Delivering water and power®

SRP ISP SUMMER SERIES MEETING 2:

"Near-Term Planning"

SRP's Mission Background

SRP has been committed to providing sustainable, reliable and affordable power to Central Arizona for more than a century. By providing this essential resource, SRP has helped the Phoenix metropolitan area develop and thrive. SRP acts in the best interest of the people it serves and strives to help build a better future for Arizona. For over a century, SRP has focused on building strategic partnerships and innovative solutions to meet the Valley's ever-changing needs. In the years ahead, SRP will continue to lead the way by applying a forward-thinking approach and new technology to address energy supply challenges.

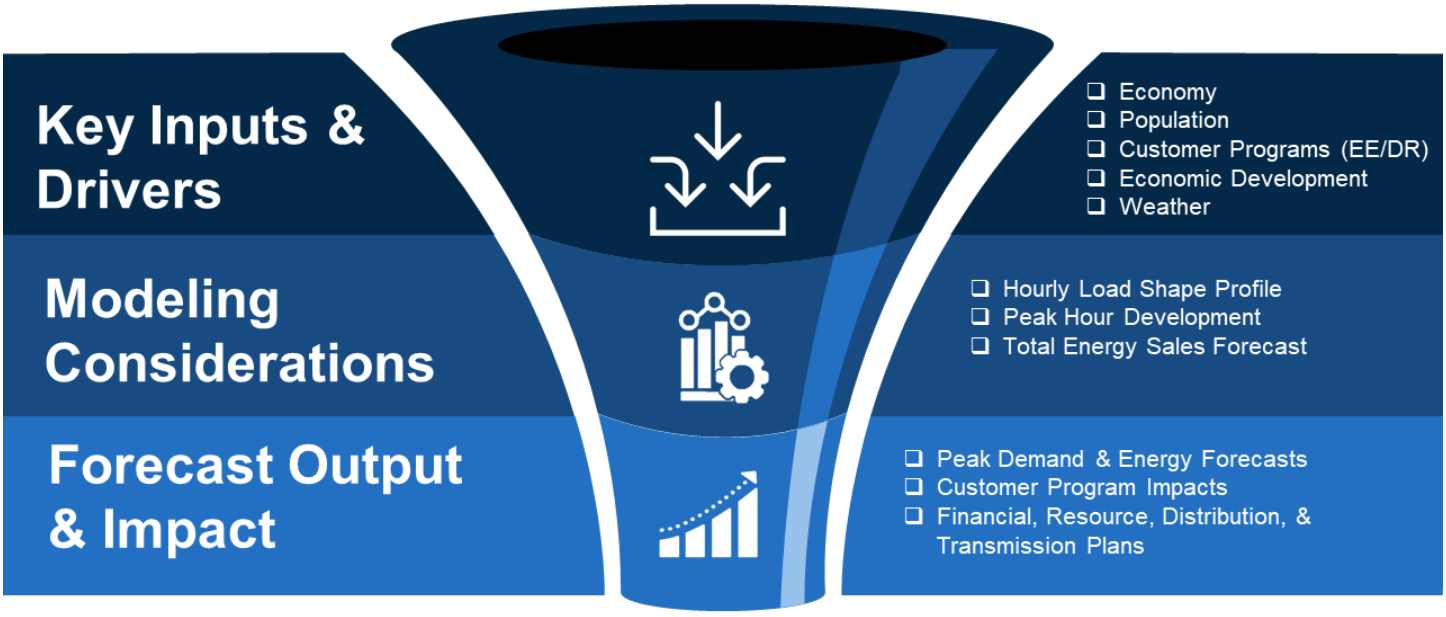
SRP focuses on these key elements when planning energy resources for the future: obligation to serve customers' growing energy demand, maintaining reliability through resource adequacy and appropriately balancing reliability with sustainability and affordability.

