STATE OF WAPA's ASSETS

WINTER 2020

WESTERN AREA POWER ADMINISTRATION

LETTER FROM THE ADMINISTRATOR AND CEO

In each *State of the Assets*, we share our upcoming goals and activities to prepare WAPA for a successful and relevant role in the energy frontier. It is critical we look forward, and not solely to our historic legacy, so we arrive at our future on purpose.

We reach a successful future by taking this journey with our customers, as we have in the past, understanding their needs and accommodating change in this evolving world. Using data from our asset management program, as well as employees' subject matter expertise, we can make the right investment decisions at the right time to safeguard our critical assets and mission.

In recognition of the significant strides we have taken to strengthen our relationships with customers and stakeholders and enhance the value of WAPA, our theme this year is Engaging in a World of Change. The partnerships and common goals we share are the foundation of a stable and progressive WAPA that is ready to take on the opportunities and challenges in the evolving energy industry.

Stability and progress at first sound antithetical to one another—a clear contradiction—but they are inextricably linked and, in reality, dependent on one another. We cannot be a progressive organization without stability in our purpose, finances, people and operations. We cannot be a stable organization without making progress in our ability to deliver on our mission in a changing energy world, modernizing our operations, making data-driven decisions, securing our financing and developing our people into thoughtful, collaborative leaders capable of carrying on our legacy.

We are seeking that balance between stability and progress through continuous engagement with our customers, the Department of Energy, our neighbors in the utility industry and our employees.

It is no coincidence that three of our six core values are directly tied to engagement: "Listen to understand, speak with purpose." "Seek. Share. Partner." "Respect self, others and the environment." Engaging at all levels pays dividends to WAPA and its customers. It is vital we are present in discussions about the energy industry and with people who can control our destiny with or without our input.

Our engagement with customers and other stakeholders will become more critical in the coming years as the Western Interconnection continues to evolve. Markets are no longer coming to the West; they are here. They are inside the front door and, this time, they will not leave.

When it comes to markets, WAPA is an influential player. It is our responsibility and obligation to use that influence to benefit our mission and our customers. We must engage in all the discussions surrounding the energy issues and opportunities available to us. It is through this engagement that we will preserve the value of the hydropower product, our public-private partnerships and the many benefits both bring to the nation.

In addition to our efforts around markets, particularly the energy imbalance initiatives across our organization, we are committed to telling the story of hydropower's importance in the new energy world.

Hydropower's significance is growing as it is a renewable, low-carbon emitting resource, capable of providing stability to the grid and a key component in recovering from massive system disturbances.

The challenge facing us today, as beneficiaries and champions of hydropower, is to quantify its worth beyond traditional means. How do we ensure the capacity, reliability, black-start capabilities, flexibility and other operational benefits—ignored in today's market structure—are appropriately and adequately compensated? How do we convince environmentalists and conservationists of the criticality of the dams in today's society while also respecting their objectives of preserving species and ecosystems?

This year we will create a strategy and vision around our transmission system. We are entering a rebuilding phase for the transmission infrastructure, most of which was built in the 1980s, 1970s or earlier.

We have, with customer support, continuously reinvested in transmission infrastructure upgrades for resilient operations to the tune of $160 million per year. Yet, we need to ensure we are making the right investments to prepare for the 21st-century grid, which includes distributed energy resources, a dearth of capacity and traditional sources of grid stability and sophisticated cyber threats that affect all utilities.

Engaging in a world of change requires a cohesive WAPA-wide transmission strategy that integrates internal expertise, Asset Management data, customer priorities and emerging technologies.

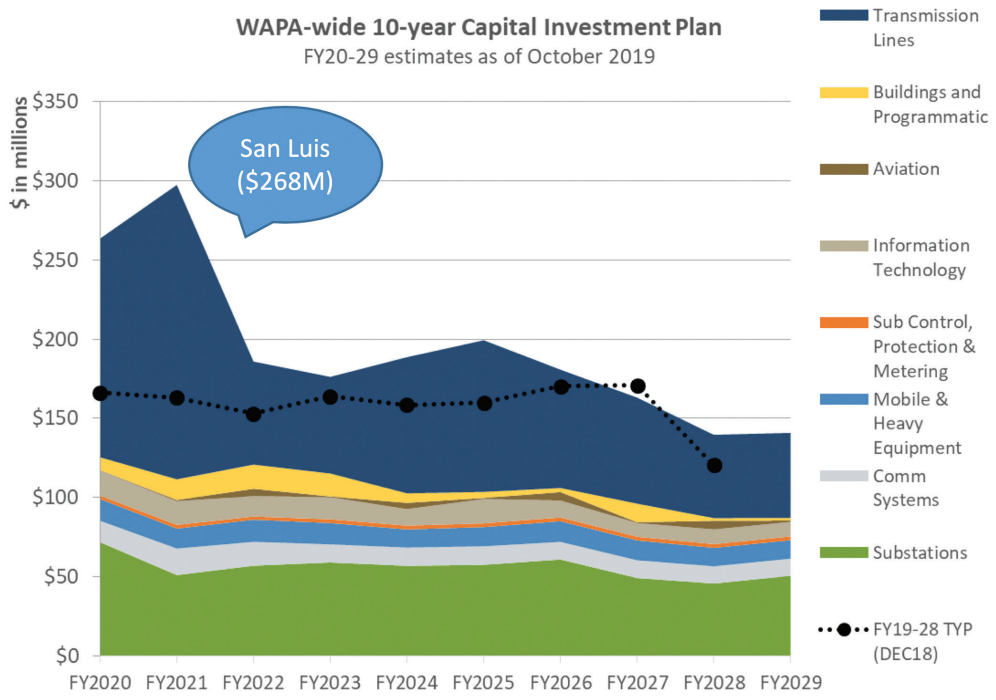
This strategy will define a vision for WAPA's transmission system that meets customer, market and national security needs, aligns with the Tactical Action Plan and makes strategic use of new tools and technologies.

It continues to be a great journey and privilege to work with all of our customers and employees to secure a relevant and beneficial future in which WAPA is a stable, progressive and engaged organization focused on delivering on its mission, operating safely, securely and reliably, and preparing for the new energy frontier.

Together, we will arrive at the future we intend—one that continues to provide value to the nation, our customers and more than 40 million consumers in the West.

State of Operations

WAPA operates a distributed business model with various functions spread throughout its 15-state, 1.4-million-square-mile territory. Located in Lakewood, Colorado, WAPA's Headquarters serves many diverse customers, including Congress, Native American power customers, public power utilities, other government agencies and WAPA's regional and field offices.



HQ is home base for WAPA's administrator and CEO, the General Counsel and the organization's Economic Impact and Diversity, Public Affairs, Operating, Finance, Safety, Physical Security, Asset Management and Information Technology offices.

