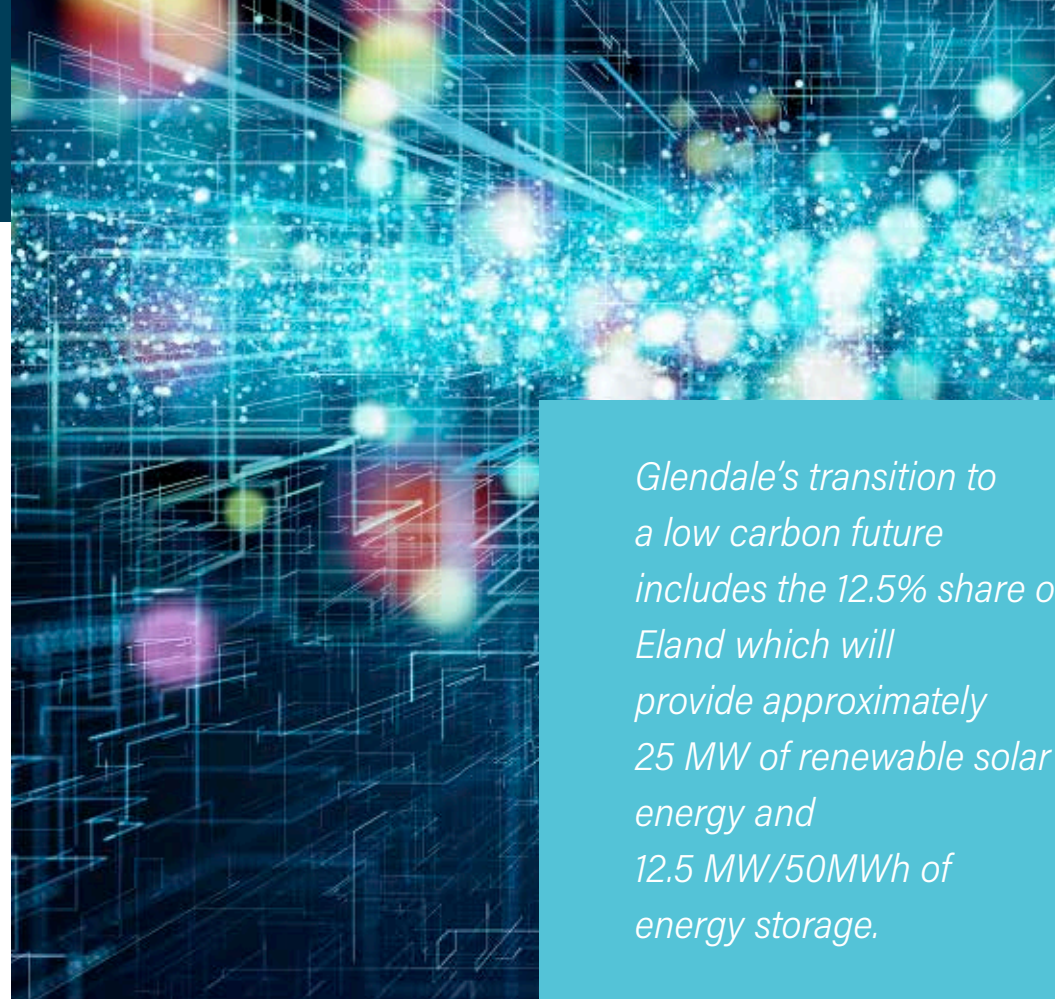
ELECTRIC DIVISION MODERNIZATION

Glendale Water & Power (GWP) is committed to a clean energy future. We continue to educate and advocate for the responsive use of natural resources and green energy sources. We support our customers that want to also work towards a clean and green energy future by offering them a variety of programs and incentives to help them achieve these goals. The following are programs, partnerships, and investments GWP has developed and implemented.

Solar Solutions Program

GWP's Solar Solutions program provides an incentive of \$0.25 per watt for installed systems sized 30KWdc or less that meet program guidelines. These systems require an interconnection agreement that allows GWP to buy any excess renewable energy from the customer.

Since 2002, a total of 1,900 interconnected solar systems were installed with a total capacity of 20 MW in Glendale. Of these systems, 1,300 were incentivized, through our Solar Solutions Program with a total capacity of 9 MW.



Glendale's transition to a low carbon future includes the 12.5% share of Eland which will provide approximately 25 MW of renewable solar energy and 12.5 MW/50MWh of energy storage.