Serving Growing Customer Energy Needs

Customer Usage and Changing Needs

As discussed in Meeting 1 of the Summer Stakeholder Series, forecasting SRP customers' future energy demand (load) is one of the most important inputs for any long-term plan development. It is vitally important to know how many residential, industrial and commercial customers are expected to reside in SRP's load serving territory so that SRP can plan and maintain the reliability of its transmission and distribution systems and also have enough generating resources online to meet that load. Additionally, customers' energy usage and needs continue to evolve and change as the digital economy drives an evolution in how and when customers use power. SRP continues to adapt customer programs to meet changing patterns in electricity use and needs. The smart thermostat program and electric vehicle price plan are just two examples of how SRP is adapting to customer usage and needs.

The metro Phoenix area continues to rank high in population growth nationally. For SRP, this growth means more customers, higher energy demand and increases in peak demand. In addition to the growth in residential customers, **the SRP service area is experiencing unprecedented economic development growth from tech firms and advanced manufacturing.** This demand is coming rapidly, putting the pressure on SRP to develop solutions ahead of the development of the Integrated System Plan (ISP). Demand has increased 1.7% per year during the last decade and SRP expects these trends to continue. **Given the significant range in possible outcomes regarding impact to energy demand (load) growth, this requires a full portfolio of resource options to manage uncertainty.**



Every year, the SRP forecasting team conducts a thorough process to develop the load forecast. This process gathers many different economic outlook perspectives from experts in both academia and industry on projected growth in economic development in SRP territory based on the latest information. Energy efficiency, electric vehicles, customer time-of-use plans and other demand response programs are all major considerations included for the development of the load forecast. It is also important to note that climate change has impacts on forecasting energy demand. In recent years, extreme heat waves have swept across the western United States and set all-time records. SRP meteorologists utilize the Intergovernmental Panel on Climate Change scenarios to employ climate change weather assumptions to inform the load forecast. The forecasting team then compiles all key assumptions and inputs into the model that projects SRP's expected customer energy demand in the coming years. This forecast helps inform many of SRP's key financial, resource, distribution and transmission plans and decisions.

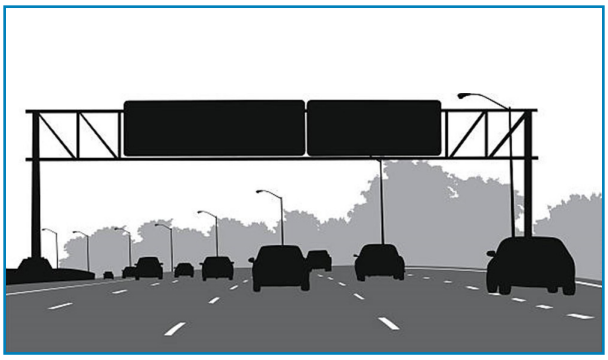
Keeping the Lights On

Energy versus Capacity

Keeping the lights on means that SRP must plan to provide reliable electric service in all hours of the year. This type of planning requires an evaluation of both energy and capacity needs, which are two important pieces of planning for reliable electric service.

Capacity is the maximum output a generating resource can physically produce or export at a single point in time, measured in megawatts (MW). This output helps serve peak demand hours and other times when the system has critical needs. Not all resources have the same capability to produce power at full capacity for all hours of the day and year. Customer programs, such as Demand Response, are measured by their capacity to reduce demand, also in MW.

