

# **Integrated Resource Plan Filing to the Western Area Power Administration**

Submitted by:

Salt River Project  
Town of Gilbert  
Fort McDowell Yavapai Nation  
Salt River Pima-Maricopa Indian Community

November 1, 2017

This Integrated Resource Plan filing to the Western Area Power Administration has been reviewed and approved by the following authorized representatives:

 10-17-17  
\_\_\_\_\_  
Charles B. Duckworth                      Date

Senior Director  
Strategy, Resource Planning & Acquisitions  
Salt River Project

If you have any questions about this plan, please contact:

Ivan Insua  
Manager  
Resource Analysis  
Salt River Project  
PO Box 52025  
Phoenix, AZ 85072-2025  
602-236-3278

# TABLE OF CONTENTS

<b>SALT RIVER PROJECT, SALT RIVER PIMA-MARICOPA INDIAN COMMUNITY, FORT MCDOWELL YAVAPAI NATION, AND TOWN OF GILBERT WESTERN AREA POWER AUTHORITY INTEGRATED RESOURCE PLAN FILING .....</b>	<b>1</b>
<b>OVERVIEW .....</b>	<b>2</b>
SALT RIVER PROJECT .....	2
FY18 RESOURCE PLAN .....	2
<b>SRP’S RESOURCE PLANNING OBJECTIVES.....</b>	<b>4</b>
<b>HOW SRP RETAIL CUSTOMERS USE ELECTRICITY.....</b>	<b>7</b>
<b>EXISTING ELECTRIC UTILITY SYSTEM INFRASTRUCTURE.....</b>	<b>9</b>
HYDROELECTRIC FACILITIES .....	9
NATURAL GAS FACILITIES.....	9
COAL FACILITIES.....	10
NUCLEAR FACILITY .....	11
EXISTING GENERATION ASSET MANAGEMENT.....	11
PURCHASED POWER.....	11
RESOURCE MIX SUMMARY .....	13
<b>TRANSMISSION RESOURCES .....</b>	<b>16</b>
<b>ENVIRONMENTAL CONSIDERATIONS IN RESOURCE PLANNING .....</b>	<b>18</b>
CLEAN AIR ACT COMPLIANCE.....	18
<i>Title IV – Acid Rain.....</i>	<i>18</i>
<i>Visibility .....</i>	<i>18</i>
<i>Hazardous Air Pollutants.....</i>	<i>19</i>
<i>New Generation — Non-Attainment.....</i>	<i>19</i>
<i>New Generation — Attainment.....</i>	<i>20</i>
<i>Climate Change – Carbon Dioxide (CO<sub>2</sub>).....</i>	<i>20</i>
WATER SUPPLY .....	20
WATER QUALITY.....	20
<i>Clean Water Act Compliance.....</i>	<i>20</i>
WASTE MANAGEMENT .....	21
<i>Resource Conservation and Recovery Act Compliance .....</i>	<i>21</i>
BIOLOGICAL AND CULTURAL RESOURCES REGULATION COMPLIANCE .....	21
<i>Endangered Species Act.....</i>	<i>21</i>
<i>Migratory Bird Treaty Act.....</i>	<i>21</i>
<i>Bald and Golden Eagle Protection Act.....</i>	<i>22</i>
<i>National Environmental Policy Act and National Historic Preservation Act .....</i>	<i>22</i>
<b>SUSTAINABLE PORTFOLIO INITIATIVE.....</b>	<b>23</b>
GRID SCALE ENERGY RESOURCES.....	24
SOLAR ENERGY .....	24
SOLAR INCENTIVE PROGRAM.....	26
SOLAR FOR NONPROFITS.....	26
EARTHWISE ENERGY.....	27
WIND.....	27
LOW-IMPACT HYDRO POWER .....	27
LARGE HYDRO.....	27
GEOTHERMAL.....	28
BIOMASS.....	28
<b>DEMAND-SIDE-MANAGEMENT PROGRAMS .....</b>	<b>30</b>
RESIDENTIAL PROGRAMS .....	30
<i>Home Performance with ENERGY STAR®.....</i>	<i>30</i>
<i>Air Sealing &amp; Insulation Programs.....</i>	<i>30</i>
<i>Cool Cash Rebate Program .....</i>	<i>31</i>

<i>Duct Test and Repair Rebate Program</i> .....	31
<i>Shade Screen Discount Program</i> .....	31
<i>Shade Screen Rebate Program</i> .....	31
<i>Third Party Project Financing Program</i> .....	31
<i>Retail Lighting Program</i> .....	32
<i>Shade Tree Program</i> .....	32
<i>SRP ENERGY STAR® Homes</i> .....	32
<i>Energy Scorecard</i> .....	33
<i>Multi-Family Energy Efficiency Program</i> .....	33
<i>Building Energy Code Initiative</i> .....	33
<i>Appliance and Equipment Standards</i> .....	33
<i>Rush Hour Rewards Program</i> .....	34
<i>M-Power</i> .....	34
COMMERCIAL PROGRAMS.....	34
<i>Standard Business Solutions</i> .....	35
<i>Custom Business Solutions</i> .....	35
<i>Small Business Solutions</i> .....	36
<i>Third Party Project Financing Program</i> .....	36
<i>SPATIA Energy Information Services</i> .....	37
<b>FY18 RESOURCE PLAN</b> .....	<b>37</b>
SRP RESOURCE NEEDS AND EXISTING RESOURCES .....	37
FUTURE RESOURCE OPTIONS .....	38
<i>Natural Gas</i> .....	39
<i>Coal</i> .....	39
<i>Sustainable Resources</i> .....	39
<i>Purchase Commitments</i> .....	40
<i>Demand-Side-Management Programs</i> .....	40
<i>Nuclear</i> .....	41
<i>Hydroelectric</i> .....	41
FY18 RESOURCE PLAN SUMMARY .....	43
<b>ACTION PLAN AND PERFORMANCE VALIDATION</b> .....	<b>44</b>
<b>PUBLIC PARTICIPATION</b> .....	<b>45</b>
<b>PUBLIC NOTICE</b> .....	<b>46</b>
<b>COMMON TERMS</b> .....	<b>47</b>

**SALT RIVER PROJECT, SALT RIVER PIMA-MARICOPA INDIAN COMMUNITY, FORT MCDOWELL YAVAPAI NATION, AND TOWN OF GILBERT WESTERN AREA POWER AUTHORITY INTEGRATED RESOURCE PLAN FILING**

Western Area Power Authority (WAPA) customers with Federal Hydropower allocations are required to periodically file Integrated Resource Plans (IRP) with WAPA. WAPA uses this information to help demonstrate the stewardship of these allocations by its customers.

This requirement was initially implemented for customers receiving Colorado River Storage Project (CRSP) allocations under the 1989 Marketing Program, and subsequently extended to all WAPA customers under the Energy Policy Act of 1992.

This report describes Salt River Project's (SRP's) plan for providing electricity to the customers in its service territory, including the Salt River Pima-Maricopa Indian Community, the Fort McDowell Yavapai Nation, and the Town of Gilbert.

SRP fully serves the loads of the Salt River Pima-Maricopa Indian Community and Fort McDowell Yavapai Nation through the SRP system, and also serves the municipal loads of the Town of Gilbert. To facilitate receiving the benefit of their Federal Hydropower allocations, WAPA delivers these allocations to SRP and SRP passes the benefits along to the respective entities.

In recognition of this load serving and allocation relationship, SRP, the Salt River Pima-Maricopa Indian Community, Fort McDowell Yavapai Nation, the Town of Gilbert, and WAPA have agreed that filing a single response under WAPA's IRP filing requirements, as represented by this report, is appropriate.

The information presented in this report is based upon SRP's Fiscal Year (FY) 2018 Resource Plan, and in accordance with WAPA's IRP filing requirement spans the five year period FY18 – FY22. SRP's fiscal year begins on May 1st and concludes on April 30th.

## **OVERVIEW**

### **Salt River Project**

The Salt River Project Agricultural Improvement and Power District (SRP) is a water and electric utility serving customers in a three county region in central Arizona, including a significant portion of the Phoenix metropolitan area. SRP is one of the nation's largest public power utilities, with annual operating expenses that exceed \$2.5 billion. SRP's continued focus on serving its customers and managing costs reflect SRP's efforts aimed at improving the quality of life in the Valley and throughout Arizona.

SRP delivers nearly one million acre-feet of water to customers annually, managing a 13,000 square mile watershed and operating an extensive delivery system that includes reservoirs, wells, canals and irrigation laterals. As a leader in Arizona's water industry, SRP is centrally involved in developing plans to meet the water supply and demand challenges of a growing population.

SRP also provides electricity to approximately one million customers. In FY16 SRP's customers consumed more than 27,000 megawatt-hours (MWh) of electricity and required more than 6,800 megawatts (MW) of generation to meet coincident demands during the peak period. SRP's diverse resource portfolio includes nuclear, coal, gas, hydro, wind, solar, geothermal, biomass, demand response programs, and energy efficiency initiatives. SRP owns and operates thousands of miles of transmission and distribution facilities that deliver the electricity produced by these resources to SRP's customers.

SRP's current strategic emphasis centers upon being:

- **Leaner.** SRP is strengthening its culture of operational excellence through the efficient and productive management of SRP's assets.
- **Greener.** SRP is advancing sustainability efforts and offering customers choices that meet their green preferences.
- **Customer Centric.** SRP is anticipating and delivering an exceptional customer experience to generate customer satisfaction that is among the best across industries.

### **FY18 Resource Plan**

SRP plans to meet its future resource needs with low-carbon and carbon-free resources that are constructed or purchased by SRP, plus energy efficiency and demand response programs. SRP believes that this represents a well balanced approach to meeting growing customer load at a reasonable cost, while mitigating risks.

Given the dynamic nature of the energy industry and the cyclical nature of the Arizona economy, it is likely that some elements of this plan will change over time in response to challenges facing the electric industry. Some of these challenges include volatile natural gas and electricity prices, the timing and nature of greenhouse gas emissions regulation, uncertainty about gas and

transmission infrastructure, changes in resource costs, and load forecast volatility. SRP's flexible resource plan is designed to accommodate current conditions while still anticipating future needs.

SRP closely follows both the state and federal regulatory and environmental policy directions to assess changes that could influence SRP's resource plan. Resource flexibility, balance, and diversity are key elements of the resource plan that help SRP successfully manage uncertainties. As a public power utility, SRP was founded on the principle of resource stewardship. SRP strives to preserve the balance among serving growing customer needs, managing costs, and protecting natural resources.

This report about SRP's FY18 Resource Plan has been developed and submitted in compliance with the requirements of WAPA's Energy Planning and Management Program.