Within these functions, WAPA accomplishes the "behind-the-scenes" work to fulfill the needs of around 700 firm electric service utility customers, who then provide electricity to more than 40 million people throughout the West. This work includes:

- Representing WAPA in Washington, D.C.
- Conducting public meetings.
- Developing publications such as the annual report.
- Managing finances and WAPA's annual budget.
- Focusing support on WAPA-wide employee safety and system security.
- Designing and maintaining power systems facilities.
- Overseeing and continuously improving North American Electric Reliability Corporation compliance activities.
- Supporting renewable resources and environmental protection.
- Supporting the power marketing community.

To address the myriad emerging changes in the electricity industry, WAPA's management and subject matter experts have embarked on an initiative to develop a transmission strategy that effectively leverages and integrates internal expertise from the regions and Headquarters with customer priorities, industry best practices, strategic partnerships and emerging technologies.

Customer outreach and engagement will be integral to the transmission strategy development process. The strategy will define a vision for WAPA's transmission system that meets customer, market and national security needs while supporting WAPA's *Strategic Roadmap 2024* and Tactical Action Plan.

As a federal power administration, WAPA is in a unique position to facilitate learning and networking opportunities for its utility customers and other industry partners. Asset Protection in the Age of Risk Management, May 19-20, is one such opportunity. The free two-day event, to be held at WAPA's Headquarters, will provide utility professionals and subject matter experts a forum to discuss the evolving security challenges facing the electricity industry.

In fiscal year 2020, WAPA continues to evaluate and apply new design and construction methods such as use of micropile foundations for transmission line structures. In rough terrain where heavy drill rigs cannot be used, these unique foundation elements incorporating small-diameter drilled piles and steel pile caps can be used with minimal impact to the landscape. Helicopter construction methods can be used to install the structures on the foundations.

WAPA continues to improve workload management, cost estimation and quality assurance of capital project designs by pursuing enhanced dashboards, computer-aided design and geographic information system tools.

This year, WAPA will host several mock audits of its registered entities to practice and prepare for upcoming Western Electricity Coordinating Council and Midwest Reliability Organization audits. The NERC Compliance program will continue participating in industry compliance groups to exchange and build knowledge for a host of upcoming new standards, such as supply-chain security. New reports and dashboards are being developed to improve communication about compliance throughout the organization.

As Asset Management enters its fifth year as a formal program, it continues to expand its scope and demonstrate the critical role data plays in managing risk. 2020 began with the addition of four new assets to the program: load tap changers, bushings, power circuit breakers under 100 kilovolts and cranes, the program's first asset in the heavy fleet class.

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These assets were chosen because of their potential to affect WAPA's ability to deliver power to its customers. Power circuit breakers of 34.5 kV and 69 kV represent a large portion of WAPA's fleet and, in many cases, are critical to directly serving customer load. Load tap changers and bushings may seem less critical, but failure of these components can take out larger, more complex, more critical and more expensive assets such as breakers and large power transformers. Cranes, while not involved in transmission, are necessary for performing many types of routine and emergency maintenance and repairs. Maintaining and replacing these asset classes consume considerable time, labor and dollars; applying the asset management approach to them will yield significant benefits for WAPA's Maintenance community.

This year, Asset Management will update its data collection methodology that standardizes descriptions of in-service asset anomalies. This will improve equipment performance analysis, consistently communicate asset data within WAPA and facilitate knowledge sharing within the industry.

Asset Management collaborated with fellow member utilities of the North American Transmission Forum to develop a new problem-code system, focusing on substation assets. The system correlates specific types of equipment component problems to codes vetted and agreed upon by industry partners who own and operate similar types of equipment. This "common language" will aid WAPA and other utilities in identifying asset performance trends and mitigating risks. Asset Management will also continue to explore tools to produce better visual data in 2020. Expanding the use of WAPA's graphical information system and leveraging other reporting systems will help increase the use of Asset Management data beyond its current audience.

In 2019, the Office of Security and Emergency Management implemented a new baseline security standard, eliminating 600 remediation items across WAPA, saving over $1 million in equipment and labor hours. WAPA also completed 100% of remediations scheduled for the year and increased the rigor and formality of remediation selection. This resulted in revising a $600,000 remediation project into a $62,000 solution.

In 2020, OSEM will build upon these accomplishments. More savings are being realized by using risk-management processes and identifying critical risk indicators. This significantly reduces the number of onsite visits necessary to assess low-consequence assets; only 25% of the assessments conducted in 2020 will require onsite visits, saving significant money on travel and labor hours.

OSEM also completed the establishment of new positions in support of its reorganization plan and is revising its functional statement. The actual reorganization package should be approved in the final quarter of FY 2020. OSEM's reorganization will result in greater process and information integration and functional alignment. It will also decrease the number of direct reports to the OSEM director and will better distribute OSEM's workload.

Additionally, OSEM developed random-screening program procedures for Headquarters employees to deter and help prevent acts of potential violence and active threat scenarios. This trial began in February and may be rolled out to other WAPA offices at a later date.

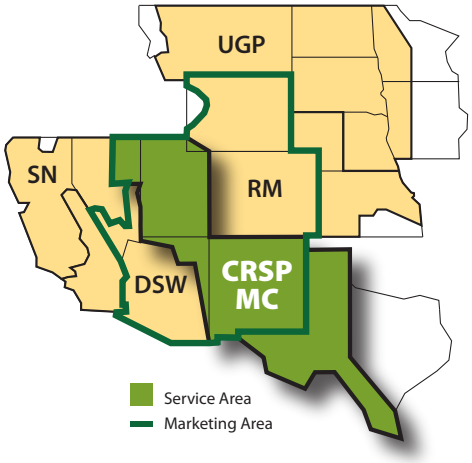
Throughout everything the organization does this year and in the years to come, safety will continue to be WAPA's priority.

State of the Regions

COLORADO RIVER STORAGE PROJECT MANAGEMENT CENTER

The Colorado River Storage Project Management Center markets clean, reliable hydropower from 15 powerplants under a single rate known as the Salt Lake City Area/ Integrated Projects. These generating resources produced an average of 5.3 million megawatt-hours annually over the past 10 years for CRSP MC's 135 preference and project-use customers. The Glen Canyon Dam is the largest powerplant, generating 74% of SLCA/ IP energy. Transmission facilities in Arizona, New Mexico, Colorado, Utah and Wyoming deliver SLCA/IP hydropower to its preference and project-use customers. CRSP MC owns 2,324 miles of transmission lines and 41 transformers.

In the area of power marketing, CRSP MC joined with other industry partners in changing over to SPP for reliability coordinator services in late 2019. This year, CRSP MC will continue to move toward joining the new Western Energy Imbalance Service offered by SPP. The Energy Marketing



and Management Office group continues to efficiently and professionally manage and coordinate several diverse systems for both CRSP and the Loveland Area Projects, with approximately $270 million of annual power marketing activity being executed and delivered across 10 states.