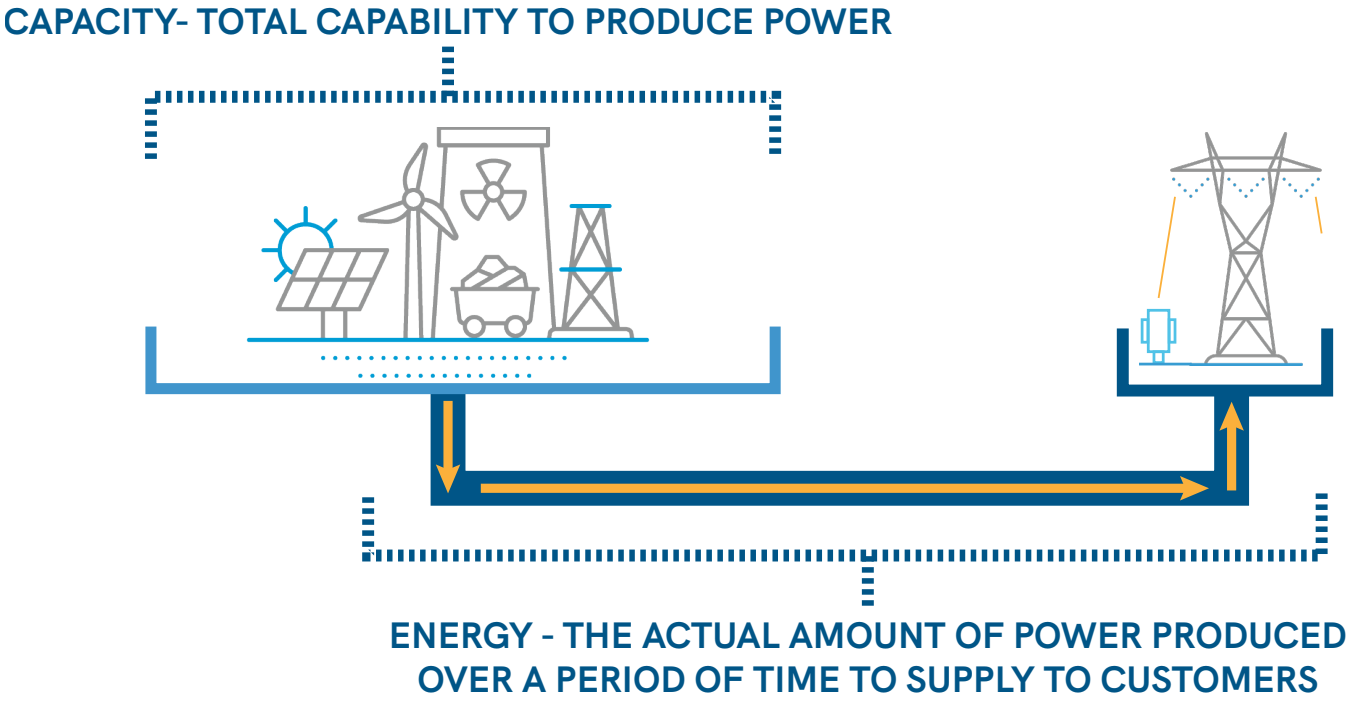
Energy is the amount of electricity a generator produces over a specific period of time. Many generators do not operate at their full capacity all the time. A generator's output may vary according to conditions at the power plant, the availability and cost of fuel, variability of wind and sun, market prices or dispatch instructions from the utility.



We can think of capacity like the lanes on a freeway and the number of vehicles it can allow at any given point. Commuters need enough lanes to accommodate the number of vehicles during rush hour traffic. This means several of the lanes may be empty during other times of the day, but the additional lanes are necessary for vehicles during a peak traffic time.

We can think of energy as the flow and number of vehicles traveling on the freeway over a given period of time.

Analogy:
Capacity: *Maximum number of cars on Interstate 10 during rush hour.*
Energy: *Cars per year traveling on Interstate 10.*



What Is Resource Adequacy and Reliability?

Resource adequacy refers to having enough resources — generation, efficiency measures, and demand-side resources — to serve electricity demand across a wide range of conditions with a sufficient degree of reliability. **Resource adequacy is the ability to meet customers' energy demand at all times of the day and across a variety of system conditions.** It is like making sure there is enough money in a bank account to cover known expenses and unforeseen emergencies. The North America Electric Reliability Corporation (NERC) defines resource adequacy as "the ability of the electric system to supply the aggregate electric power and energy requirements of the electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components." Resource adequacy is primarily a function of energy demand (load), generation and transmission.