Since 2002, 1,900 interconnected solar systems were installed in Glendale with the total capacity of 20 MW.



Nearly \$18 million has been spent to incentivize solar installations since the program began in 2002. GWP is one of the last utilities in the region that continues to incentivize the installation of rooftop solar. As GWP looks into offering a virtual power plant and solar program option as part of its Clean Energy Programs, it proposes to stop the Solar Solutions program so that customers can take advantage of a more modernized approach to solar energy investments.

Investing in Renewables

The Glendale City Council adopted a resolution on December 10, 2019 to enter into a 25-year Power Sales Agreement with the Southern California Public Power Authority (SCPPA), of which Glendale is a member, for a 12.5% share of the renewable solar energy, battery energy storage products, and associated environmental attributes from the Eland 1 Solar and Storage Center (Eland) in Kern County. The state-of-the-art Eland facility will provide fully dispatchable power for GWP to meet customer demand with reliable, cost-effective power - a capability previously reserved for large fossil fuel power plants.

GWP's 12.5% share of Eland will provide the City of Glendale approximately 25 MW of renewable solar energy and 12.5 MW/50MWh of energy storage. It is expected to contribute to about 9% of Glendale's Renewable Portfolio. Glendale is on board to transition to a low-carbon future and is putting us on the path to achieving 100% of the energy needs of the Glendale community through reliable, affordable and sustainable clean energy.

GWP has also entered into two other renewable projects: the Whitegrass and Star Peak Geothermal Projects. GWP has signed 25 year power purchase agreements for 15.5 MW of renewable geothermal energy from these projects which will contribute approximately 11% of GWP's renewable power portfolio.

GWP is also subscribed to a 4.166% share of the Intermountain Power Plant (IPP) Repowering Project which will increase Glendale's rights on the STS Transmission from 55MW to 128MW. Participation in the project provides Glendale access to plentiful, cheap, and reliable renewable projects that are being developed and interconnect at the IPP bus in Utah. IPP is expected to be fueled by 30% green hydrogen by volume by 2030 with a plan of transitioning to 100%.

Expanding Local Distributed Solar Generation in the City of Glendale

GWP has issued a Request for Proposals for an Owner's Engineer for Solar and Storage Development of City of Glendale Properties. The Owner's Engineer will assist the City with a master plan for developing solar and energy storage facilities on City-owned properties in the City of Glendale. The Scope of Work includes identifying viable City-owned sites for solar and storage assets, determining the requirements for development of such sites, preparing a schedule, planning and engineering an estimate for the development, and preparing technical requirements suitable to be included in a Request for Proposals that will be issued in the future to retain an Engineer, Procure, and Construct (EPC) contractor to develop such sites.

4kV/12kV Feeder Conversion

Investing in Glendale's future includes upgrading and replacing aging infrastructure, and building new assets that improve the system. Improving our infrastructure as we upgrade and enhance reliability and operational efficiency keeps us ready for future changes. Our customers can count on reliable and affordable power now and into the future.

As part of modernization efforts, we are upgrading 4kV distribution lines to 12kV lines. This upgrade is needed due to rapid technology advancements and increased customer electricity demand. The higher voltage lines will improve our reliability and will increase voltage stability. This is especially important for customers using solar panels and for manufacturing and industrial customers using sensitive equipment. During the past two years, we have:

- Converted two 4kV feeders to 12kV in Tropico feeder areas.
- Rebuilt 63 poles for 12kV operation.
- Replaced 45 deteriorated poles.
- Replaced 22 distribution transformers.

Street Lighting Conversion to LEDs

We are continuing to improve Glendale city streets by converting the existing High Pressure Sodium (HPS) street lights to energy efficient Light Emitting Diode (LED) lights. LEDs are small pieces of electrical circuitry encased in a hard plastic that emit light when energized. LEDs require less power than HPS and other incandescent lights. The LEDs that are being installed in Glendale are typically 3 to 5 times more efficient than the lights they are replacing.

There are a total of 11,343 light fixtures in Glendale. 40% of these fixtures have already been converted to LEDs, while 58% still use HPS lights, and the other 2% use different kinds of lighting. This conversion will offer significant energy savings, increased reliability, and lights with extended longevity. LED lights help reduce energy and maintenance costs, in addition to reducing the overall carbon footprint. LED lighting has high color rendering which means it has the ability to reproduce colors of objects well. This is essential for helping drivers notice and identify objects such as hazards and pedestrians on the road.