Employees have worked tirelessly to implement a new scheduling and accounting system effective in February. Staff members continued reaching out to customers who have not yet signed the 2025 SLCA/IP power contracts. The contracts extended customers' services under the current marketing plan through 2057 and will provide long-term assurance and stability for customers receiving SLCA/IP hydropower. The Rates team worked tirelessly to collaborate with and gather input from CRSP customers and other stakeholders as it geared up for public process to establish a new firm electric service rate to take effect in October.

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CRSP MC's tribal outreach continues to strive to find and provide additional benefits to 53 Native American tribal customers. CRSP MC staff met with many tribal leaders, utilities and regional associations. Since the SLCA/IP allocations were awarded in 2004, two tribal utilities have been established and another begins service early this year. Several other tribes are considering establishing their own utilities. In 2020, CRSP MC will continue to visit and meet with tribal leaders to strengthen its working relationships.

Maintaining infrastructure in partnership with other WAPA regions and the Bureau of Reclamation is a high priority for CRSP MC. In 2019, replacements to older breakers and switches at Archer Substation were completed, relays replaced at Pinnacle Peak, and important physical security features were installed at certain facilities to help ensure safety and reliability. Construction will continue or be completed in 2020 on:

- Glen Canyon-to-Shiprock 60-megavolt-ampere-reactive, 230-kV reactor project.
- Glen Canyon Warehouse workspace for WAPA and Reclamation staff.
- Ault 230-kV breaker replacement.
- Midway 345/230-kV, KV1A transformer.

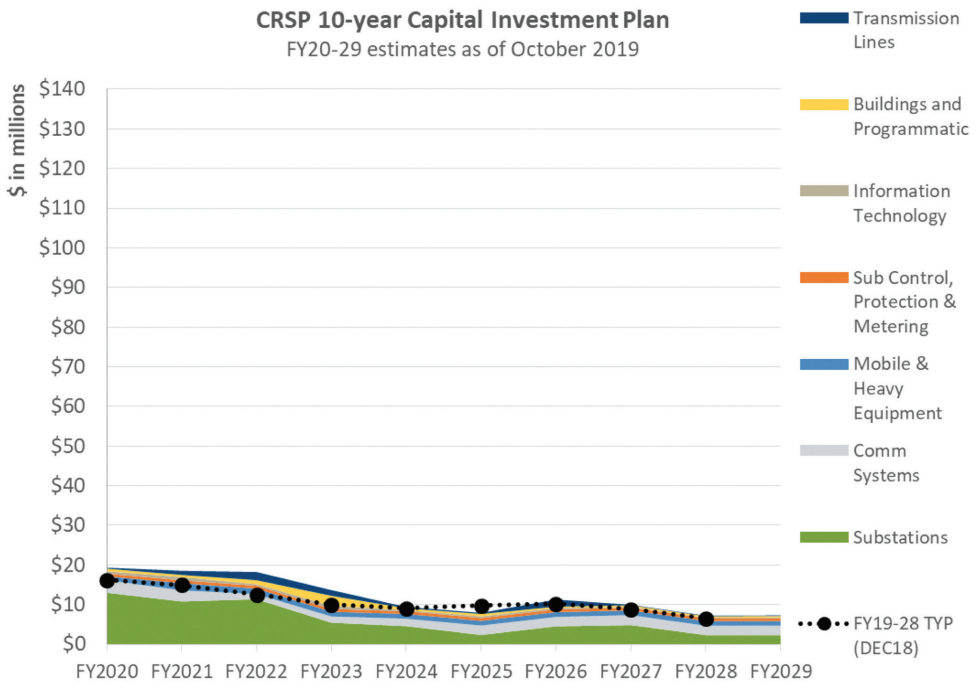
Protecting resources, environment

Environment staff from CRSP MC is proud to be playing a role in the recovery of endangered fish species in the Colorado River through participation in the Upper Colorado River Endangered Fish Recovery Program and the Glen Canyon Dam Adaptive Management Program.

In January, the Fish and Wildlife Service issued a proposed rule to downlist the federally protected humpback chub from endangered to threatened status due to their increasing populations and is working on a proposal to downlist the razorback sucker. Downlistings are the result of successful conservation efforts between the FWS and other organizations, including WAPA, to protect these unique fish populations and their habitats. Changing the fishes' status from endangered to threatened should allow more flexibility in the hydropower facility operations in the Colorado River drainage basin. The FWS' efforts to downlist and revise their recovery plans will continue into 2021.

In the Upper Colorado River Basin, Environment employees are conducting a hydropower analysis on an Endangered Species Recovery Program Report that recommends flow and temperature experiments in the Green River below Flaming Gorge Dam. Biologists are collaborating with the Bureau of Reclamation and the FWS Endangered Fish Recovery Program Office to conduct the analysis of how experimental flow recommendations influence hydropower resources. Experimental flow releases being evaluated include spring peak water releases timed to match larval razorback sucker abundance and enhancing backwater rearing habitat inundation, spike flows in late spring or early summer to disrupt smallmouth bass spawning, and elevated base summer flows to support spawning and rearing habitat for juvenile Colorado pikeminnow.

Additionally, the biologists help coordinate and conduct biannual trout surveys for the popular sport fishery below Flaming Gorge Dam. The trout survey helps determine the population status as it relates to dam operations and



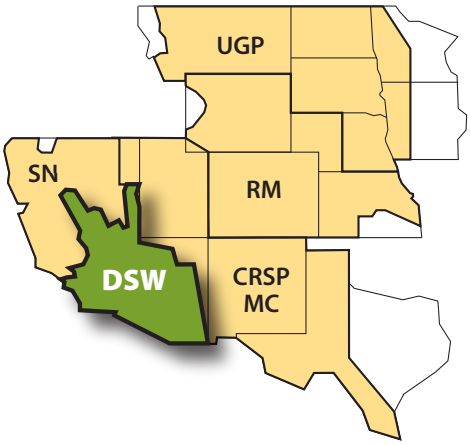
environmental conditions. This work has shown that trout populations are strong and winter double peaking has been beneficial to trout populations—a win-win.

Environment employees are assisting the Grand Canyon Monitoring and Research Center with studies evaluating the effects of Glen Canyon Dam operations on downstream resources. One such study, the "bug flow" experiment, evaluated how changes in water releases affect the insect population that supplies food for the rainbow trout below the dam. Researchers hypothesized that fluctuating river levels cause insect eggs to dry out and die, reducing the primary food source for native fish. The bug flow experiment tested to see if adjusting the daily release patterns at Glen Canyon Dam can increase the diversity and production of aquatic insects without significantly affecting the hydropower resource.