Electric power systems must continuously balance instantaneous supply and demand. However, neither supply nor demand is perfectly predictable. For example, generating resources are sometimes unavailable due to either planned or unplanned outages. The outputs of some renewables are subject to significant variability due to clouds and wind fluctuations, and customer loads vary for reasons ranging from weather to behavioral factors. To ensure that supply is available to meet demand, electric system operators and planners rely on reserves, or additional resource capacity as insurance.

Power system reliability refers to the ability to supply adequate electric service to end use customers on a nearly continuous basis, with few interruptions over an extended time period. In simple terms, reliability means that electricity is always there when the customer needs it. **Resource adequacy, as described above, is one key element of reliability. A second key element is power system stability.**

Under normal operating conditions, the power system is in a state of "equilibrium"; the electric demand and supply of energy are perfectly balanced, and all power system elements are operating within their respective ratings and limits. However, disturbances on the power system will frequently occur that will disrupt the state of equilibrium; the power system will either recover to a new state of equilibrium or will completely fail resulting in a widespread blackout. **Power system stability is the ability of the power system to transition from one state of equilibrium to another in response to a system disturbance.**

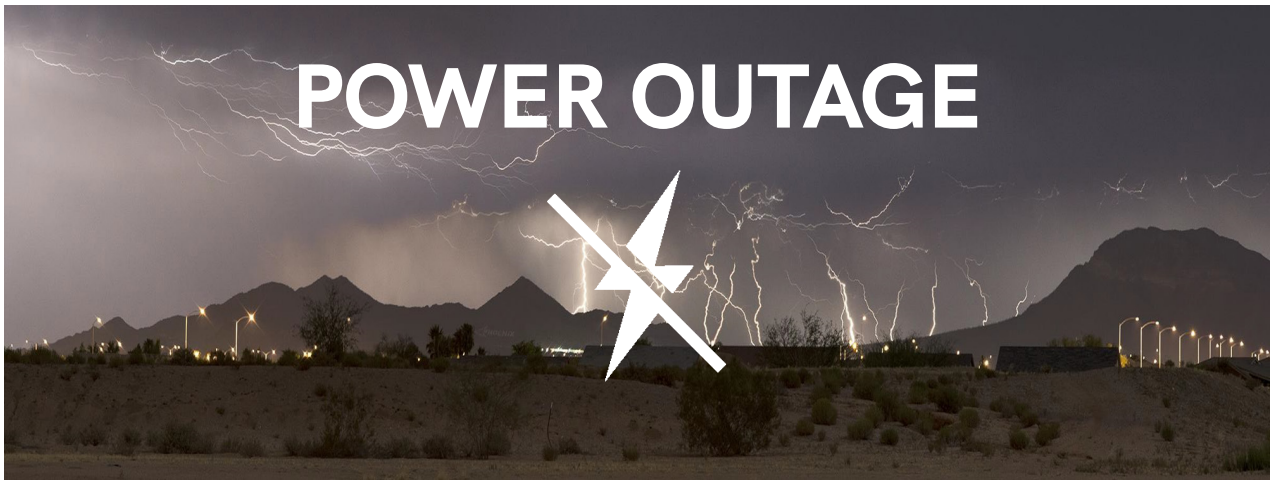
Traditional generating resources have inherent characteristics that strengthen power system stability. The ability to maintain power system stability will be challenged as traditional generation resources are retired and renewable generation technologies are introduced to the power system. The current ability of most renewable resources to support power system stability is not comparable to those inherent in traditional generating resources. **Ensuring a strong system stability moving forward will require a more integrated approach to plan, design and operate the power system.**

What Happens Without Resource Adequacy?

Without sufficient generation resources and power system stability, the region may experience power shortages. Sometimes, a power shortage can mean the lights stay on, but electricity becomes more expensive to supply. Other times, a power shortage means the electrical grid fails and there is a complete loss of power. This type of power shortage is called a blackout. Traditionally, an area of great concern is meeting the most intense hours of demand where risk is the highest for power shortages. A widespread blackout during an intense heatwave may be detrimental to the health and safety of customers, which is why SRP needs to maintain resource adequacy to serve its customers during the hottest days of the year when the peak demand is highest.