## **SRP'S RESOURCE PLANNING OBJECTIVES**

SRP is committed to serving the demand and energy needs of the customers within its service territory. To meet these needs, a variety of resource options, including supply-side and demand-side alternatives, is considered. The selected combination of resources must be capable of meeting future customer demand and energy requirements, as well as the reserve capacity necessary to provide reliable electric service during equipment outages, severe weather conditions, sudden unexpected surges in load, and changing future marketplace conditions. SRP's interest is in the efficient utilization of electricity on both sides of the meter.

SRP's current resource planning process attempts to strike an effective balance among multiple, and often competing, objectives. Recognizing that no single plan can meet every objective equally well, SRP examines numerous alternative futures in order to design a plan that best meets the following resource planning objectives.

### **Provide Electricity at A Low, Reasonable Cost While Maintaining SRP's Financial Integrity**

SRP recognizes the important role that low-cost power plays in the economic vitality and standard of living enjoyed by our customer base. SRP's financial integrity is a critical aspect in the preservation of our legacy in providing this value over the long-term. Resource decisions are at the core of SRP's economics, and the impact of these decisions on SRP's financial strength is extensively modeled and considered. The financial consequences of resource decisions are ultimately reflected in the prices our customers pay for electricity. To help ensure that SRP's rates remain as low as possible, decisions are made from a long-term perspective that values resource diversity and balance.

SRP is committed to providing reasonably priced electricity while making investments to preserve fuel diversity, support infrastructure, and meet environmental requirements. Resource alternatives are evaluated in such a way that total resource value is recognized, helping SRP to make wise resource decisions. Fully integrated costs, including base technology, integration, delivery, and risk premiums are considered so that resources are evaluated on a comparable and comprehensive basis. Understanding the total value and cost of potential resources helps SRP make better resource decisions and maintain reasonable prices.

### **Ensure System Reliability**

SRP actively works to ensure system reliability. SRP has a system-wide program to maintain equipment and keep it in proper working order. SRP, in conjunction with Arizona Public Service (APS), performs operating studies annually for the Phoenix metropolitan area to define the maximum load serving capability and the simultaneous import limit. To minimize any other anticipated reliability concerns, SRP studies other factors such as weather and severe contingencies as a proactive measure to ensure system reliability.

SRP is aware that wind and solar generation can be intermittent and therefore, it may be necessary to carry additional operating reserves to maintain load and reliability requirements.

For this reason, SRP continues to study solar and wind integration to further identify the capacity value it can expect from renewable resources and the operational integration costs of having different levels of penetration on SRP's system.

Furthermore, SRP is actively looking into battery storage opportunities to assist in meeting peak customer demand. In April of 2017 SRP announced a 20-year power purchase agreement for a grid-scale, integrated solar and battery project that will be located in Pinal County. SRP will purchase all of the energy produced at the Pinal Central Energy Center, which will be constructed and owned by a subsidiary of NextEra Energy Resources.

SRP is a member of the Southwest Reserve Sharing Group (SRSB), and therefore, is entitled to receive emergency assistance as needed. The amount of assistance varies depending on the size of the unit lost and the loading level of the generator at the time of loss. SRSB is structured such that the combination of contingency reserves carried by individual members plus SRSB's assistance, allows members to comply with Western Electricity Coordinating Council's (WECC) contingent reserve requirements. SRP abides by operating reserve criteria as established by North American Electric Reliability Corporation (NERC), WECC and SRSB's participation agreement.

### **Advance Environmentally Responsible and Sustainable Resource Choices**

SRP plans, constructs, and operates its power facilities in a manner that conforms to existing environmental requirements and is responsive to evolving public policy on environmental stewardship. SRP meets the established environmental standards that are intended to protect the public health and the environment.

SRP's Sustainable Portfolio combines renewable energy resources with energy conservation programs to benefit the environment. The acquisition of these resources is guided by SRP's Sustainable Portfolio Principles (SPP).

SRP's Board of Directors, which has responsibility for setting renewable and energy efficiency standards, set a goal for the company to meet 20% of its retail energy requirements through sustainable resources by 2020. As of this writing, SRP meets 15.88% of retail requirements through sustainable resources, and is on track to reach the 2020 goal.

One of the primary motivations for establishing sustainable energy goals is to reduce carbon emissions intensity. Looking beyond 2020, SRP plans to transition from its sustainable portfolio goal to a long-term carbon emission intensity commitment that will drive meaningful emissions reductions at the lowest cost to our customers. SRP's goal is to reduce its generation fleet carbon emissions intensity level in FY43 by 40% relative to the FY13 level.

### **Manage Risk**

The uncertainties presented by customer demand, fuel prices, electric prices in the wholesale marketplace, and the regulatory and political environment can each have a profound impact on resource planning and acquisition. SRP's resource planning efforts place an emphasis on

adopting plans that maximize the flexibility for responding to the changing conditions of an uncertain future.

SRP has an energy risk management program to limit exposure to risks inherent in normal energy business operations. The goal of the energy risk management program is to measure and report exposure to market risks, credit risks, and operational risks. SRP has established policies and procedures to meet the goals of the energy risk management program using various physical and financial instruments, including forward contracts, futures, swaps, and options.

### **Summary**

Providing instantaneous electric service to hundreds of thousands of Arizonans requires advanced planning. Some of the alternatives that SRP could call upon to meet expected future customer demands could take years to bring from the drawing board to reality. The resource planning process identifies resource alternatives and strategies that will enhance SRP's ability to meet customer needs at low, reasonable costs and provide the flexibility to respond to load and various uncertainties. SRP will continue to develop long-term resource plans in a manner that provides an effective balance of resource planning objectives.

## HOW SRP RETAIL CUSTOMERS USE ELECTRICITY

Unlike other forms of energy, such as gasoline for cars or propane for barbecue grills, electricity is an instantaneous commodity that for the most part cannot be stored. When any SRP customer turns on a light switch, starts a microwave oven, or starts a pool pump, SRP's system for supplying electricity must respond immediately to meet that customer's demand. Thousands of SRP customers make decisions either to use, or stop using, electricity every minute of every day. It is a challenge to accurately predict how much electricity customers will use, and when they will use it.

The amount of electricity that SRP's customers use at any moment is referred to as "load" or "demand." Like other Sunbelt utilities, SRP is a "summer peaking" utility. This means that each year, demand for SRP electricity is greatest during Arizona's hot summer months. Central air conditioning, a fixture in the southwestern desert lifestyle, is a significant reason that SRP's greatest demand occurs during the summer. The highest single hourly demand that occurs each year is referred to as the Total System Peak Load.

SRP's highest hourly load during a year can be described as a needle peak. This means the annual peak load tends to spike well above other hourly loads. SRP does not experience consistent, level hourly loads. The annual peak occurs during the summer months and is usually driven by extreme weather conditions. Area temperatures can rise above 110 degrees, and the need to air condition and refrigerate spaces causes the loads to spike.

For example, in the summer of 2017 (FY18), the highest daily peak load and new all-time peak was 7,219 MW which occurred on June 20. On that day the maximum temperature was 119 degrees, and the minimum temperature was 84. On the summer peak day of 2016, the maximum and minimum temperatures were 117 and 85 degrees respectively.

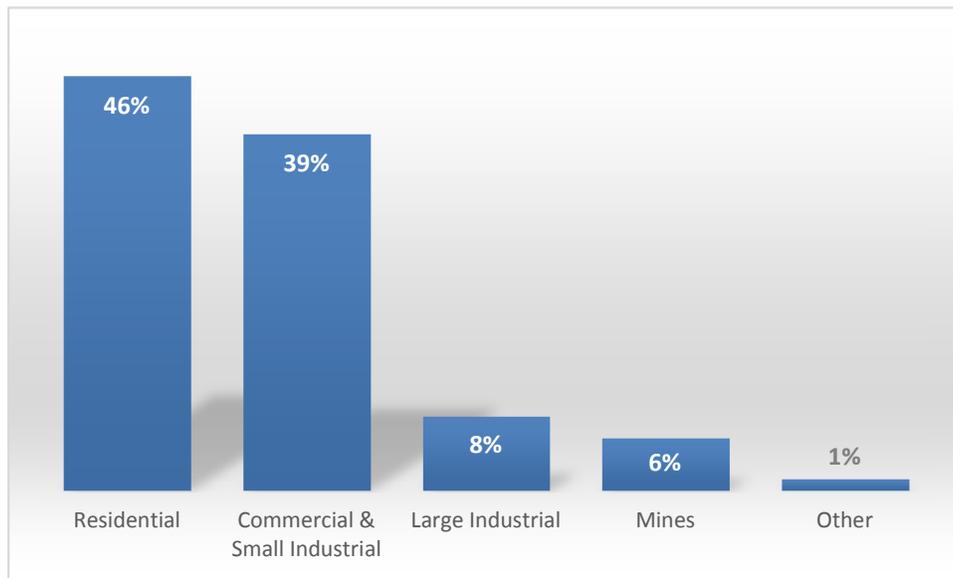
Peak load conditions are influenced by a number of factors, including extreme temperatures, humidity, number of electrical customers, and number of consecutive days with high temperatures.

Historically, SRP's highest loads have occurred during a limited number of hours on a limited number of days each year. While SRP plans to meet all of its customers' requirements, a resource acquired solely for the purpose of meeting customers' demands during these peak hours could conceivably sit idle during the remainder of the year. Therefore, resource alternatives such as summer season purchases, time-of-use pricing and demand response programs that focus primarily on this characteristic of SRP's electric customer needs are carefully analyzed and considered in the resource planning process.

The amount of electricity that SRP's customers use during a measured unit of time is referred to as "energy." The industry standard measure of energy is the watt-hour, and quantities of energy are usually expressed in units of thousands of watt-hours (kilowatt-hour (kWh)), millions of watt-hours (megawatt-hours (MWh)), or billions of watt-hours (gigawatt-hours (GWh)). Each month, SRP customers are billed for the amount of energy they use. The sum of all SRP customer decisions to use electricity during a particular time frame is called Total Retail System Energy. During FY17, Total Retail System Energy sales were approximately 28,054 GWh.

SRP serves over one million customers in five customer classifications: (i) residential; (ii) commercial and small industrial; (iii) large industrial; (iv) mines; and (v) other. Residential customers comprise more than 90% of the total customer base. Energy used by the residential and commercial and small industrial classes make up the largest share, almost 90% combined, of Total Retail System Energy. The strongest growth in electricity use over the next six years is expected to be in the large industrial class, with modest additional growth in the other classes.