Water releases may also directly affect the reproduction and growth of rainbow trout, so CRSP MC has teamed up with Reclamation and the Grand Canyon Monitoring and Research Center to research trout-management flows. The strategy is intended to enhance the trout fishery below Glen Canyon Dam while reducing conflicts between rainbow trout and native fish such as the endangered humpback chub farther downstream in Grand Canyon National Park. Using releases to control the trout population could potentially enhance hydropower value. Water releases may also directly affect the reproduction and growth of rainbow trout, so CRSP MC has teamed up with Reclamation and the Grand Canyon Monitoring and Research Center to research trout management flows. The strategy is intended to enhance the trout fishery below Glen Canyon Dam while reducing conflicts between rainbow trout and native fish like the endangered humpback chub farther downstream in Grand Canyon National Park. Using releases to control the trout population could potentially enhance hydropower value, a side benefit of trout management flows that particularly interests WAPA.

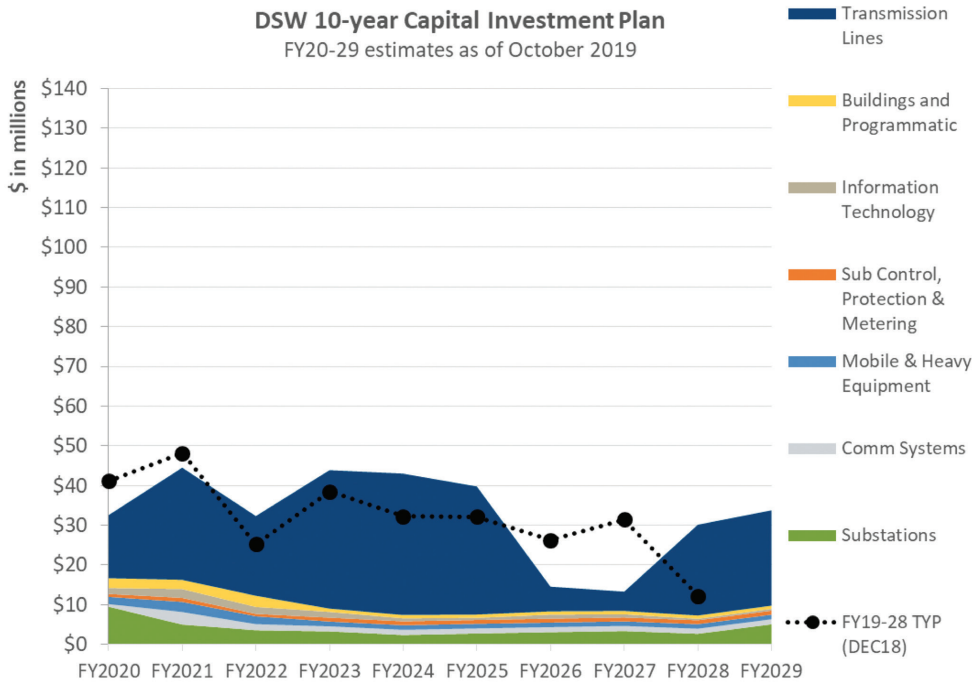
DESERT SOUTHWEST

Desert Southwest markets hydroelectric power to about 100 municipalities, cooperatives, Native American tribes, federal and state agencies and irrigation districts in California, Arizona and Nevada from powerplants operated at Hoover, Parker and Davis dams. During 2019, power was also marketed from the federal portion of Navajo Generating Station. In November 2019, Navajo Generating Station, as with many coal plants in the West, stopped producing energy, the owners making the decision to shut down the plant. DSW maintains 67 substations, 2,689 miles of transmission lines ranging from 34.5-kilovolt to 500-kV and 80 communication sites to provide safe, secure, reliable and affordable energy and transmission services to its customers.



During the early part of FY 2020, DSW along with the other WAPA regional offices successfully transitioned to a new reliability coordinator, a necessary transition due to the ceasing of operations of Peak RC, the former coordinator.

In 2020, Power Marketing along with other teams at DSW are undertaking and will complete cost and benefit studies of joining an energy imbalance market. Due to DSW's geographic location, customers have requested and are participating in the studies of the two available imbalance market providers: Southwest Power Pool's Western Energy Imbalance Service and the California Independent System Operator's Western Energy Imbalance Market. The studies are anticipated to be completed by the end of summer.



DSW continues to work closely with customers and tribal governments to find the most feasible and cost-effective design to improve the region's transmission systems. This will be critical to helping WAPA determine the best course of action to replace transmission lines such as those connecting Parker Substation to Headgate Rock and Bouse substations. The existing structures are well past their estimated service lives and replacing them is necessary to ensure continued operational reliability. Discussions about the replacement of these transmission lines began in earnest in late 2019 and will continue in 2020, to be followed by extensive collaboration throughout the project's phases.

DSW will continue to focus on the safety and reliability of its transmission system and has numerous projects planned or already in progress to facilitate that. During FY 2020, about 14 miles of the Parker-Davis Project Blythe-to-Knob 115-kV transmission line will be rebuilt in-kind by WAPA personnel. This work is being performed under a multiyear approach to renew portions of DSW's system that do not require upgrades but do require replacement to maintain system reliability. The remaining portions of the approximately 86-mile circuit will be completed over the next two fiscal years.

The Liberty Substation Series Cap Bank Replacement Project will be completed this year. The existing 345-kV capacitor bank was installed in 1969 and is being replaced due to load and reliability concerns. The 345-kV Mead-to-Liberty transmission line is heavily scheduled and the new capacitor bank will ensure that the line maintains its current rating into the future.

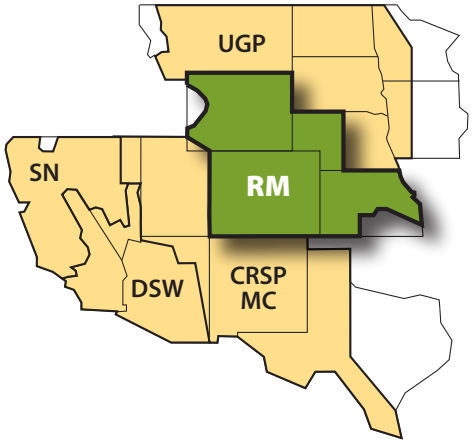
DSW will also replace the existing communications building on Mingus Mountain with a repurposed building from the Electrical District No. 5-Palo Verde Hub project. The communication building will be placed on an existing concrete pad at Mingus Mountain once the old communication building is removed. A new structure will be built next to the building using the same concrete pad that will house a new backup generator. This creative approach will reduce project costs and provide protection and enhanced reliability for many more years.

The Southline Project continues to evolve. In late 2019, Southline presented a multiple-phase approach to the project due to flagging levels of commercial interest. The first phase would construct a 230-kV double-circuit transmission line in place of an existing Parker-Davis Project line. This equates to approximately one-half of the original proposed upgrade to WAPA's system. The second phase would be constructed when commercial interest is sufficient and would consist of the new transmission lines between southern New Mexico and Arizona, as envisioned in the original Southline proposal.