Resource adequacy is becoming more complex as the utility industry is transitioning away from conventional generating technology and towards renewables and storage. Resource adequacy considers conditions across all hours of the year, not just during peak demand periods. With more renewables and storage on the system, resource adequacy must consider more types of conditions that could result in loss of load, such as periods of cloud cover. Reliable electricity supply is also becoming increasingly important to society as recent extreme weather events triggered regional outages that impacted customers and communities across the electric system. Since SRP is connected to a larger grid system that connects with neighboring utilities, when one area is not resource adequate, it puts the risk on the regional grid.

Extreme temperatures also put pressure on utilities in terms of maintaining reliability. Extreme temperatures not only drive up the demand for more energy by customers, but they also fuel natural disasters such as wildfires that can damage the transmission system and limit utilities' ability to bring power into their service territories to serve customers. These issues are expected to continue given the climate change impacts experienced over the last few years. Recent issues in the West have led officials to urge customers to use less electricity to prevent further power outages. For more information about resource adequacy issues in the western United States, please reference the appendix of the pre-read, Near-Term Challenges in the West.



Types of Resources and How They Contribute to Resource Adequacy

Firm Resources: These are sources of electricity (generation resources) that the utility can dispatch to meet system needs. Characteristics of a firm resource include reliable capacity in all seasons and over long durations. Some firm resources also provide flexibility to balance ramps caused by intermittent resources and fast response during emergency events. Of the commercially available technologies today, firm resources include natural gas combustion turbine/peakers (including hydrogen ready), natural gas combined cycle, nuclear, coal, geothermal and biomass.

Intermittent Resources: These energy sources are not fully dispatchable due to their variable output, which is determined by weather conditions. Intermittent resources include wind and solar.

Limited Duration Resources: These resources can be dispatchable but can only provide energy for a set number of hours before needing to be recharged or affecting customer behavior. Examples include battery storage, pumped hydro, customer demand response and energy efficiency programs.

Harnessing intermittent generation resources like solar and wind is a key part of lowering SRP's carbon emissions, but these resources alone cannot supply the flexible and sustained capacity needed to maintain reliability and resource adequacy. To maintain reliability and resource adequacy, SRP needs enough firm dispatchable resources to meet capacity needs when the sun is not shining and the wind is not blowing. **As SRP transitions its resource portfolio and plans for growing customer energy demand, there is a near-term planning need to integrate all resource types: firm, intermittent and limited duration. An all-the-above approach will provide value to customers in terms of reliability, affordability and sustainability.**

Balancing Sustainability, Reliability and Affordability

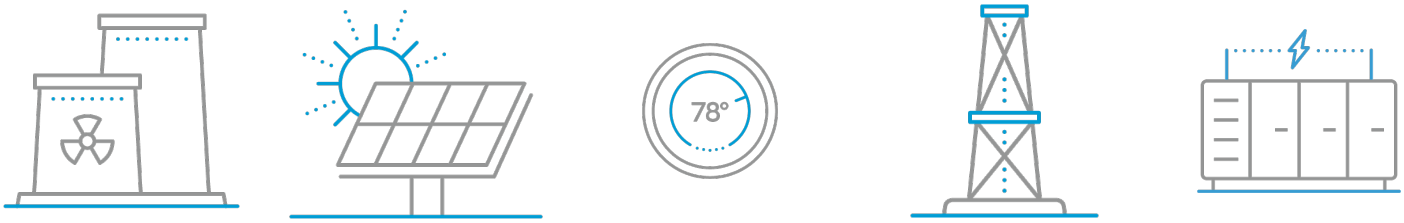
As SRP plans its resource decisions to address growing customer energy demand, it is working towards a sustainable future to benefit customers and the communities served. To do this, SRP makes decisions through future generations' eyes while still providing reliable and affordable power for customers today.

Resource Focused Sustainability Corporate Goals

SRP's 2035 Corporate Goals set specific sustainability targets that impact SRP's future resource planning. SRP integrates these commitments into resource planning objectives to advance these corporate goals.