**Figure 1**  
**Share of Total Retail System Energy**



During recent years, SRP has focused on including in its planning the impacts of external forces that may affect the decisions of SRP customers. These include energy efficiency programs, distributed generation, demand response, the availability of electric vehicles, and federal standards for heating, ventilation, and air conditioning (HVAC), and lighting.

## **EXISTING ELECTRIC UTILITY SYSTEM INFRASTRUCTURE**

In the early 1900s, agricultural landowners in the greater Phoenix area formed the Salt River Valley Water Users' Association (Association). When these landowners initially pledged their lands as collateral for the construction of Theodore Roosevelt Dam, electric power generation was incidental. The primary concern of the Association was the delivery of water for agricultural purposes.

Water continues to play an essential role in the Valley but as the area has moved steadily toward urbanization, the fundamental nature of SRP's business has changed considerably. To serve electric customers, SRP currently utilizes a diverse portfolio of resource options that have developed over time as the demand for power has grown in SRP's service territory. SRP utilizes a combination of hydroelectric, natural gas, coal, renewable resources, energy efficiency, demand response, and nuclear facilities to meet its customers' demands.

### **Hydroelectric Facilities**

Following the completion of Theodore Roosevelt Dam in 1911, the Association added five other conventional hydroelectric (hydro) units at three other sites in the late 1920s and early 1930s. Since then, all of the original units have been refurbished, and other units have been added. Today SRP has six conventional hydro units and two pumped-storage units on the Salt River and three canal hydro units that represent 269 MW of generating capacity.

SRP's hydro system is operated on a seasonal basis to meet the fluctuating seasonal demands of water customers while maximizing the benefit for SRP's electric customers. Consequently, most of the electricity generated by SRP's hydro system is produced during the summer months, May through October.

SRP also receives energy from several federal hydro projects, including the Boulder Canyon Project, the Parker Davis Project, and the Colorado River Storage Project (CRSP). SRP's summer season allocation of capacity from these projects totals 115 MW of generating capacity.

### **Natural Gas Facilities**

As the Phoenix metropolitan area grew in the post-World War II era, SRP constructed additional generating capacity in the Valley to meet the increasing demand for electricity. In the 1950s and 1960s, SRP constructed two gas-fired steam units at the Kyrene facility and three gas-fired steam units at the Agua Fria facility. Currently, Kyrene's two gas-fired steam units are off-line. Agua Fria's three gas-fired steam units provide about 407 MW of summer season capacity.

As the Valley continued to boom in the early to mid-1970s, SRP added three combustion turbines at the Agua Fria site and four<sup>1</sup> combustion turbines at the Kyrene site, which currently provide about 384 MW of summer season capacity. In addition, SRP developed a new Santan facility with four combined-cycle units that currently provide about 368 MW of summer season capacity.

---

<sup>1</sup> One combustion turbine was sold back to the vendor in 1996.

As the Valley has continued to grow, SRP has grown with it. SRP has added four new combined-cycle facilities to its existing resource portfolio. In 2001, SRP purchased the Desert Basin plant from Reliant Energy. Desert Basin is a combined-cycle facility with 577 MW of summer season generating capacity and is located in Casa Grande, Arizona, approximately 40 miles southeast of the Phoenix metropolitan area. In October 2002, Kyrene Unit 7, a combined-cycle plant, became operational with a summer season generating capacity of 250 MW.

In addition to the Desert Basin and Kyrene facilities, SRP constructed two additional combined-cycle plants at Santan to keep pace with rapid growth in the East Valley. Santan Unit 5 became operational in April 2005, and Santan Unit 6 became operational in March 2006 with a combined summer season capacity of 859 MW.

More recently, SRP acquired the 625 MW Mesquite Block 1 generating facility and purchased a 550 MW portion of the Gila River generating station. SRP began operating the Mesquite facility in FY14 and expects to begin operating the Gila River facility in June 2017. Together, the newer combined cycle units at Santan, Kyrene, Desert Basin, Mesquite and Gila River are expected to provide the majority of SRP's Valley-based generation, while the older steam and combustion turbine units at Kyrene and Agua Fria will operate primarily to provide additional capability to meet peak load during the summer season.

### **Coal Facilities**

In the late 1960s and early 1970s, SRP realized that expansion of its Valley generating facilities would not be sufficient to meet growing customer demands for electricity and thus participated in the construction of a number of large, coal-fired generating facilities. In total, at the present time SRP owns or purchases approximately 3,076 MW of summer season coal-fired generating capability that is located at six different sites.

As the mainstay of today's system, SRP's primary coal plant interests are in the jointly owned Navajo Generating Station (NGS) plus the solely owned Coronado (CGS) and Springerville Unit 4 Generating Stations. Together, generation at these facilities accounts for more than 80% (2,545 MW) of SRP's coal-fired summer season capability. SRP also owns interests in the Four Corners plant in New Mexico and the Craig and Hayden plants in Colorado.

Recognizing the decline in prevailing and forecasted natural gas prices, in 2016 the owners of the NGS decided to close the facility because continued operation could not be economically justified. Facing a 2019 expiration of the then-current land lease with the Navajo Nation, the owners considered closing the plant in December 2017 in order to complete decommissioning activities by the end of 2019.

However, in June 2017 the owners of the NGS and the Navajo Nation reached a lease extension agreement that will allow the NGS to continue operation through December 2019. While other parties may pursue ownership and operation of the facility, SRP's current plan is that after December 2019 SRP will no longer be an owner of the NGS.

## **Nuclear Facility**

Like many other Sunbelt utilities, in the early 1970s, SRP faced extremely high population and economic growth rates and expected more of the same during the 1980s. Thus, after extensive study and consideration, SRP decided to participate in the Palo Verde Nuclear Generating Station (Palo Verde) as a means of meeting growing electric customer demand.

As a 17.49% owner in Palo Verde, SRP depends upon nuclear generating capability to provide approximately 688 MW (summer season capability) to help meet customer load requirements. Palo Verde's operating costs are extremely low in comparison with other facilities, including base-load coal plants. Palo Verde is designed to produce electricity 24 hours per day, 365 days per year for all of its participant owners. For this reason, the availability of Palo Verde continues to be very important for both SRP and its customers.

## **Existing Generation Asset Management**

With the exception of Palo Verde, Coolidge and some of the combined-cycle units, every existing SRP generating facility is at least 30 years old, and some, more than 50 years old as of 2017.

SRP's existing generation assets have been and will continue to be an integral part of its long-term resource plans. These generating stations historically have achieved high availability and low forced outage rates as compared to the industry averages. This performance is largely attributed to prudent operational and maintenance practices. Sustaining and improving this performance will be achieved by continuing a focused effort on preventative, predictive, and corrective maintenance activities. By combining these practices with the ongoing application of engineering and technology improvements, SRP is taking steps to ensure that the future economic and operational value of existing assets is maintained.

## **Purchased Power**

SRP supplies a portion of its energy and demand requirements with purchased power from several sources. Approximately 9% of the energy requirements in FY18 are expected to be met with long-term power purchases and an additional 1% are expected to be met with short-term purchases.

Table 1 summarizes the sources of SRP's purchased power.

**Table 1  
Purchased Power**

Name	Resource Type	Counterparty or Seller	Max Capacity	Start Date	End Date	Special Considerations
Springerville 3	Coal	Tri-State Generation and Transmission Incorporated	100	7/31/2006	9/30/2036	
Dry Lake Wind	Wind	Iberdrola Arizona Renewables LLC (Avangrid Renewables)	127	9/4/2009	11/27/2030	<sup>1</sup>
Coolidge Generating Station	Gas	Coolidge Power LLC (TransCanada)	575	5/1/2011	5/1/2041	<sup>2</sup>
Copper Crossing Solar Ranch	Solar	Iberdrola Arizona Renewables LLC (Avangrid Renewables)	20	8/27/2011	8/26/2036	
Navajo Surplus Purchase	Coal	CAWCD	300	10/1/2011	9/30/2031	<sup>3</sup>
Hudson Ranch 1	Geothermal	PSEG	55	3/9/2012	10/23/2021	<sup>4</sup>
Queen Creek Solar	Solar	PSEG Solar Arizona LLC (PSEG)	19	10/15/2012	10/31/2032	
Snowflake Power Extension	Biomass	Novo BioPower	14	1/1/2013	6/8/2023	
Cove Fort Geothermal	Geothermal	Oski Energy LLC	25	1/1/2014	12/31/1933	
REDD	Coal	City of Redding	22	12/1/2015	12/31/2017	
Sandstone Solar	Solar	Sandstone Solar LLC (sPower)	45	12/31/2015	12/31/2036	
CalEnergy	Geothermal	CalEnergy, LLC	18	2/11/2016	12/31/2039	<sup>5</sup>
Bonneybrooke Solar	Other	Apple	50	12/31/2016	12/31/2041	<sup>6</sup>
Kayenta Solar	Solar	Navajo Tribal Utility Authority	30	3/31/2017	12/31/2018	<sup>7</sup>

<sup>1</sup> 9/4/09 - 9/3/2029 (Phase 1, 63 mw), 11/28/10 - 20 Yr PPA (Phase 2, 64 mw)

<sup>2</sup> w/10-year extension

<sup>3</sup> June/July/Aug

<sup>4</sup> sale to another utility

<sup>5</sup> Additional capacity will be added in January 2019, March 2019 and May 2020 for a total of 87 MW by FY21

<sup>6</sup> SRP's agreement facilitates Apple's renewable energy objectives. Apple will retain all of the environmental attributes generated from the solar plant

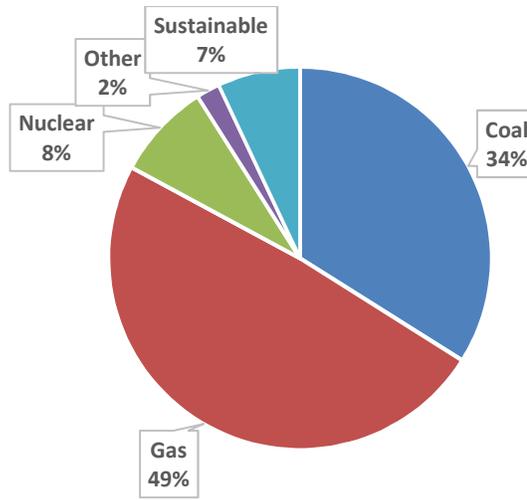
<sup>7</sup> SRP has the agreement for the environmental attributes from the Kayenta Solar Project, while NTUA receives the capacity and the energy

## **Resource Mix Summary**

This report provides information about SRP's projected resources during the five year period FY18 – FY22. SRP's resources are positioned to provide the capacity and energy that SRP's customers are expected to need.