ROCKY MOUNTAIN

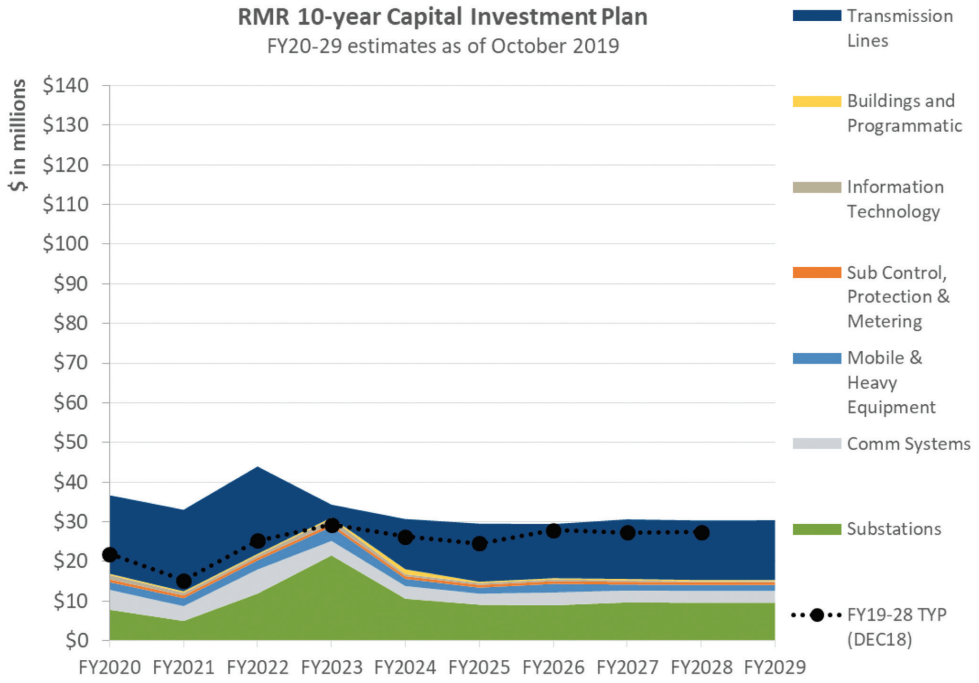
Rocky Mountain serves about 120 preference customers with Loveland Area Projects allocations in Colorado, Wyoming, Nebraska and Kansas. It sells more than 2.8 million megawatt-hours of power generated at 20 hydroelectric plants in the Loveland Area Projects, through both the Fryingpan-Arkansas Project and the Pick-Sloan Missouri Basin Program—Western Division. RM reliably delivers federal and nonfederal power through 3,366 miles of transmission lines and 84 substations.

As the hydrology of the river systems fluctuates, Power Marketing staff provides stability in navigating the ebb and flow of hydropower while keeping costs low. WAPA decreased the composite LAP rate by 12% in 2017 and 14% in 2018. WAPA held the LAP rate flat for 2019 and is again holding the rate flat for 2020.



The Maintenance and Vegetation Management Environmental Impact Statement for RM is undergoing the final review between WAPA and the U.S. Forest Service. After the final EIS is signed, WAPA and the Forest Service will work on finalizing the long-term Operation and Maintenance Plans and Special Use Permits. The plan is to get the final O&M plans and SUPs issued in July.

Before the EIS is finalized, vegetation management work will need to be completed on several lines this summer. WAPA is coordinating with the Forest Service to obtain approval to proceed with the work.



There are 14 large-generator interconnection requests in RM's queue, totaling 2,695.70 megawatts of generation output. Seven of the requests are for wind generation, five are solar and two are solar with battery storage. There are also 11 transmission service requests for long-term, firm, point-to-point transmission service in the queue for a total of 1,719 MW that is being requested on the Colorado River Storage Project transmission system. All requests are being studied to determine what upgrades are necessary to accommodate the requests.

RM is also revising the current switchman certification training to include key concepts of Human Performance and Just Culture. Further aspects of this implementation include reducing the number of unnecessary alarms generated in the control room and forming a regional Event Analysis Team to analyze switching errors, share lessons learned and prevent recurrence.

In September 2019, RM and the Western Area Colorado Missouri Balancing Authority signed the Western Joint Dispatch Agreement to become a market participant of the Southwest Power Pool Western Energy Imbalance Service. WAPA is preparing to change its operations and processes so that it is prepared for a go-live date of Feb. 1, 2021.

Activities supporting the implementation of WEIS include Open Access Transmission Tariff modifications, transmission and ancillary formula rate updates, development of the Balancing Authority Services Agreement Contract, development of Settlements processes and procedures and working with the Bureau of Reclamation to install generation metering on Reclamation hydropower generators.

The WACM BA became a member of the Northwest Power Pool Reserve Sharing Group on Sept. 3, 2019. WAPA will continue to monitor, adapt and document process improvements regarding its participation in the NWPP RSG throughout 2020.

WAPA is working to reestablish compliance with North American Electric Reliability Corporation reliability standard FAC-008-3. WAPA is finalizing new facility ratings and implementing a mitigation to account for any reductions in available transmission capacity. A compliance finding was determined during an August 2018 audit. Since then, RM has reviewed the rating of every facility in its FAC-008, completing the research in 2019. There were more than 400 facilities to verify, with 81 of them requiring some type of corrective action plan. The results are being presented to a new Facilities Rating team. The team will approve future changes to the ratings before they are implemented.

On Jan. 15, RM's largest customer, Tri-State Generation and Transmission Association, announced transformative Responsible Energy Plan actions to advance cooperative clean energy. The plan increases renewables to 50% of energy consumed by members by 2024, adding 1 gigawatt of renewables from eight new solar and wind projects. WAPA will work with Tri-State to understand the impacts to the WACM BA and LAP and Colorado River Storage Project transmission services.

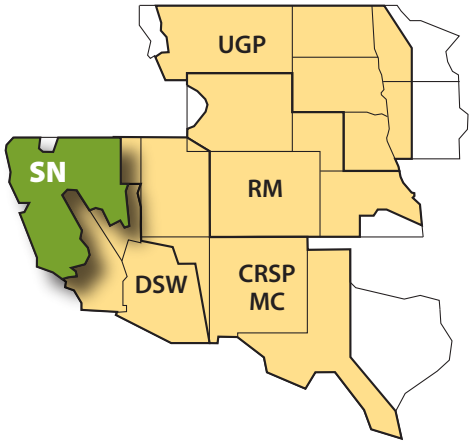
WAPA is working with one customer on a pilot program involving the customer providing resources to cover a portion of its requirements for regulation service. If successful, the program will provide the WACM BA with greater flexibility and additional resources for providing regulation service. The pilot program is intended to last about one year and may be extended to additional customers if successful.