- Reduce the amount of CO2 emitted by generation by 65% (per MWh) from 2005.
- Reduce carbon intensity by 90% from 2005 levels by 2050.
- Achieve a 20% reduction in generation-related water use intensity across all water types.
- Eliminate or offset power generation groundwater use in Active Management Areas (AMAs).

As explained in Meeting 1**, SRP is positioning its resource portfolio for a lower-carbon future by retiring coal plants, adding new renewable resources, adopting customer programs that reduce demand, integrating storage, adding flexible natural gas and acquiring existing zero-carbon nuclear resources. SRP will soon launch preparation of the Integrated System Plan for continued progress on achieving a lower-carbon future.**



Palo Verde Nuclear
+114 MW by 2024

Solar Additions
+2025 MW by 2025

Demand Response
150 MW by 2022

Near-term Peakers
+176 MW by 2022

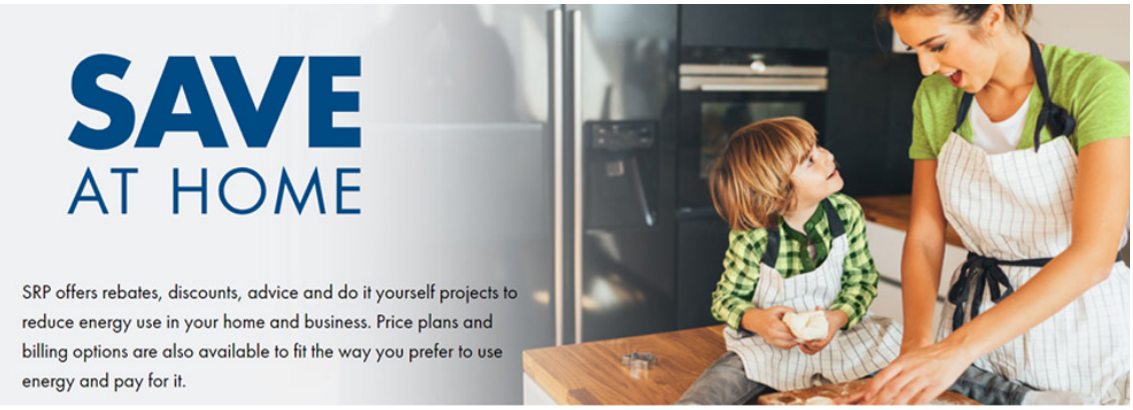
Battery Storage
+372 MW by 2023

Importance of Affordability

For many decades, the power industry counted on traditional generation resources such as coal as the least-cost resource that could operate day and night to serve retail load reliably. These resources were an essential part of a utility's generation mix to help keep operating costs low. Given the retirement of traditional resources paired with customers' growing energy needs, SRP faces significant near-term resource decisions from 2021-2024 to address near-term energy needs. These investment decisions for additional resources must consider costs for customers. Affordability is a pillar in SRP's mission to serve customers. Increases in energy costs impact all SRP customers but often have a higher burden on low-income households that struggle to keep up with rising costs.

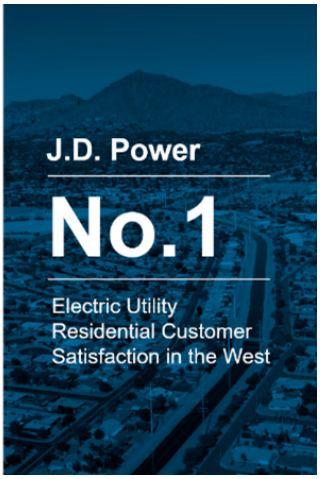
Other Ways SRP Supports Saving Customers Money on Their Energy Bills

- Providing customers an understanding of their energy usage and offering energy saving solutions and ways to save.
- Offering price plans and billing options that fit customers' energy usage and lifestyle.
- Providing rebates and incentives for customer technologies from smart thermostats to electric vehicle chargers.