In the past two years, we have completed the following major LED Conversion projects:

- Converted 141 lights on Verdugo Rd. from Acacia Ave. to La Crescenta Ave.
- Converted 57 lights on Colorado St. from San Fernando Rd. to Glendale Ave.
- Converted 71 lights on San Fernando Rd. from Windsor Rd. to Tyburn St.
- Converted 746 lights to LED.

In total, 1,015 lights have been converted to LED in the past two years.



GWP recognizes the importance of underlying technologies to provide better service to our customers and to increase efficiencies.



LED street lights have lower maintenance costs, save energy, provide more light and reduce our carbon footprint.



We are currently focusing on converting all lights in and around the downtown area and on major thoroughfares throughout the city to LEDs. When that is completed we will move to convert the remaining lights in residential areas. These conversions will save the City of Glendale over 700 MWH of energy per year.

GWP Modernization of Business Systems, Reliability, and Automation

As GWP focuses on modernization, we recognize the importance of the underlying technologies to provide better service to our customers and to increase efficiencies. This year GWP Business System Support has worked to improve reliability, security, and business continuity.

GWP built an SQL cluster virtual environment to support the Glendale Modernization initiatives, and implemented high availability in many of our infrastructure computer systems. The SQL clusters and the virtualization environment are highly redundant and resilient against many different failure scenarios. The designs allow GWP to reduce downtime due to unplanned outages and planned maintenance resulting in improved systems availability and continuity.

GWP is always planning for the future. An important component of the focus on reliability is being prepared for unplanned events and disasters. GWP is implementing a disaster recovery and data protection plan which is anticipated to be completed by end of FY 20/21. Security is an important part of GWP's goals toward reliability and modernization of its infrastructure. It's important to have many layers of data protection in place. Should a major event happen, the goal is to bring our major applications online and restore service as quickly as possible. GWP continues to focus on security and develop a stronger, sustainable state of security and business continuity.

GWP continues to implement automation using the enterprise service bus and the automation platform within the Customer Information and Billing System (CIS). The enterprise service bus is a platform that allows for integrations to be automated between internal and external business systems and provides email notification of integration successes and/or failures. GWP implemented fifteen (15) different integrations in the in Fiscal Year 19-20, including the automation of external payment processing files, SCADA data, GIS, Energy Trading software file transfers between contracted vendors, electric mapping site updates, and generation data between Glendale and Burbank. The NorthStar Automation Platform is a powerful tool to streamline business processes, improve customer service efficiency, and free valuable staff time by automating manual business processes. This tool enables users to schedule and run routine tasks on a regular or event driven bases. It also allows instant email notifications of failed and/or successful business processes.

In-Home Display and Thermostat Program

Since 2015, GWP has enrolled over 1200 customers in the In-Home Display and Thermostat program. This innovative program provides eligible residential customers with a digital picture frame that shows their real-time electric usage and near real-time water usage. Having this usage information readily available enables customers be more aware of their energy use and water consumption, and can potentially result in customers modifying their behavior to save more energy and water. In addition to the energy and water use, the frame also promotes conservation by displaying custom conservation messages from GWP and emergency alerts during special events like a heatwave or power outage. The frame can also display personal photos to rotate along with the usage information and conservation messages. As part of the program, customers also receive a free smart thermostat that can set schedules with different temperatures and be controlled from any smartphone, tablet, or computer.

Electric Vehicle Infrastructure

GWP is committed to advancing the adoption of electric vehicles and their infrastructure in the Glendale community. Since 2016, GWP has installed 11 public EV chargers throughout Glendale, including one EV fast charger at Glendale City Hall. GWP has also provided over \$70,000 to incentivize 129 residential and commercial customers for the installation of level 2 EV chargers at their home or business. In addition, GWP has hosted multiple Electric Car Guest Drive events that allow residents to learn more about EVs and test drive EVs without the sales pressure of dealing with dealerships. GWP plans to continue adding more EV chargers throughout the city to keep up with the increasing demand for EVs and EV infrastructure.