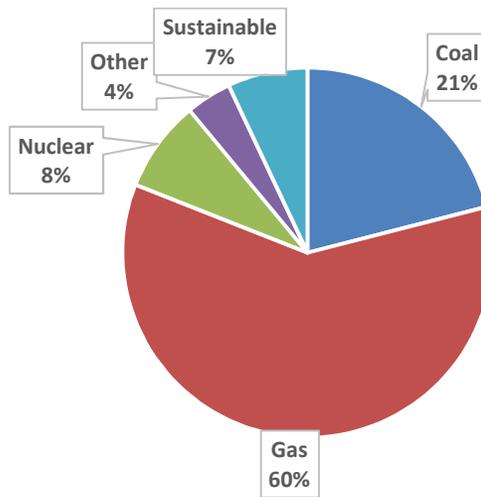
Figures 2 and 3 contrast SRP's peak hour capacity resource types in the first and fifth (last) years, while Figures 4 and 5 contrast SRP's energy resource types in the first and fifth (last) years of this IRP filing. Both comparisons display SRP's move away from more carbon-intense resources toward more sustainable and less carbon-intense resources.

**Figure 2**  
**FY 2018 Peak-Hour Capacity Mix (MW)**



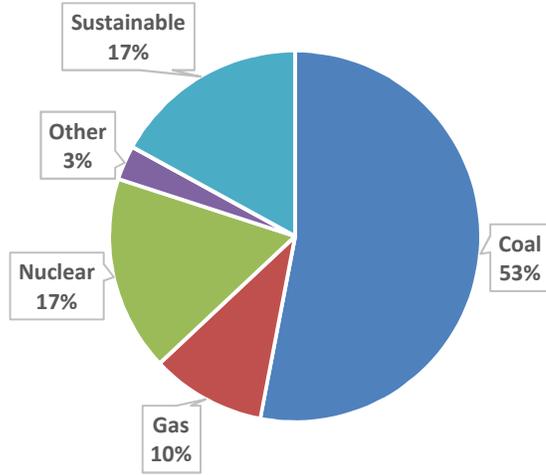
**Total Peak-Hour Capacity: 8,918 MW**

**Figure 3**  
**FY 2022 Peak-Hour Capacity Mix (MW)**



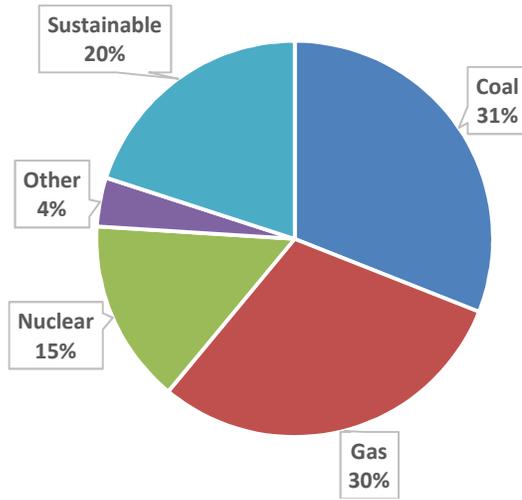
**Total Peak-Hour Capacity: 8,503 MW**

**Figure 4**  
**FY 2018 Resource Energy Mix (GWh)**



**Total Energy Production: 30,000 GWh**

**Figure 5**  
**FY 2022 Resource Energy Mix (GWh)**



**Total Energy Production: 33,000 GWh**

## TRANSMISSION RESOURCES

SRP's extensive system of transmission, sub-transmission, and distribution facilities is a key element in providing electric service to SRP's customers. Transmission refers to the 500, 230, and 115 kV systems that are designed to carry electricity from remote SRP resources to the Phoenix metropolitan area. Sub-transmission refers to the 69 kV system that moves electricity to neighborhood substations. Distribution refers to the lower voltage 12 kV system that is used to deliver electricity locally. SRP owns, in whole or in part:

- 1,525 circuit miles of 500 kV lines
- 495 circuit miles of 230 kV lines
- 265 circuit miles of 115 kV lines
- 1,024 circuit miles of 69 kV lines
- 19,790 circuit miles of 12 kV lines

SRP also maintains ownership in an extensive system of 86 transmission substations and 320 distribution substations that help effectively deliver electricity to SRP's customers.

The interconnected transmission system of the Western United States allows SRP to purchase electricity from other utilities, and in a similar manner, allows SRP to sell electricity during those periods when energy from SRP resources is not needed by its retail customers. By selling to the wholesale market when SRP has surplus energy available, SRP generates revenue that helps keep customer rates low. These wholesale sales also help SRP to more efficiently utilize its generation assets. SRP actively participates in transmission projects and inter-utility working groups to help ensure that there will be adequate transmission capability to meet Phoenix metropolitan area requirements. Some of these projects may also provide access to new resource areas and increase access to existing power markets that represent new wholesale opportunities.

The interconnected transmission system also helps to sustain adequate system reliability. With connections to many other western state transmission and generating facilities, it is extremely unlikely that SRP customers will experience an extended electrical outage due to a shortage of generating resources.

As the Phoenix metro area expands and the population density increases, SRP will need to add transmission, substations, and distribution facilities to continue reliably serving its customers. Without these additions, the existing system may become overloaded, compromising the reliability and quality of service to SRP customers.

Each year, SRP updates a 10-year outlook that identifies future load growth patterns and determines when and where the existing transmission system may become strained. The location of new electrical facilities is a community concern and a sensitive issue for existing businesses and homeowners. Therefore, whenever SRP studies indicate that new facilities are needed to serve an area, SRP initiates a public process to determine the facility location that maximizes the quality of electric service delivery to customers and minimizes physical impacts on the immediate area. The public process for transmission lines 115 kV and above is defined by the state, while SRP's Board of Directors defines the process for other facilities.

In conjunction with other transmission owners and stakeholders, SRP regularly participates in a number of regional and local forums where transmission system needs and issues are considered. Through these efforts, SRP supports the maintenance and development of the electric grid in the Western United States.

## **ENVIRONMENTAL CONSIDERATIONS IN RESOURCE PLANNING**

SRP plans, constructs, and operates its power facilities in a manner that meets existing environmental requirements and is responsive to evolving public policy on environmental stewardship. SRP works closely with regulatory agencies and stakeholders in establishing environmental standards for SRP facilities that will be protective of public health and the environment.

### **Clean Air Act Compliance**

#### **Title IV – Acid Rain**

Title IV of the 1990 Clean Air Act (CAA) Amendments established the Acid Rain Program, which requires reductions of sulfur dioxide (SO<sub>2</sub>) emissions and nitrogen oxides (NO<sub>x</sub>) from fossil fuel-fired power plants.

The Program's SO<sub>2</sub> requirements are implemented via a market-based allowance trading system. Emission allowances are allocated to each affected fossil fuel electric generating unit. The owner of the electric generating unit must hold allowances equal to the amount of SO<sub>2</sub> emissions produced each year. Rigorous monitoring and reporting requirements must be satisfied to comply with the Acid Rain Program. SRP has fully complied with all elements of Title IV.

SRP currently has full or partial ownership of six coal-fired power plants and six gas-fired power plants. SRP holds sufficient acid rain allowances to cover actual and projected SO<sub>2</sub> emissions from its current portfolio of coal and gas-fired power plants. In addition, SRP's coal-fired units also meet the NO<sub>x</sub> emission rate limits set forth in Title IV for coal-fired boilers.

All of the coal-fired power plants have scrubbers to reduce SO<sub>2</sub> emissions and Low NO<sub>x</sub> Burners (LNB) to reduce NO<sub>x</sub>. In 2014, SRP began the operation of a Selective Catalytic Reduction (SCR) on CGS Unit 2 for NO<sub>x</sub> removal. Additionally, Unit 4 at Springerville Generating Station and Unit 2 at Hayden Generating Station, two of SRP's participant plants, are equipped with SCRs.

#### **Visibility**

States are required to periodically submit a State Implementation Plan (SIP) to the Environmental Protection Agency (EPA) describing the measures they will take to address the federal Regional Haze requirements to protect visibility in Class 1 Areas, which include National Parks and Wilderness Areas. The first state plans cover the period from 2008-2018. These initial SIPs addressed a requirement to evaluate certain stationary sources of pollutants, like power plants, for installation of controls for SO<sub>2</sub>, NO<sub>x</sub>, and coarse particulate matter (PM<sub>10</sub>) to meet the Best Available Retrofit Technology (BART) provisions of the rule. Each state was responsible for submitting their own SIP to EPA, and if EPA disapproved of certain portions of the SIP, a Federal Implementation Plan (FIP) would be issued to address the

deficiencies. Comprehensive revisions to the initial Regional Haze plans to address the period between 2021 and 2028 are due to EPA in 2021.<sup>2</sup>

SRP has full or partial ownership of several coal-fired power plants that are subject to the BART requirements of the Regional Haze Rule. In particular, additional NO<sub>x</sub> emissions reductions at CGS are required by December 2017. SRP is working with the Arizona Department of Environmental Quality (ADEQ) and EPA to develop an alternative to meet the BART requirements to delay installation of NO<sub>x</sub> control equipment until there is more certainty regarding obligations under other CAA programs. SRP has already installed low NO<sub>x</sub> burners on both units and SCR on CGS Unit 2. Depending on results from evaluations for subsequent planning periods, additional SRP generating stations may become subject to Regional Haze requirements.

### **Hazardous Air Pollutants**

In February 2012, EPA published the Mercury and Air Toxics Standard (MATS) rule that established emissions limits for mercury and other hazardous air pollutants (HAPs) emitted by coal and oil-fired power plants. SRP has full or partial ownership of several coal-fired power plants that are subject to the MATS rule and these power plants were required to meet the rule requirements by April 2015.<sup>3</sup> At CGS, NGS and Springerville Unit 4, a powder activated carbon injection system and an oxidizer application system were installed to control mercury emissions. Additionally, sorbent trap monitoring systems and continuous emissions monitoring systems were installed to monitor emissions and help guide the optimization of control measures.

### **National Ambient Air Quality Standards**

In October 2015, EPA published final revisions to the National Ambient Air Quality Standards (NAAQS) for ground-level ozone. In these revisions, the primary and secondary standards were lowered from 75 parts per billion (ppb) to 70 ppb. This revision will likely result in the addition of new non-attainment areas in Arizona. An expansion of Arizona's ozone non-attainment areas may affect SRP's construction of facilities that emit NO<sub>x</sub> and volatile organic compounds (VOC). EPA is expected to complete its periodic review of the primary NAAQS for NO<sub>2</sub> and SO<sub>x</sub> in 2018 and 2019 respectively.