SRP Ranks Highest in West Large Region for 21st Year

SRP takes great pride in serving its community. With careful planning, SRP strives to strike the right balance of reliability, affordability and sustainability for its customers. J.D. Power recently ranked SRP highest in customer satisfaction in the western United States among large electric utilities for the 21st time in the 22 years that J.D. Power has been surveying residential electric customers — and the 19th year in a row.



Among the large electric utilities (500,000+ households), **customers ranked SRP as the top-performing utility nationwide** in three of the six factors that make up the customer satisfaction score: **Power Quality and Reliability, Corporate Citizenship and Customer Care.** On the other three factors — **Price, Billing and Payment and Communications — SRP ranked a close second.**

Key Takeaways

- When planning energy resources for the future, SRP focuses on the obligation to serve customers' growing energy demand, maintaining reliability through resource adequacy and appropriately balancing reliability with sustainability and affordability.
- The SRP service area is experiencing unprecedented economic development growth from a wide variety of new and expanding customers, including tech firms and advanced manufacturing. This demand is coming rapidly, putting the pressure on SRP to develop solutions ahead of the development of the ISP.
- To address some immediate resource needs, SRP has already more than doubled its commitment to solar to 2,025 MW by 2025, is adding 114 MW of carbon-free nuclear generation by 2023, 150 MW of demand response by Summer 2022 and with the additions of 372 MW of battery storage by 2023 SRP will have some of the largest solar plus battery installations in the country.
- Given the significant range in possible outcomes regarding impact to energy demand (load) growth, this requires a full portfolio of resource options to manage uncertainty.
- SRP must maintain resource adequacy, or the ability to meet customers' energy demand, at all times of the day and across a variety of system conditions. The second key element of reliability is power system stability, or the ability of the power system (transmission and distribution) to transition from one state of equilibrium to another in response to a system disturbance. To ensure strong system stability moving forward will require a more integrated approach to plan, design and operate the power system.
- Without sufficient generation resources and power system stability, the region may experience power shortages. Sometimes, a power shortage can mean the lights stay on, but electricity becomes more expensive to supply. Other times, a power shortage means the electrical grid fails, and there is a complete loss of power.
- As SRP transitions its resource portfolio and plans for growing customer energy demand, there is a near-term planning need to integrate all resource types: firm, intermittent and limited duration. An all-the-above approach will provide value to customers in terms of reliability, affordability and sustainability.
- Given the retirement of traditional resources paired with customers' growing energy needs, SRP faces significant near-term resource decisions from 2021-2024 to address near-term energy needs. These investment decisions for additional resources must consider sustainability, costs and reliability.
- For the long term, SRP is positioning its resource portfolio for a lower-carbon future by retiring coal plants, adding new renewable resources, adopting customer programs that reduce demand, integrating storage and adding zero-carbon nuclear resources. SRP will soon launch preparation of the ISP for continued progress on achieving a lower-carbon future.
- Customers ranked SRP as the top-performing utility nationwide in Power Quality and Reliability, Corporate Citizenship and Customer Care. In Price, Billing and Payment and Communications, SRP ranked a close second.

Appendix: Near-Term Challenges in the West

Planning for resource adequacy with rising load growth is essential because of the expected retirements of baseload generation, the expanding penetration of intermittent renewable resources and long-term carbon goals. For more information about resource adequacy issues in the western United States check out these articles:

Blackouts Threaten Entire U.S. West This Summer as Heat Awaits. Bloomberg Green. https://www.bloomberg.com/news/articles/2021-05-13/u-s-west-facing-white-knuckle-summer-with-power-in-short-supply

How an Oregon Wildfire Almost Derailed California's Power Grid. Los Angeles Times. https://www.latimes.com/business/story/2021-07-12/california-flex-alert-power-grid-heat-wildfire

The Southwest Is America's New Factory Hub. 'Cranes Everywhere.' Wall Street Journal. https://www.wsj.com/articles/the-southwest-is-americas-new-factory-hub-cranes-everywhere-11622554044