The Mobile Source Air Pollution Reduction Review Committee (MSRC) 2017 Local Government Partnership Program

MSRC has reserved funding for Glendale to partner with them in reducing motor vehicle air pollution. The MSRC's Local Government Partnership Program is designed to forge partnerships between the MSRC and cities or counties within the South Coast region to jumpstart implementation of the South Coast AQMD's 2016 Air Quality Management Plan (AQMP). The 2016 AQMP relies heavily on use of incentives to achieve air pollution reductions above and beyond those obtained solely by regulation.

The Local Government Partnership Program is a unique funding opportunity that will provide GWP with additional funding to implement high priority clean air programs. The amount of funding allocated to Glendale will scale with the amount of air quality improvement funding the City receives under the AB 2766 Motor Vehicle Subvention Fund Program. The City of Glendale has an approved Reserved Funding Amount of \$260,500.

GWP will be pursuing the Electric Vehicle Charging Infrastructure Installation category of the Local Government Partnership Program, which includes the costs to purchase and install electric vehicle supply equipment



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(EVSE) to support increasing numbers of electric and plug-in-hybrid vehicles. The MSRC will contribute up to 75% of the cost of publicly accessible EVSE installations and up to 50% of the total EVSE cost for private access EVSE.

Police Electric Motorcycles

GWP partnered with Glendale Police Department (GPD) to implement a pilot program which would promote greenhouse gas reductions through the purchase of two zero emissions electric motorcycles for the GPD to test feasibility of broader use by the GPD. Electric Motorcycles can potentially be used off-road for the purpose of patrolling the fire roads and hiking trails of Glendale.

LCFS Credits and Clean Fuel Rewards Program

Since 2017, Glendale has been participating in the Low Carbon Fuel Standard (LCFS) program by the California Air Resources Board (CARB). Glendale receives LCFS credits which are designed to encourage the use of cleaner low carbon fuels in California, encourage the production of those fuels, and therefore, reduce greenhouse gas emissions. These LCFS credits may be monetized and used for local GWP EV programs, including education, outreach, installation of public EV charging infrastructure, and rebate programs for private residential and commercial charging stations.

In 2020, GWP became a participant in the statewide Clean Fuel Rewards Program, utilizing its LCFS credits to fund point of sale rebates for EV purchases.

Fiber

GWP is undertaking the installation of a new fiber optic network for the city with the goal of making fiber optic services available to residential and commercial customers in most parts of the city at an estimated cost of about \$1.8M. GWP has developed a Utility Fiber Optic Business Plan which recommends that GWP increase its presence in Glendale's telecommunications market with a service offering for business customers marketed/sold (a) directly to the end user customer and (b) indirectly through resellers and other service providers. The recommended service offering includes Dark Fiber, Switched Ethernet, and Direct Internet Access. By offering these services, the Fiber Business Plan concluded that Glendale could generate \$2M to \$4M from telecommunications services sold to businesses, assuming that adequate network, staff, and business processes are in place and capable of providing service performance and customer support that meet or exceed commercial standards. Once the project is completed, through interconnecting arrangement at major carrier hotels in Los Angeles, Glendale businesses can connect their locations in Glendale to locations anywhere in the world. The lit services are services of interest to major businesses with needs for dedicated, highly secure, and very high data rates to interconnect their businesses, partners, customers, and suppliers. The design phase of the project is expected to be completed in September, 2020, and construction by the end of 2021.

Voltage Reduction Program

GWP utilizes Conservation Voltage Reduction (CVR) programs to decrease power consumption, which benefits the environment and reduces our customers' electricity bills. The CVR program takes real-time voltage data and uses software to adjust the transformer voltage to keep it at a pre-determined level. In addition to achieving energy savings through voltage control, the CVR program helps GWP identify problem areas on feeders, such as poor transformer performance, so corrective action can be taken before the feeder is included in the program. CVR lowers the voltages at substations by operating transformer tap changers, but it cannot lower them beyond the minimum allowable voltage level established by American National Standards Institute (ANSI) for any GWP customer. Hence, the customers with the lowest voltages at their electric meters are the ones limiting how low the voltage can be reduced at the substations. In order to improve the overall voltage reduction and to lower power consumption even more, GWP plans to employ ENGO V10 devices manufactured by Varentec Inc. These devices selectively provide a voltage boost at particular transformers that provide power to the customers with the lowest service voltages. Such voltage boosts enable GWP to further lower transformer taps at substations, thus increasing the overall effectiveness of the CVR program. An ENGO device accomplishes a local voltage boost by providing variable capacitance on the secondary side of the targeted transformer. ENGO units are placed on poles and automatically boost the voltage when the transformer's secondary voltage drops below a certain value. GWP continues to work with Dominion Voltage Inc. (DVI) to expand its CVR program system wide. CVR conserves electricity by operating electric customer voltage in the lower half of ten percent (10%) voltage band required by equipment standards using the voltage data collected from the Advanced Meter Reading Infrastructure (AMI) to distribution feeders. We have 24 transformers and 40 Feeders in CVR mode. The average percentage of savings by feeder in FY 18/19 was 1.42% with a combined savings of 3847.43 MWh.