### **New Generation — Non-Attainment**

SRP's resource plan calls for building new gas-fired peaking generation within or near its customer load. A substantial portion of SRP's service area is located in a region classified as being in "non-attainment" with EPA's ambient air quality standards for PM<sub>10</sub> and ozone. New

---

<sup>2</sup> On January 10, 2017, EPA finalized revisions to the Regional Haze Rule which extended the due date to 2021 for state plans covering the second planning period of 2018 to 2028. Subsequent state plans will be due in 2028 and every 10 years thereafter.

<sup>3</sup> While the compliance date for the MATS rule was April 2015, several coal facilities, including CGS, received a 1-year extension for complying with the mercury provisions of the rule.

peaking generation within the “non-attainment” area would have to be designed and constructed to meet the Lowest Achievable Emission Rate set forth by EPA. Furthermore, any significant increase of PM<sub>10</sub>, NO<sub>x</sub>, and VOC emissions would have to be offset, at minimum, by an equal amount. This may be accomplished by reducing emissions at other stationary sources, upgrading mobile sources of emissions, or paving roads. New units would also have to meet New Source Performance Standards (NSPS) and conduct air quality modeling to demonstrate that emissions from the new unit(s) will not degrade air quality or impact visibility in nearby Class 1 areas.

### **New Generation — Attainment**

Any new generation located in areas classified as being in attainment with the national ambient air quality standards would have to meet Best Available Control Technology Standards, NSPS, and demonstrate that it would not degrade air quality or impact visibility in nearby Class 1 areas. Most new fossil fuel-fired units would also be required to meet new source limits for HAPs and secure SO<sub>2</sub> allocations to cover SO<sub>2</sub> emissions.

### **Climate Change – Carbon Dioxide (CO<sub>2</sub>)**

EPA has moved to regulate carbon dioxide (CO<sub>2</sub>) and other greenhouse gases (GHGs) under several new or expanded CAA programs. In 2009, the agency passed the greenhouse gas mandatory reporting rule that requires large sources of GHG emissions to report their emissions to EPA annually. EPA also added GHGs to the list of pollutants that are regulated under the existing New Source Review (NSR) and NSPS programs; the NSR program affects new fossil fuel-fired units and existing units that undertake reconstruction or modification activities. In October 2015, EPA finalized rules to address CO<sub>2</sub> emissions from new and existing power plants; however, the rules are being challenged in court. If the rules are not repealed or significantly modified they will affect the permitting of new generation facilities and the operations of existing facilities.

## **Water Supply**

Steam electric generating units require water for cooling purposes. SRP makes every effort to use renewable water resources at its power plants, find beneficial uses of plant cooling water, or implement technology to recycle cooling water. Given the water supply constraints of the arid West, dry cooling or hybrid cooling is considered to minimize water requirements when evaluating new plants.

## **Water Quality**

### **Clean Water Act Compliance**

In August 2014, EPA published standards under 316(b) of the Clean Water Act (CWA) to reduce impingement and entrainment of aquatic organisms at cooling water intake structures used by certain facilities, such as steam-electric power plants that withdraw cooling water from waters of the United States. Several of SRP’s generating facilities withdraw water from waters of the U.S. Each facility utilizes closed-cycle cooling, a pre-approved technology that is

expected to minimize the threat of impingement or entrainment to aquatic life. Facility-specific 316(b) requirements will be implemented during the permit renewal process for each generating station.

## **Waste Management**

### **Resource Conservation and Recovery Act Compliance**

In April 2015 and August 2016, EPA published final rules regulating coal combustion residuals (CCRs) as a solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA). The rules apply to active and inactive CCR facilities. The rules allow the continued-but-restricted beneficial use of CCRs and require facilities to comply with new regulations for management and closure of CCR landfills and surface impoundments. Under these regulations, CCR landfills or surface impoundments are required to install a groundwater monitoring network and conduct long-term groundwater monitoring. Certain surface impoundments must be closed in the near term if groundwater pollutant concentrations exceed established criteria. In addition, groundwater monitoring is required for 30 years post closure of the CCR facility.

SRP has full or partial ownership of several coal-fired power plants that are subject to the CCR rules. At these facilities groundwater well networks have been installed and monitoring to establish baseline conditions is in progress.

## **Biological and Cultural Resources Regulation Compliance**

### **Endangered Species Act**

The Endangered Species Act (ESA) was passed in 1973 with the purpose to protect and recover jeopardized species and their habitats. Species that could be listed as “threatened” or “endangered” under the ESA include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. Construction and maintenance projects that involve federal lands, federal funding, or federal permits are subject to Section 7 consultation under the ESA. During the consultation, the proposed actions are evaluated to determine whether they will have impacts on protected wildlife and plant species and incidental take permits may be issued. SRP has developed best management practices to avoid or minimize impacts to protected species.

### **Migratory Bird Treaty Act**

The Migratory Bird Treaty Act (MBTA) of 1918 protects a vast array of bird species that migrate through the United States, Canada, and Mexico. Under the MBTA it is unlawful to attempt to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, part, nest, or egg unless authorized by the government. Although there currently is no established permit process under the MBTA, SRP has adopted an extensive avian protection training program for employees and holds a Special Purpose Utility (SPUT) Permit. Under the SPUT permit, SRP has been granted permission move active nests that are threatening SRP infrastructure or posing an imminent threat to the birds utilizing the nest.

Each year SRP submits an annual report to U.S. Fish and Wildlife Service (USFWS) to report all injured and dead migratory birds handled by SRP employees. SRP also developed a tracking database that allows the identification of areas for immediate retrofitting and proactive retrofitting to reduce future avian interactions.

### **Bald and Golden Eagle Protection Act**

The Bald and Golden Eagle Protection Act (BGEPA) was passed in 1940 and protects bald and golden eagles by prohibiting the take, possession, sale, purchase, transport, export, or import of any live or dead eagle, part, nest, or egg.

SRP is a member of the Southwest Bald Eagle Management Committee and the Southwest Golden Eagle Management Committee, which allows collaboration with experts to protect eagles within Arizona and to identify methods of preventing impacts to eagles from SRP's infrastructure or new construction activities. In addition, SRP coordinates closely with the Arizona Game and Fish Department and the USFWS on all bald and golden eagle issues.

### **National Environmental Policy Act and National Historic Preservation Act**

The National Environmental Policy Act (NEPA) was passed in 1970 to promote the enhancement and protection of the environment and the National Historic Preservation Act (NHPA) of 1966 was passed to preserve historical archaeological sites in the United States. Construction and maintenance projects that involve federal lands, federal funding, or federal permits are subject to consultation under both acts. These compliance requirements could likely add time and cost to a project or potentially restrict areas where new resources could be constructed.

## **SUSTAINABLE PORTFOLIO INITIATIVE**

Over the years SRP has implemented a number of measures designed to reduce the use of fossil fuels for power generation. In April 2004, SRP's Board of Directors adopted a set of general principles to guide the acquisition of sustainable resources that include renewable generation, demand response, and energy efficiency. In the spring of 2011, SRP's Board of Directors approved a management proposal that directs SRP's future use of renewable energy resources and energy conservation measures.

SRP has established a goal that by FY20, 20% of SRP's retail energy requirements will be met with sustainable resources. This target includes the percentage of retail energy requirements met with annual aggregate energy-efficiency savings, utility scale renewable generation, and that which is directly attributable to certain customers (such as rooftop solar and Community Solar). This target was set at 9% in FY12 and increases at a rate of approximately 1.375% per year until the final 20% is reached. SRP will proactively seek opportunities to exceed the yearly target. As an incentive for early or accelerated acquisition, the environmental attributes of such resources may either be applied to future years or sold to reduce customer costs.

SRP's Sustainable Energy Portfolio combines renewable energy resources with energy conservation programs to benefit the environment. SRP's program integrates sound science, customer values, and resource preservation strategies.

As of FY17 SRP has met 15.88% of our retail requirements with sustainable resources, which consists of 2.32% hydro, 3.77% renewable energy and 8.90% energy efficiency.. Banked credits from over compliance in previous years make up the remainder.

Being "sustainable" means not simply being environmentally friendly in the way SRP generates power, but it also means how SRP uses it as well. SRP is committed to developing programs that enable SRP customers to partner in renewable energy resources and conservation.

Since August 2004, SRP has committed over \$150 million in solar incentives to approximately 20,000 customers. Since May 2008 SRP has paid \$178 million in energy efficiency incentives to customers, resulting in more than 12.98 million MWh saved. In FY17, the percent of SRP's total year-end retail energy requirements met by incremental Energy Efficiency Programs was 1.97%. SRP exceeded its annual retail energy requirement target of 1.75%.

SRP has continued its investment in energy efficiency and demand response programs. Through FY17, SRP's total investment in energy efficiency efforts totaled over \$350 million. Examples include incentives for the construction of energy efficient homes and commercial buildings, retail partnerships to discount the cost of energy efficient LED light bulbs, the Cool Cash AC Rebate program that offers residential customers rebates for the purchase and installation of high efficiency central air conditioners, and comprehensive commercial programs that provide incentives for standard and customized efforts to install efficient lighting and other energy savings equipment.

## **Grid Scale Energy Resources**

Renewable resources are clean or “green” energy sources that have a lower environmental impact than conventional energy sources. Renewable resources are attractive because they are replenished naturally, which means they will never run out. SRP has entered into contracts for the output from utility-scale sustainable resources. Among them are a diversified resource mix of wind, geothermal, large hydro, low-impact hydro, landfill gas and solar. SRP’s total current (FY17) renewable capacity is 742.1 MW and includes the following resources:

- Biomass: 14 MW
- Geothermal: 43 MW
- Hydro: 387 MW
- Solar, rooftop: 106.1 MW
- Solar, utility-scale: 65 MW
- Wind: 127 MW

## **Solar Energy**

Arizona’s “Valley of the Sun” is well situated for solar generation, enjoying more than 300 days of sunshine each year. The advancement of technology, federal solar tax incentives, and reduced equipment costs has resulted in strong solar generation growth over recent years. SRP is utilizing solar energy in a variety of ways while helping to advance research and development of solar energy technologies and applications.

SRP has a 20-year agreement with PSEG Solar Source to purchase all the output generated by Queen Creek Solar. The plant is located in Pinal County and began commercial operation in October 2012. SRP receives 19 MW of solar energy from the photovoltaic plant operating on a single axis tracking system that follows the sun.

SRP has a 25-year agreement with Iberdrola Renewables to purchase all the output from Copper Crossing Solar Ranch. The 20 MW plant is located in Florence, Arizona. Copper Crossing went online in 2011.

SRP has a 21 year power purchase agreement with sPower for 45 MW of solar photovoltaic energy from a facility near Florence. The plant came online in late 2015.