The major projects RM plans to address this year include:

- **Estes-to-Flatiron and Estes-to-Lyons 115-kilovolt rebuild:** A rebuild of two 14-mile 115-kV lines, consolidating to one double-circuit line. This will increase reliability and reduce maintenance costs. It will also improve and increase the communications reliability and capacity for WAPA and others sharing the fiber-optic line. Construction will begin in the first quarter of fiscal year 2021 with an in-service expectation of Q1 FY 2022.
- **Archer-to-Sidney 115-kV breaker installation:** A replacement of the existing 115-kV tap with a four-breaker 115-kV ring. This will reduce the amount of taps and increase reliability for customers by adding the ability to sectionalize new wind generation. Construction will begin in Q1 FY 2021 with an in-service expectation of Q3 FY 2022.
- **Shiprock 345-kV breaker replacements:** Replacement of four existing live-tank breakers and current transformers with new, gang-operated dead-tank breakers. This will reduce maintenance costs and will increase reliability by eliminating ground issues experienced with existing current transformers. Construction will begin in Q2 FY 2021 with an in-service expectation of Q3 FY 2021.

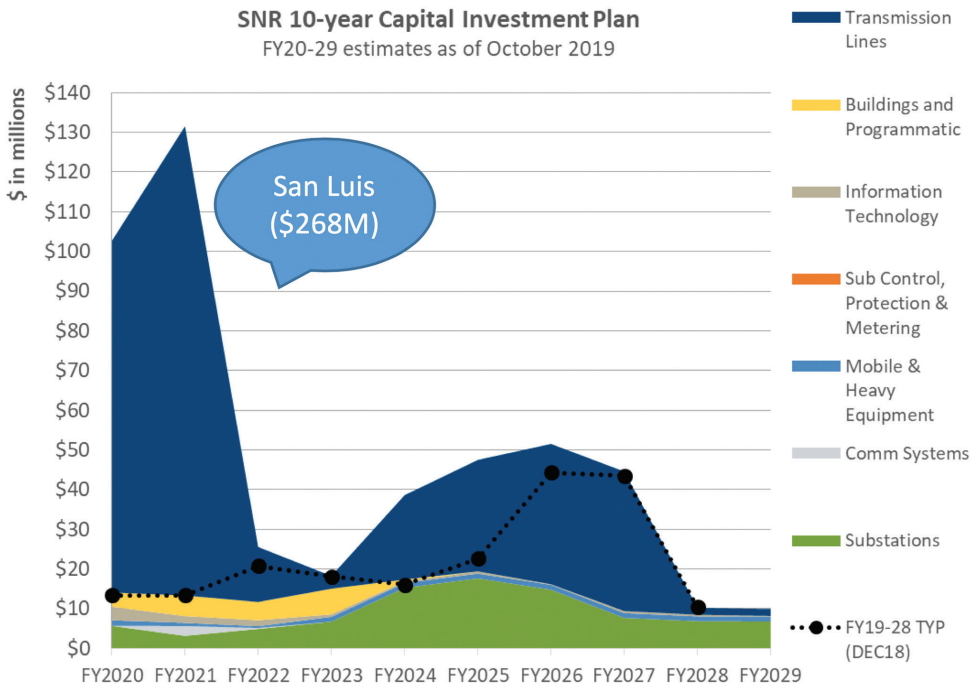
SIERRA NEVADA

Sierra Nevada markets hydroelectric power generated from the Bureau of Reclamation's Central Valley Project to 83 preference power customers in California, including municipal public power utilities, irrigation districts, Native American tribes, rural electric cooperatives and federal and state entities.



The CVP federal transmission system is owned, operated and maintained safely and reliably by SN and consists of 25 substations, 21 transformers and 1,363 miles of transmission line. SN is also the operating agent for the 350-mile California-Oregon Transmission Project, one of the three lines forming the California-Oregon Intertie.

In 2020, SN staff will continue to work with Reclamation and SN's customers on issues related to the future of CVP hydropower as a result of changing market conditions in California. The most significant issue is the CVP Improvement Act true-up. In November 2019, Reclamation released Business Practice Guidelines for CVPIA Receipts, Program Accounting, Cost Allocation and Cost Recovery for public review and comment. Power customers have shared concerns with Reclamation about the methodology proposed in the guidelines for the allocation of CVPIA costs between water and power customers and have requested that alternate proposals be considered. Reclamation has committed to continue working with project stakeholders to address their concerns. SN is working with Reclamation to ensure that power customer concerns are heard.



On Jan. 14, the CVP Final Cost Allocation Study was completed and posted to Reclamation's website. The results show a decrease to the total capital cost obligation for commercial power of about $32 million. An additional adjustment will also be made to reflect a reduction to interest. Now that the study is complete, SN plans to reduce the 2020 power revenue requirement by $10 million as a midyear adjustment in April.

In September 2019, SN and a few other members of the Balancing Authority of Northern California made a joint announcement that they intend to join the California Independent System Operator's Western Energy Imbalance Market beginning April 1, 2021. With the bulk of available bilateral trading partners either having plans to join the EIM or having already joined, participation in the EIM will ensure SN's continued ability to economically make imbalance energy purchases and address energy imbalance requirements with a greater pool of available resources.

Operations is supporting the development of WAPA-wide Open Access Transmission Tariff updates in advance of SN's participation in CAISO's Western EIM, starting in April 2021. Tariff revisions are necessary to incorporate provisions for SN's participation in the EIM under the BANC EIM entity.

SN will begin an informal rate process in April to share cost and rate information for participation in the EIM. Additionally, the informal rate process will include rate information for frequency-response reserve and for the sale of surplus products. A rate for frequency-response reserve is needed by April. SN will request approval of a rate for short-term sales, which can be put in place until the public rate process is complete.

SN staff completed negotiations of the Base Resource Contract under the 2025 Power Marketing Plan with its customers in January. Executable contracts are planned to be provided to customers in March and must be executed by the customers within six months.

Most of SN's contracts will expire Dec. 31, 2024. SN is working on extending the contracts that can be extended. SN staff will begin negotiations with the Pacific Gas and Electric Company this year to develop new transmission-related contracts and establish distribution service for some of its customers.

SN staff continues to implement elements of the 2020 Wildfire Mitigation Plan. Crews are performing line inspections and right-of-way assessments in high-fire-risk areas ahead of fire season. SN is developing long-term contracts to provide enhanced inspection technology and services such as infrared and corona detection. Vegetation Management crews are removing excess fuels and hazard trees both within ROW and off-ROW. WAPA will monitor the effects of these efforts and modify as necessary in order to continually improve the wildfire mitigation plan.