Clean Energy Programs

In developing its Integrated Resource Plan, GWP held public meetings, focus groups, and conducted surveys in order to determine Glendale residents' priorities regarding clean energy programs. Based upon that feedback, GWP has proposed a plan that will transform the way GWP provides reliable and affordable clean energy resources to its residents and business. In July 2019, we received approval from the Glendale City Council to move forward with the development phase of a plan to repower the aging Grayson Power Plant with a combination of renewable energy resources, energy storage and a limited amount of thermal generation. The plan includes a 75 megawatt (MW), 300 megawatt-hour (MWh) Battery Energy Storage System (BESS), as much as 50 MW of distributed energy resources that include solar photovoltaic systems, energy efficiency and demand response programs, and 93 MW of thermal generation from up to five internal combustion engines.

GWP's Voltage Reduction program takes real-time voltage data and uses the software to adjust the transformer voltage to keep it at a predetermined level. In addition to achieving energy savings through voltage control, the CVR program helps GWP identify problem areas on feeders, such as poor transformer performance, so corrective action can be taken.



The proposed repowering of Grayson will include a diverse mix of energy resources with a goal of providing the cleanest power possible while maintaining reliability at a reasonable cost in a transmission constrained location. This is one of many steps in establishing GWP as a national clean energy leader and achieving GWP's 100% clean energy goals. Based upon the direction of the City Council and input from the community, GWP has partnered with Clean Energy providers to develop the innovative, community-facing clean energy.

Commercial Residential Demand Response and Smart Thermostat Program

The objective of this proposed program is to develop a load control program that will deliver up to 10 MW of demand response to GWP during demand response events with guaranteed capacity of 5.9 MW of automatic demand responses from residential thermostats and 4.1 MW of manual demand response from commercial and industrial customers.

Virtual Power Plant

GWP is proposing a Virtual Power Plant (VPP) program for approximately 3,000 to 4,000 single family residential customers and approximately 30-40 multi-family housing properties that would include both solar generation and energy storage. This would be the largest program of its kind and would be significantly larger than the VPP programs that have been implemented to date in other jurisdictions which have been introduced on a very small, pilot-scale basis to test the concept. Through a purchase power agreement (PPA), this program would provide GWP with an average of 28 MW of solar power and 25.25 MW of battery storage each year over the life of the program.

Commercial Direct Install Program

The objective of this proposed program is to implement energy efficiency measures designed to reduce annual electric usage by 35,000MWh in commercial buildings which equates to reducing demand by 8.32 MW once fully implemented. The program will be implemented over a seven year period and the energy savings measures are expected to last an average of 12.5 years.

Behavioral Demand Response (BDR)

For the past two summers, GWP partnered with run-by-cloud software provider Oracle America, Inc. (Opower) to deploy a residential Behavioral Demand Response (BDR) pilot program which leveraged AMI data analytics, behavioral science, and multi-channel communications to give customers personalized, low cost recommendations for saving energy on peak days. This program targeted 40,000 residential Glendale customers to receive email, IVR (Interactive Voice Response), and paper communication to encourage customers to adjust their energy consumption during periods of peak energy demand. BDR is an innovative approach to residential demand response because it gives customers personalized feedback on their performance shortly after a peak event is complete. Customers no longer have to wait until their monthly bill to see how much they saved and

this is paramount to locking in positive peak-shaving behaviors for future events. The goal is to make sure that GWP customers have the right information and tools to empower them to take action to reduce energy usage during peak days.

WATER DIVISION MODERNIZATION

Modernizing our water utility gives our customers opportunities to save water and for us to operate in a more efficient, effective and reliably way. Our customers can actively participate in programs that help manage their water usage. Below are water programs, partnerships, and investments GWP has developed and implemented.