In addition, SRP has a one-year agreement with the Navajo Tribal Utility Authority (NTUA) for the environmental attributes from the Kayenta Solar Project, the largest renewable energy project on the Navajo Nation land in Arizona. The 25 MW solar photovoltaic project is currently under development. The energy from the solar facility is consumed by local NTUA load. NTUA will bundle the Renewable Energy Credits from the solar generation with firm energy from gas and hydro resources and deliver to SRP.

SRP is dedicated to utilizing sustainable practices at its own facilities, which includes the use of solar energy to reduce its environmental footprint. From offsetting the power requirements at one facility

to heating the water for another, these solar installations provide a significant reduction in SRP's overall energy use.

SRP uses solar technologies at its facilities and partnership facilities as part of its best practices model and to test feasibility for customer and shareholder use.

**SRP Facilities – 975 kW**

- Arizona Falls Solar – 2.5 kW
- Agua Fria Solar – 200 kW
- Coronado Generating Station Solar – 21 kW
- Desert Basin Generating Station Solar – 10 kW
- Kyrene Telecom Facility – 5 kW
- Pinal Customer Center – 189 kW
- Power Operations Building – 75 kW
- Rogers 1, 2, and 3 – 400 kW
- Tempe Service Center Warehouse – 75kW

**SRP Community Partnerships – 245 kW**

- Arcadia High School – 10 kW
- Phoenix Park and Ride – 100 kW
- Mesa Public Library – 25 kW
- USBR Covered Parking – 10 kW
- Pecos Community Center – 30 kW
- Scottsdale Senior Center – 30 kW
- Mesa Community College – 10 kW
- Scottsdale Senior Center – 30 kW

**SRP Solar for Nonprofit Projects – 683.2 kW**

- Phoenix Zoo Conservation Center – 11.65 kW
- Desert Botanical Gardens (Dorrance Hall) – 12.24 kW
- Maryvale YMCA – 12.6 kW
- Nina Mason Pulliam Rio Salado Audubon Center – 26.4 kW
- Sunshine Acres Children's Home – 13 kW
- Arizona Recreation Center for the Handicapped (ARCH) – 12.25 kW
- The Center for Habilitation (TCH) – 12.25 kW
- Sarah's Place/Glencroft – 12.25 kW
- Hospice of the Valley – 12.6 kW
- A New Leaf – 12.6 kW
- Boys & Girls Club Metro Phoenix – 12.6 kW
- Chandler-Gilbert Community College – 14.85 kW
- Habitat for Humanity Avondale – 4 kW
- Habitat for Humanity Hillcrest – 3.5 kW
- Habitat for Humanity Tempe – 3 kW
- Habitat for Humanity Ora Vista – 5.1 kW

- Habitat for Humanity Apache Junction (18 homes) – 59.4 kW
- Chrysalis – 31.2 kW
- Boys & Girls Club East Valley – 31.2 kW
- Child Crisis Center – 31.2 kW
- Phoenix Zoo Ferret Breeding Compound – 31.2kW
- Valley Life – 7.15 kW
- Tanner Terrace – 44 kW
- Homeward Bound – 38.5 kW
- Fellowship Square – 27 kW
- Phoenix Zoo Volunteer Center – 60.7 kW
- Liberty Wildlife – 80.37 kW
- Desert Botanical Gardens (4 buildings) – 86.88 kW

SRP, Arizona State University (ASU), and SunPower Corp. have partnered to build a 1-megawatt solar photovoltaic power plant at ASU’s Polytechnic campus in Mesa, Arizona. The 1-megawatt facility will be the first commercial deployment of SunPower® C7 Tracker technology, a solar photovoltaic tracking system that concentrates the sun’s power seven times and is designed to achieve the lowest levelized cost of electricity (LCOE) for solar power plants. The plant is expected to produce an amount of energy equal to that needed to serve about 225 SRP customer homes.

### **Solar Incentive Program**

The goal of the SRP Residential Solar Water Heating Incentive Program is to encourage investment and interest in solar power to increase consumer demand for solar, which will spur further research into solar technologies.

The program offers financial incentives to SRP customers who install solar water heaters in their homes to reduce energy usage. The contribution made by SRP helps defray the cost of purchase and installation of these systems and encourages their use and further development. SRP residential customers who install a solar water heater may qualify for an incentive payment of \$0.30 per kWh of the annual energy savings realized by the system.

### **Solar for Nonprofits**

Solar for Nonprofits allows SRP customers to be active in securing renewable resources for the future. For as little as \$3 per month, participating customers can invest in the development of renewable energy applications, as 100% of Solar for Nonprofits funds are used to generate clean energy. Solar for Nonprofits is used to build solar projects for non-profit organizations in the Valley. It is a cost effective way to make a difference by supporting solar with nonprofits reaping the rewards. These projects allow the recipients to offset some of their energy use with clean, renewable energy and save money on their monthly electric bill while reducing CO<sub>2</sub> emissions. Currently, approximately 3,600 residential and 75 small business customers participate in the Solar for Nonprofits Program.

## **EarthWise Energy**

EarthWise Energy allows customers to “green up”+ 50% or 100% of their electricity use with SRP renewables – a mix of wind, solar, biomass and/or geothermal. At a cost of 1 cent more per kWh, the investment in SRP renewables helps increase production of renewable energy as SRP buys replacement RECs in the marketplace. Currently, approximately 2,500 residential and 26 business customer accounts participate in the EarthWise Energy program.

## **Wind**

SRP diversified its renewable energy portfolio in October 2009 by purchasing 100% of the output from the Dry Lake Wind Power Project, located near Heber, Arizona. The project is Arizona’s first commercial-scale wind farm. Dry Lake Wind I has 30 wind towers and Dry Lake Wind II, which came online in 2011, has 31 wind towers. Underground cabling links the turbines to a nearby substation that transmits the power to the grid. Each turbine produces approximately 2.1 MW of clean, renewable energy, and total Dry Lake nameplate capacity is 127 MW.

## **Low-impact Hydro Power**

SRP’s system of canals also plays a part in utilizing the energy stored in water.

The term "low-impact" refers to hydro generation that produces clean power using a canal’s natural drop in elevation. Because a dam is not needed to create a drop in elevation, no negative environmental impact is made on the site. SRP has almost 2 MW of low-impact hydro power from two facilities: South Consolidated, a 1 MW facility located in Mesa; and Arizona Falls, a 0.75 MW facility located in Phoenix on the Arizona Canal.

SRP installed a low-impact hydroelectric plant on the Arizona Canal at an historic site known as Arizona Falls (located near 56th St. and Indian School). Arizona Falls incorporates part of a retired hydroelectric plant built in 1911. It is a transformation of a historic waterfall that was formed by a natural 20-foot drop along the Arizona Canal. The new Arizona Falls combines art, history, and technology to generate clean electricity from the canal’s waterfall. Power is provided by water from the Arizona Canal running through an adjustable blade turbine driving a 750 kW induction generator. SRP has improved the aesthetic features of Arizona Falls with waterfalls, shade canopies, landscaping, stairs, and walking paths around the power plant in order to make this an inviting point of interest for Valley residents.

## **Large Hydro**

Hydroelectric generation is an important part of the history of SRP and a technology that remains core to SRP’s power production portfolio. SRP built the first hydroelectric facility to deliver power to the Phoenix area.

The water captured by SRP’s dams on the Salt and Verde river systems store tremendous potential energy released through hydroelectric generation stations built into five of SRP’s seven dams:

Theodore Roosevelt, Horse Mesa, Mormon Flat and Stewart Mountain dams on the Salt River system and C. C. Cragin Dam on the Verde system.

These generating facilities produce a combined 267 MW of power to serve customers in the Valley. Through contract power purchases, SRP also receives power from the Hoover Dam, Glen Canyon Dam, and the Parker-Davis Project. In sum, SRP's large hydro resources produce 382 MW of power to serve its customers in the Valley.

## **Geothermal**

Geothermal power plants produce electricity from naturally occurring geothermal steam. The steam forms when production wells tap into superheated water reservoirs thousands of feet beneath the Earth's surface. Instead of burning a fuel to heat water into steam, heat from the Earth is used to create the steam that powers the turbines. Unlike some other forms of renewable energy, geothermal power plants produce energy continuously irrespective of the time of the day or weather conditions. Geothermal is considered renewable energy because no fuel is consumed and the energy is from a naturally occurring source.

In FY12, Hudson Ranch Phase 1, a geothermal plant, began operation with capacity of 55 MW. Currently Hudson Ranch's output is being sold to another entity and will return to the SRP portfolio in late 2021.

SRP has a 20-year agreement to purchase the entire output of the Cove Fort Geothermal Project, a 25-MW plant located in Beaver County, Utah. The geothermal project utilizes binary cycle technology, allowing access to regions with lower temperature geothermal resources. The project began commercial operation in late 2013.

In addition SRP has a long-term agreement with CalEnergy, LLC to purchase 87 MW of geothermal energy from a number of plants in the Imperial Valley of Southern California. The geothermal facilities are located in the Salton Sea Known Geothermal Resource Area – one of the world's most prolific regions for the production of renewable energy. The purchase began with 18 MW in February 2016 and will grow to the full 87 MW in 2020. The agreement will allow SRP to continue providing its customers with sustainable energy from these facilities until 2039.

## **Biomass**

Biomass energy is generated from the combustion of fuel, which is typically sourced from wood. SRP has 14 MW of biomass energy in our portfolio through June 2023. The energy is generated from the Novo BioPower Plant located in Snowflake, Ariz. The plant is required to obtain the majority of its fuel from forest thinnings, which helps promote healthy forests.

SRP has also conducted a test burn of more than 2,600 tons -- equivalent to about 200 acres -- of forest debris biomass at CGS. Through the test burn, SRP wanted to learn if using forest debris as a supplemental fuel in a plant designed to burn coal was feasible.

The test concluded that it is technically feasible to blend up to 3% biomass with coal at one of the CGS units, although several operational and equipment hurdles would need to be addressed for longer term use of the fuel. Based on the learnings from the first test burn at CGS last fall, SRP is evaluating the possibility of a second test burn and possibly a different fuel injection method for the biomass.

If future testing returns successful results, CGS may be able to provide significant assistance to keep Arizona's forests and watersheds healthy.