In collaboration with customers, SN continues to refine and update its 10-year capital investment program to ensure its business of marketing and transmitting power continues safely and reliably. SN is experiencing an increase in projects using public-private partnerships. These partnerships will generate benefits to the preference power and transmission customers by increasing safety, reliability and serviceability.

In 2019, two projects on SN's 10-year plan were completed: the transformer replacement at Folsom Substation and the shunt reactor project. In 2020 the Folsom office station service project is expected to be completed.

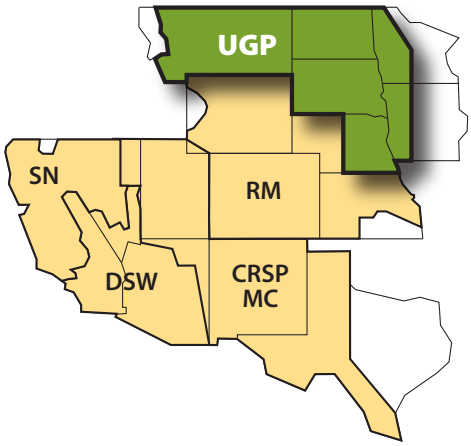
This year, SN will continue working with Duke Energy through a public-private partnership to develop the San Luis Transmission Project. The SLTP is a proposed 230-kilovolt transmission line that will deliver Reclamation-generated hydropower to move water deliveries to agricultural and water users. SN is also partnering with the City of Roseville in its 230/60-kV Transformer Addition Project at its Fiddyment Substation by providing project management coordination, specification review, commissioning support and design of the protection and controls systems.

SN is partnering with the Department of Energy's Lawrence Livermore National Laboratories to provide new 115-kV service for LLNL's project to modernize its Exascale Computing Facility. SN is working with LLNL's contractor in the design, construction support and commissioning of the new 115-kV transmission line and 115/13.8-kV substation.

SN also continues with project development activities for the proposed Beale Air Force Base Interconnection Project. The project includes a 230-kV transmission line and 230/60-kV substation that will provide the base access to reliable energy sources and help bolster Beale's security and resilience.

UPPER GREAT PLAINS

Upper Great Plains markets more than 9 million megawatt-hours generated at eight dams and powerplants in the Pick-Sloan Missouri Basin Program—Eastern Division to more than 339 power customers in Montana, North Dakota, South Dakota, Nebraska, Iowa and Minnesota.



UGP delivers enough hydropower to serve more than 3 million households through 129 substations with 118 transformers and across 7,922 miles of federal transmission lines in its 378,000-square-mile service territory.

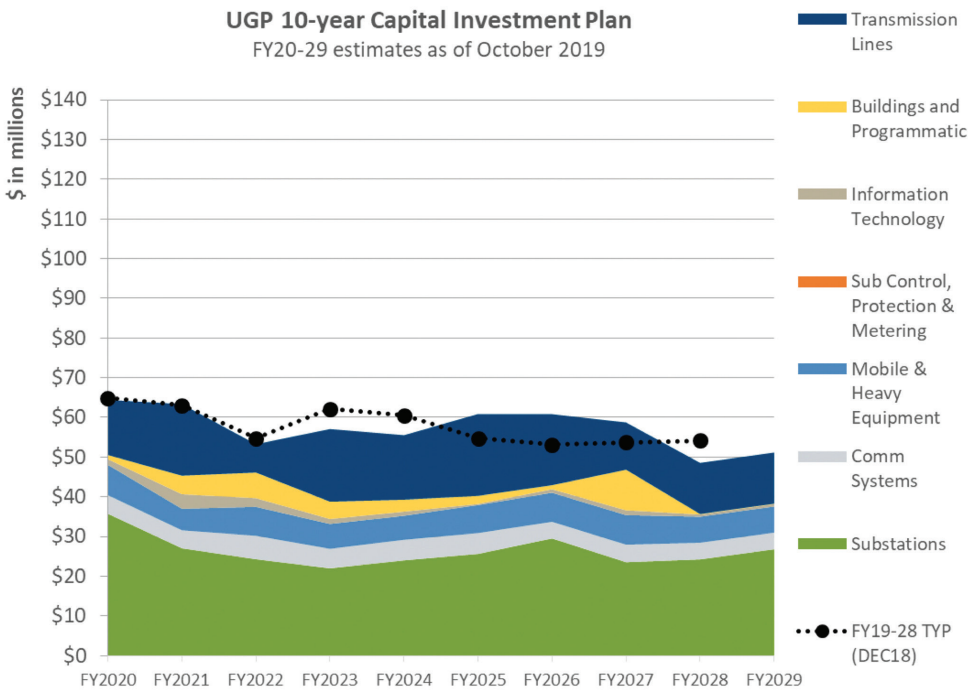
In 2019, UGP had an exceptional year in the Southwest Power Pool market. Strong water releases from the hydroelectric dams along the Missouri River throughout the summer season drove significant surplus energy sales into the market. Annual generation was about 9% higher than the previous year, increasing energy sales by more than 17%.

SPP market prices were also higher than in 2018. Better-than-average water conditions reduced the region's purchase-power needs, resulting in about $5 million more in net market revenues over the previous year. The cumulative result was net market revenue of more than $57 million. Being able to sell excess generation into SPP and purchase energy from the market to meet contractual commitments has proven beneficial to keeping WAPA's costs low and its firm power rates stable.

In 2019, eight construction projects were completed, 26 projects were in progress and 22 were in the planning stages.

Infrastructure projects completed in 2019 include:

- Replacing the 345/230-kilovolt KU1B transformer at the Fort Thompson #2 Substation.
- Adding a 230-kV bay for a new wind farm interconnection at Utica Junction Substation and converting the ring bus to a breaker-and-a-half configuration.



- Constructing Roberts County Substation, consisting of a 115-kV ring bus and a 69-kV main and transfer bus, on the Summit-to-Forman 115-kV line. The substation was built to serve new East River Electric Cooperative customer load and increase ERC system reliability.
- Adding and energizing a 230-kV bay and breaker at Watford City Substation for a new interconnection for Montana-Dakota Utilities.

Upcoming projects that were highlighted in WAPA's 10-Year Capital Plan include:

- Replacing the 115-kV main and transfer yard at Devils Lake Substation with a new yard expansion. The work will also include replacing the 115/41.8-kV transformer, a bank of 41.8-kV shunt capacitors, the control building, control panels and communication equipment. A second 115-kV capacitor bank will also be added. Construction should begin in May.
- Improving Gregory Substation with a new yard expansion and replacement of the 115-kV ring bus, the control building, control panels and communication equipment. The customer-owned transformer and equipment will also be moved into the new yard. Design is in progress and construction is should begin in May.
- Replacing the Killdeer-to-Charlie Creek 115-kV transmission line within the existing right of way with a larger conductor and taller structures. Construction should begin in May.
- Replacing the 115/69-kV transformer KY1A at Eagle Butte Substation. Installation of the new equipment is targeted for this fall.