Next Level Smart Utility

In 2013, GWP became one of the first utilities to implement Digital Meters in its water system. Being first has its advantages. Water engineers have been able to utilize the data collected to replace water demand estimating techniques to utilize actual information from meter data collected to replace water demand estimating techniques. GWP's Digital Meters record hourly water data usage from each of the City's 34,000 water meters, and GWP engineers are able to totalize water use in each of the City's twenty-two water pressure zones to calculate water demands based on water usage. This data allows GWP to accurately size water tanks, pump stations, and pipelines to meet the actual peak hour demands and maximum daily demands in each part of the water system. This saves money on replacement projects and improves water quality by minimizing the need to "oversize" water system facilities. Actually utilizing smart data to drive infrastructure replacement decisions puts GWP at the next level of smart utilities.

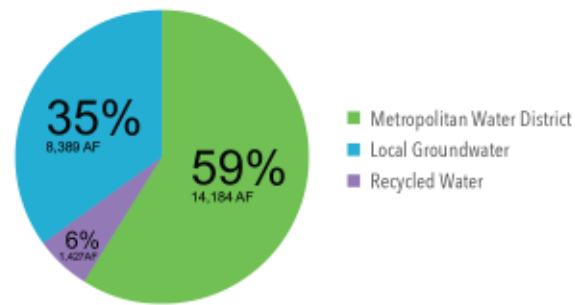
Modernizing for Resilience

GWP is focused on ensuring that the City of Glendale's water system is resilient and can maintain, or quickly restore, water service after natural disasters like earthquakes. To help accomplish this, GWP implemented a Pipeline Management Program in 2016 after completing an assessment of the condition of its entire water system. There are over 380 miles of water pipelines in Glendale and the Water Engineering team prioritized the replacement of the pipelines based on attributes like their size, age, and condition. Replacing the pipelines before they fail increases the resilience of the water system now. In addition to this, the pipelines are replaced with modern ductile materials and fittings that are more resistant to ground movement like settling of the soil over time, and movement during earthquakes that may occur in the future. This ductility, as opposed to the more rigid pipeline materials used when the water system was first built, will reduce the number of main breaks caused during an earthquake and speed up any recovery efforts that are needed. Continuously modernizing the water system increases the resilience for today and helps prepare the City for unexpected events that may occur in the future.



GWP is focused on ensuring that the City of Glendale's water system is resilient and can maintain, or quickly restore, water service after natural disasters

FY 2018-2019 Sources of Water



Optimizing for the Future

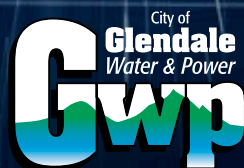
Water systems are routinely operated based on the water level in the water storage tanks. If customers use more water, the tank level goes down and pumps turn on to keep the tanks full. This is how the City's water system worked for the first 100 years. Since 2016, Water Division staff have been leveraging data from the City's Digital Meter system to optimize operation of the water system. This optimization allows the Water Operations team to keep the tanks and reservoirs at lower levels in general, and to increase the turnover of the water stored in the reservoirs while maintaining minimum storage amounts for emergencies and for firefighting purposes. This has reduced the age of the water in the system and reduced the amount of additional treatment and chemicals needed to maintain water quality. The optimization process has also led to physical improvements in the water system being identified during changes in operations, creating a positive feedback loop of greater and greater efficiencies. Formalizing the optimization program has modernized operational processes of the Water System and will continue to provide a roadmap to improve operations into the future.

WaterInsight Program - Leak Alerts

GWP in partnership with WaterSmart Software, launched the WaterInsight Program to encourage more water conservation among residential customers. The program includes WaterSmart's bi-monthly Home Water Report designed to provide residential customers with a more granular understanding of their water consumption, and help drive conservation among residents.

Through the WaterInsight Program, customers can log into the WaterInsight portal and see their hourly, daily, weekly or monthly water usage and check to see if they have any water leaks. Customers can also sign up to receive leak alerts through e-mail and text messages. Knowing about a potential water leak is one of the most effective ways to save water and prevent it from being wasted. In the past year, 18,747 leak alerts have been sent to customers.

Each year, GWP provides approximately 150,000 Water Insight Reports to our residential customers to inform them about their water usage and provide them with tips to conserve water. By improving the efficiency of water use, customers can quickly benefit from smaller water bills, help maintain our reliable long-term water supply, and reduce future impacts on our local groundwater resources.



Your Trusted Community Utility

GLENDALE WATER & POWER

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