## **DEMAND-SIDE-MANAGEMENT PROGRAMS**

For over a century, stewardship and conservation have been integral parts of SRP's heritage. Being environmentally responsible extends beyond the way SRP generates electricity to how SRP helps its customers understand and conserve energy. Sustainable energy efficiency programs provide benefits to SRP and its customers by deferring the need for future generating resources, reducing emissions, improving overall efficiency and reliability, and reducing costs. SRP currently offers 20 energy efficiency programs. Since May 2008, SRP has paid \$178 million in energy efficiency incentives to its customers. Over the next five years, SRP plans to invest more than \$230 million in energy efficiency and demand-response programs. Together, SRP and its customers take an active role in the stewardship mission, as evidenced by the following programs:

### **Residential Programs**

SRP offers a variety of programs and rebates to help its residential customers save energy, save money, and increase the comfort of their homes. By partnering with customers to manage their usage, SRP can better manage the cost to supply electricity. SRP's energy-saving rebates, discounts and advice give customers more control over their energy use and monthly bills. Customers are provided with the peace of mind that comes with taking control of their costs and protecting the environment. Residential customers can learn about SRP's programs on the *savewithsrp.com* website.

#### **Home Performance with ENERGY STAR®**

The SRP Home Performance with ENERGY STAR® program is a comprehensive home energy assessment. Instead of focusing on a single problem, such as an outdated cooling system or lack of insulation, the program identifies solutions throughout the home that can work together to provide the customer with the best results. This past year, SRP was recognized by the EPA as an ENERGY STAR "Partner of the Year – Sustained Excellence" for its growth and continued success in managing this program and the other ENERGY STAR partner programs.

Assessments and installations are completed by prequalified contractors certified by the Building Performance Institute (BPI). Contractors receive \$199 per assessment. Participating customers are responsible for \$99 of that amount, and SRP pays contractors the remaining \$100. Energy-saving improvements identified in this assessment may qualify for other money-saving offers from SRP, such as rebates for cooling systems, duct repairs, shade screens and pool pumps.

#### **Air Sealing & Insulation Programs**

Participation in Home Performance with ENERGY STAR® also means customers are eligible for air-sealing and insulation program rebates of 75% of the cost to seal air leaks (up to \$250) and 75% of the cost of qualified insulation (up to \$400). Many homes are full of hidden holes that let outside air in and conditioned air out. These leaks can have a negative impact on insulation performance. Sealing leaks is critical to improving overall efficiency and comfort. For insulation to achieve its maximum performance, it must be installed in the right locations

and be free of gaps, voids and compressions. When combined with sealing air leaks, properly installed insulation provides more even temperatures throughout the house, resulting in a more comfortable living environment and greater energy savings.

### **Cool Cash Rebate Program**

SRP Cool Cash™ Rebate Program participants receive up to \$800 for the purchase of new energy-efficient heat pump and AC systems to replace existing units in their homes. Qualifying fixed-capacity systems with a Seasonal Energy Efficiency Rating (SEER) of at least 16 are eligible for a rebate of \$400, while units with a SEER rating of 17 or higher are eligible for a \$600 rebate. Customers that choose to invest in the most efficient variable-capacity systems are eligible for an \$800 rebate.

### **Duct Test and Repair Rebate Program**

The SRP Duct Test and Repair Rebate Program offers up to \$250 for qualified testing and duct repairs. Ducts distribute air from the central heating or air-conditioning system to each part of the home and back again. In a typical house, about 20% of the air that moves through the duct system is lost because of leaks or improper installation. Tightly sealed and well-insulated air ducts can maintain temperatures throughout the home, reduce energy costs, and prevent dirt, dust, moisture, pollen, pests and fumes from entering the home. BPI-certified contractors use industry-accepted testing methods to perform the work.

### **Shade Screen Discount Program**

SRP provides incentives for customers to add shade screens to windows on east-, west- and south-facing walls. SRP customers can receive a rebate based on the square footage of the screens on qualifying new or refurbished, installed shade screens.

### **Shade Screen Rebate Program**

The SRP Shade Screen Rebate Program provides incentives for installing shade screens on east-, west- and south-facing windows. Screens must block at least 80% of the sun's rays, which can reduce heat gain by up to 50% and lower customer cooling costs by up to 25%. SRP customers receive an \$0.80-per-square-foot rebate on qualifying new or refurbished, installed shade screens.

### **Third Party Project Financing Program**

SRP has arranged third-party project financing through National Bank of Arizona to provide participating Home Performance with Energy Star customers with a means to finance home efficiency retrofit projects. Financing is offered to overcome initial capital constraints and allow customers to fund comprehensive energy savings solutions in the home.

## **Retail Lighting Program**

SRP's Retail Lighting Program partners with manufacturers and retailers to provide customers with a discounted retail price for select energy-efficient LEDs. The negotiated buy-downs range from \$1 to \$3 per lamp on a wide range of LEDs from GE, TCP, CREE, and Philips. Customers can purchase the discounted LEDs at Costco, Home Depot, Wal-Mart and Sam's Club stores within our service territory

## **Shade Tree Program**

The SRP Shade Tree Program provides customers with up to two desert-adapted shade trees. Shade trees can reduce cooling needs by up to 10% by blocking the sun's rays. Shaded walls can be 10°–35° cooler at peak times. In addition to saving energy, the desert-adapted varieties the program offers require minimal irrigation and help conserve precious water resources. Customers must attend a workshop designed to educate them about the best ways to plant and care for their new trees.

## **SRP ENERGY STAR® Homes**

SRP ENERGY STAR® Homes is a partnership with Valley homebuilders to encourage their efforts to build new energy-efficient homes. The program benefits builders and buyers alike. In fact, nearly 70% of new homes built within SRP's service territory in the past year were certified by the program. That is a good indication that homebuyers are increasingly more interested in energy efficiency and that builders have embraced the program's benefits.

SRP has received four consecutive ENERGY STAR® "Market Leader Award" for our efforts with this program during the past years. This partnership with ENERGY STAR® and our homebuilders offers major benefits to homebuyers in the Valley. It embraces SRP's commitment to energy-efficient, quality-built housing while leveraging the nationally recognized ENERGY STAR® name. SRP's program follows ENERGY STAR® Version 3 guidelines and features additional HVAC and water-efficiency requirements important to our desert climate.

To demonstrate the energy efficiency of the models being offered to buyers, tests and inspections are performed on randomly selected houses during construction and given a rating with the Home Energy Rating System (HERS). Builders earn an incentive for each completed house with a HERS Index of 65 or lower. The program's escalating incentive structure encourages builders to reach even greater levels of efficiency. The program enhancements will amount to a significant increase in energy and water savings, helping new-home owners save up to \$550 annually on their utility bills.

## **Energy Scorecard**

The Energy Scorecard Program provides targeted residential customers with customized energy-saving solutions and energy-consumption data that compare their usage with similar homes. The program includes approximately 85,000 customers. The program is designed to help customers better manage their energy usage throughout the year and establish long-term behavior change and savings. Scorecards are issued six times per year to participating customers.

## **Multi-Family Energy Efficiency Program**

SRP's Multi-Family Energy Efficiency Program is designed to break down the technical and capital barriers which exist for this building type and customer base. The SRP Multi-Family program is similar to other direct install programs delivered in the Arizona market. The offering includes two main components: 1) a predefined list of direct install retrofits for existing living space including low-cost lighting, water and control measures, and 2) referral of other larger energy saving opportunities identified in the common areas to SRP's other commercial programs.

## **Building Energy Code Initiative**

The SRP Building Energy Code Initiative aims to raise awareness and promote the adoption of residential and commercial building energy codes within SRP's electric service territory. Building energy codes are becoming increasingly more effective in providing SRP customers with homes and buildings that are more energy efficient and affordable to operate. Building energy codes also represent one of the lowest-cost options to improve energy efficiency and reduce greenhouse gas emissions across SRP's service territory.

The primary goal of this program is to provide municipal building officials, advisory board members, and elected officials with the necessary information, training, and technical assistance to adopt the most current IECC energy code for residential and ASHRAE 90.1 standard for commercial construction. SRP also provides educational support and training to members of the local building community, including builders, architects, engineers and contractors who need to comply with the newly adopted energy codes. Finally, SRP uses its presence at the national, state and local levels to help our customers and stakeholders develop and advocate for more robust building energy codes.

Within SRP's Sustainable Portfolio, this program will capture credit for a portion of the energy saved as more-efficient homes and buildings are constructed in jurisdictions that have adopted the advanced energy codes.

## **Appliance and Equipment Standards**

The SRP Appliance and Equipment Standards Program is designed to increase the awareness of and advocate for more-robust efficiency standards at the national, state and local levels. SRP participates in national standards development committees and provides leadership within Arizona through support of local legislative initiatives to retain and adopt new equipment

efficiency standards. This program captures credit for a portion of the energy saved as home and building owners in SRP's service territory purchase more-efficient pool pumps and other devices.

### **Rush Hour Rewards Program**

SRP's Rush Hour Rewards program is a residential demand response program that was developed and launched in November of 2016. The program is designed to be a dispatchable resource to reduce SRP's peak load during Phoenix's hot summer months. SRP partnered with Nest to implement this offering and to leverage this smart thermostat technology. The Nest thermostat can help customers use less energy and live comfortably in their home while SRP can call events to reduce air conditioning usage during peak hours. Customers that enroll in Rush Hour Rewards receive a \$75 electric bill credit per thermostat (up to two thermostats). After each subsequent summer season, customers earn an additional \$25 per thermostat for participating in events and continuing in the program.

### **M-Power**

SRP M-Power® is a prepay program that uses in-home display monitors, smart cards and a payment kiosk network to put more than 152,000 consumers in control of many aspects of their energy use, payments and budget. As a result, analysis indicates M-Power customers, on average, reduce their annual energy consumption 12% by:

- Monitoring electricity usage with real-time information
- Managing the cost of consumption to meet personal needs
- Using in-home displays that provide positive reinforcement and immediate feedback about energy usage

In addition, the program provides hands-on energy education for the entire family. According to annually conducted customer research, M-Power has achieved one of the highest levels of satisfaction.

- 86% of respondents prefer M-Power over monthly billing.
- 97% of respondents feel that M-Power could help a lot of people if they were aware of the benefits.
- 91% of respondents say they agree/strongly agree with the statement that they use energy more wisely.
- 78% of respondents agree/strongly agree that they use a lot less electricity.

### **Commercial Programs**

SRP offers a wide range of energy-efficiency opportunities for business customers, including rebates for technical assistance and equipment installation. Commercial customers also have access to SRP's website *savewithsrpbiz.com*. Businesses can select their industry to get benchmarking data, advice,

and rebates specific to their operations. The website also showcases customers who have benefited from participating in SRP Programs.

### **Standard Business Solutions**

SRP's Standard Business Solutions Program is the largest contributor to the portfolio of commercial energy-efficiency programs. It provides prescriptive rebates for the purchase of thousands of high-efficiency measures used in lighting, HVAC, compressed-air, refrigeration, data center and building-envelope applications.