Projects launched last year that will receive significant stage additions in 2020 include the Shelby, Fargo, Martin, Mount Vernon and Grand Forks substations.

In addition, UGP has three significant projects supporting wind interconnection requests for a total of 500 MW of capacity. These are located at the Valley City Substation (currently in suspension), the Fort Thompson 230-kV Substation and a new switching station on the Fort Thompson-to-Huron 230-kV line.

Summarizing 2019 hydrology conditions

Editor's note: *The following report summarizes data from WAPA's Hydropower Conditions webpage for straight power purchase costs, which are based solely upon hydrology, actual hydropower generation and related generation shortages. Readers may review all data by visiting* ***wapa.gov, Power Marketing, Hydropower Conditions***

One of the biggest challenges for hydropower is water variability due to intermittent drought and flooding. By definition, hydropower needs water to generate electricity. Without it, WAPA must buy power on the open market from other sources to meet contractual obligations to its customers. This is referred to as purchased power.

In an ideal year, snowpack around the West is average or above average, yielding snowmelt runoff to recharge reservoirs behind the dams and powerplants that provide the power WAPA markets. Federal dam owners such as the Bureau of Reclamation, the Army Corps of Engineers and the International Boundary and Water Commission move water to federal hydroelectric powerplants.

WAPA markets the subsequent power generated to around 700 preference customers. Its customers, in turn, sell that power to more than 40 million Americans.

Water around WAPA in 2019

WAPA's actual generation was 108.9% of average in water year 2019, for a total generation of 28,524 gigawatt-hours. For the same period, total purchased power was 2,488 GWh with actual purchase power expenses of $75,169,620 equating to $30.21 per megawatt-hour.

The Colorado River Storage Project Management Center projected most probable purchase power expenses for water year 2019 to be $19,291,789. Actual purchase power expenses were $24,660,358. The cost per MWh was $34.05.

Lake Powell ended the water year with an elevation of 3,615 feet, which is about 85 feet below the maximum reservoir level and 125 feet above the minimum generation level. At the end of water year 2019, inflows into Lake Powell were 35% percent of average. Water year 2020 forecasts are for an inflow of 88% of average—9,500,000 acre-feet—and an annual release of 8,230,000 acre-feet.

NET GENERATION

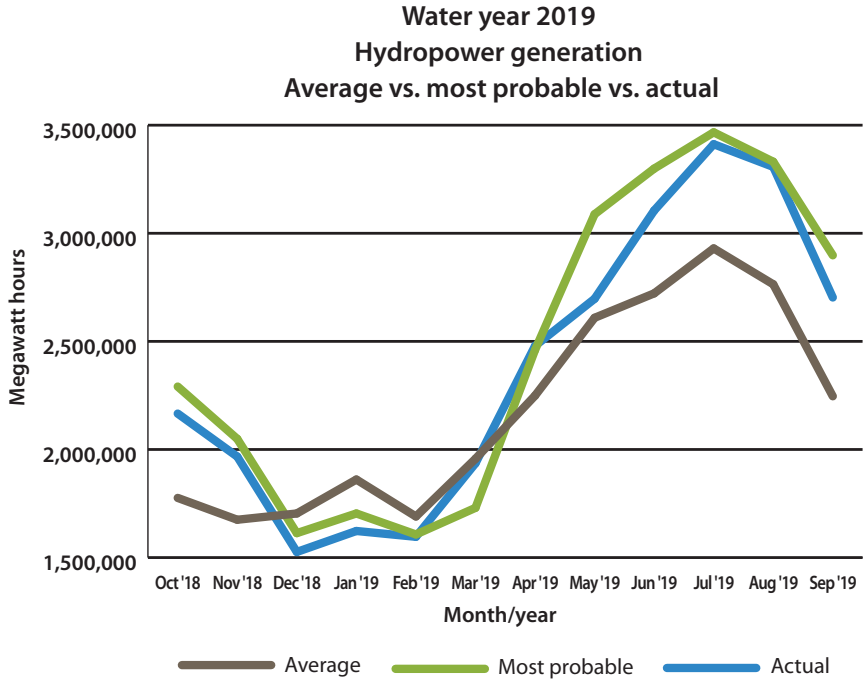
28,524

gigawatt-hours

OR

108.9%

of average



Desert Southwest's hydrology is mostly dependent on the Colorado River Basin snowpack and precipitation above Lake Powell. Precipitation was 26% of average at the end of September. The region's most probable projected purchase power expenses were $11,221,729. Actual purchase power expenses were higher at $12,932,391, with a cost per MWh of $49.07. Lake Mead ended the water year with an elevation of 1,083 feet, about 137 feet below the full storage level and 133 feet above the minimum generation level. During water year 2019, Lake Mead's elevation dropped to a low point of 1,078 feet in November and rose to a peak of 1,090 feet in March.

In Rocky Mountain, reservoir inflows ranged from 90% to 169% of average, with the low point coming in September and the peak in July. Only December and September were below average. The projected purchase power expenses were $8,167,404, but actual purchase power expenses were $9,912,420. The cost per MWh was $28.27.

Sierra Nevada ended the water year with 143% of the 15-year average reservoir storage for Trinity, 138% for Shasta, 150% for Folsom and 147% percent for New Melones. Accumulated inflow for the same date was 133% of the 15-year average for Trinity, 135% for Shasta, 144% for Folsom and 153% for New Melones. The region began water year 2019 with a most probable projection of purchase power of $6,114,200 but ended with an actual expense of $9,063,870. The cost per MWh was $18.19.

In Upper Great Plains, the active conservation pools ended the water year 85.8% full at Canyon Ferry Dam and 99.4% full at Yellowtail Dam. The yearly runoff was 241% of average. Abnormally dry and moderate drought conditions were reported for seven months this water year. The region's most probable projection for purchase power was $11,432,556. Actual purchase power expenses were significantly higher at $21,350,484. The cost per MWh was $28.12.

Anticipating water year 2020

The Seasonal Drought Outlook provided by the National Weather Service's Climate Prediction Center in November 2019 predicted drought-related improvement almost entirely throughout the western United States, with drought removal predicted in the east.

Exceptional drought, the NWS's most extreme drought rating, is not present in this prediction for the first time in several years. Areas of drought development are predicted, however, in areas of California and Texas.

Drought conditions are expected to persist in areas of Colorado, New Mexico, Kansas and Oklahoma. Drought removal and improvement is expected elsewhere in Colorado and New Mexico, as well as in Nevada, Utah, Arizona and Southern California.

For more information…

Visit the National Weather Service's Climate Prediction Center at **cpc.ncep.noaa.gov**

STATE OF WAPA's ASSETS WINTER 2020

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