- **Lighting:** Rebates of \$300 per kW of installed demand reduction and \$0.17 per watt for lighting controls.
- **HVAC:** Rebates range from \$60 to \$85 per ton, based on the unit's level of efficiency, and up to \$40 per programmable or smart thermostat. Energy management systems are rebated at \$0.15 per square foot.
- **Variable-frequency drives:** Customers can receive a \$75-per-horsepower (hp) rebate for drives that are installed on HVAC fan and pump motors.
- **Data centers:** For networked PC power management software, customers can receive \$8 per desktop computer, \$375 per high-efficiency server, and \$200 per server virtualization. High-efficiency computer room air conditioners (CRACs) are rebated up to \$400 per ton, and electronically commutated motors for CRAC/computer room air handlers are rebated at \$75 per hp.
- **Building envelope:** Rebates of \$0.60 per square foot for window film and \$0.80 per square foot for shade screens are offered.
- **Economizers:** A rebate of \$40 per ton is available.
- **Hotel room occupancy controls:** Customers can receive a \$50 rebate per controlled room.
- **CO and CO2 sensors:** Rebates range from \$85 to \$250 per sensor.
- **Compressed air, chillers and refrigeration measures:** Refer to SRP's equipment catalogs and program manuals online for specific rebate levels.

### **Custom Business Solutions**

The SRP Custom Business Solutions Program offers customers the opportunity to submit projects for energy-efficient upgrades unique to their facilities and operations.

Customers may submit rebate applications for eligible measures regardless of whether they participate in an assessment. Examples of eligible measures include certain central plant improvements, building-envelope enhancements, process or equipment improvements, and energy-efficient air distribution systems. Cost-effective projects receive rebates of \$0.10 per kWh for the first year energy savings. Rebates are limited to 50% of the incremental cost and can be reduced by 25% if the customer does not complete the outlined commissioning requirements.

Certain large businesses may qualify for an assessment of energy-saving opportunities. To qualify, eligible customers must meet one of these criteria:

- Be served by an E-60 series price plan
- Have a compressed-air system of 100 hp or greater (excluding backup systems)
- Have a pumping system for non-HVAC applications of at least 25 hp (excluding backup systems)

An SRP Qualified Service Provider (QSP) will perform a preapproved preliminary assessment to identify cost-effective opportunities for energy savings. This initial assessment is fully funded by SRP up to \$3,000. Projects with the strongest returns are further evaluated by the QSP as part of a more in-depth, preapproved technical assessment. This assessment provides specific measure details and estimates of costs, energy savings and financial returns. SRP will pay 50% of the technical assessment cost (up to \$10,000 per customer per year). SRP will pay the remaining 50% for customers who implement the recommended measures that meet established requirements. Technical assessments are also available for data centers larger than 1,000 square feet with dedicated HVAC equipment.

### **Small Business Solutions**

The SRP Small Business Solutions Program is designed exclusively for customers who consume less than 145,000 kWh per year. It provides a free walk-through audit of the customer's lighting system and discounts of up to 75% on the purchase of qualifying lighting technologies, such as:

- ENERGY STAR or DesignLights™ Consortium LED fixtures and lamps
- T8 or T5 systems fluorescents
- Ceramic metal halide lamps
- LED exit signs
- Wall-mounted, ceiling-mounted, and integrated occupancy sensors and vacancy sensors
- Wi-Fi enabled smart thermostats

Projects typically have a simple payback of less than one year. Customers who do not meet the criteria can still receive lighting rebates through the SRP Standard Business Solutions program.

### **Third Party Project Financing Program**

SRP has arranged third-party project financing through National Bank of Arizona to provide participating small and mid-sized customers with a means to finance building efficiency retrofit projects. Financing is offered to overcome initial capital constraints and allow customers to fund comprehensive energy savings solutions in the business.

## **SPATIA Energy Information Services**

SPATIA® is an energy information service that SRP provides to our business customers. This program uses a near real-time, Internet-based tool to help enrolled customers visualize and better understand their energy consumption patterns. The comprehensive view is intended to help customers identify opportunities to cut costs by shifting peak loads, managing consumption and optimizing performance.

## **FY18 RESOURCE PLAN**

Resource planning is an ongoing process in which SRP analyzes and evaluates a wide variety of resource options, taking into account a number of considerations. The resulting plan needs to strike a balance among diverse stakeholder interests while ensuring a reasonably priced, reliable supply of electricity to SRP customers. SRP's plan was developed by assessing and balancing several key considerations, including:

- Customer/stakeholder input
- Customer and operational needs
- Cost and value (minimizing costs and maximizing value)
- Location/transmission
- Conservation and stewardship
- Emissions reductions
- Fuel diversity and supply
- Water

SRP expects that many regional factors will continue to influence which resource options are most attractive including how much new generation is built, the adequacy of transmission, the adequacy of gas supply and transportation, evolving market structures, technological advancements, and uncertain regulatory and political outcomes.

## **SRP Resource Needs and Existing Resources**

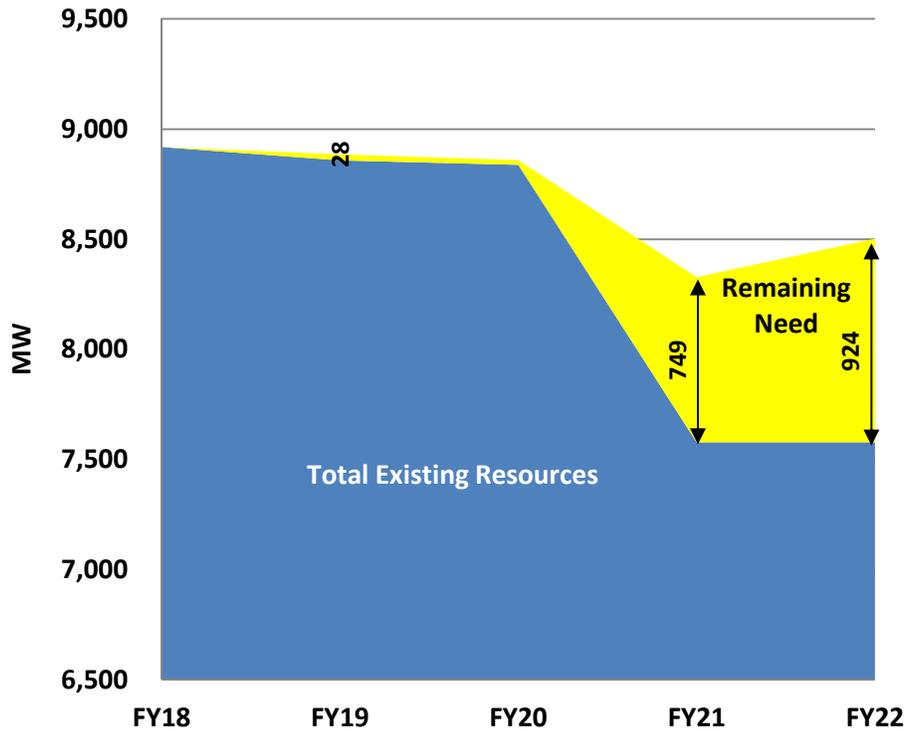
A primary component of SRP's expected resource need is the baseline forecast of the capacity and energy requirements of SRP's current retail electricity customers, plus those that are expected to migrate into SRP's electric service territory. In addition to retail demand, SRP's resource need also recognizes the impact of SRP's demand-side-management programs, firm sales, and a 12% planning reserve margin.

Even with slowed growth in customers and usage, and despite conservation efforts, SRP must plan for steadily increasing demand for electricity in the future. SRP plans to meet retail load growth projections with conventional generation, renewable resources, energy efficiency programs, demand response programs, and time-of-use pricing programs.

SRP's highest demand occurs during a relatively short period of time each summer. This high summer season demand establishes the basis for reserve calculations and drives the need for new resource

additions. Figure 6 shows SRP’s projected capacity requirements, including planning reserves, compared to existing resources. The FY18 plan projects a 924 MW gap between capacity needs and existing resources by 2022.

**Figure 6  
Projected Resource Need**



Options for meeting the gap between projected resource need and existing resources are described in the following section.

**Future Resource Options**

Electric utilities generally employ three types of resources for meeting the fluctuating needs of customers: base, intermediate, and peaking. Base load generating facilities, such as Palo Verde, are operated as much of the time as possible. Peaking units (combustion turbines at Coolidge Generating Station, for example) are used for short periods of time to help meet the highest electric demands and to help handle the fluctuations associated with wind and solar generation. Intermediate resources, such as the combined cycle units at Santan, are deployed to fill the gaps. Base load generating facilities meet the bulk of SRP customers’ annual energy requirements.

SRP is committed to expanding its use of environmentally sensitive supply- and demand-side options, exploring additional ways to displace the use of fossil fuels, and providing opportunities for the introduction of new technologies and ideas. SRP will continue to evaluate and implement cost

effective supply-side and demand-side measures that either offset or do not emit greenhouse gases or that reduce the use of fossil fuel generation. During the annual resource planning process, SRP seeks to achieve an appropriate balance between owned and purchased resources, and conservation/energy-efficiency measures. To control customer costs, preference is given to least-cost options.

The following discussion outlines resource options that SRP evaluates on an ongoing basis to meet its resource needs.

### **Natural Gas**

Natural gas-fired generation is currently the preferred economic and environmental choice for new electric generating capacity. Gas-fired resources can be constructed and placed into service relatively quickly, have predictable capital costs, may be sited near load pockets, and usually present fewer environmental challenges than other fossil fuels. Some of the challenges associated with gas-fired generation include fuel price volatility and infrastructure considerations such as pipeline capacity and storage facilities.

SRP continues to explore various gas-fired generation options including development at new sites, expansion and/or refurbishment of existing SRP sites, and merchant gas plant options.

### **Coal**

Favorable aspects of coal-fired generation include fuel diversity, fuel availability, and fuel price stability. Some of the challenges associated with coal-fired generation include remote siting, environmental issues, long lead times, and capital cost uncertainty for new plants. No additional coal plants are contemplated in SRP's current resource plan.

There have been advancements in technology with modern coal-fired power plants. Such plants produce significantly less air emissions than older coal plants due to increased efficiency. For many years coal plants have offered reliable, cost effective base loaded power.

### **Sustainable Resources**

In the spring of 2011, SRP's Board set a Sustainable Portfolio Principles (SPP) target at 20% of SRP's Retail Energy Requirements to be sourced by sustainable resources by FY20. SRP's Sustainable Energy Portfolio combines renewable energy resources with energy conservation and demand response programs to reduce the impact of SRP's business operations on the environment and further increase the diversity of SRP's resource portfolio. As highlighted in the Sustainable Portfolio Initiative portion of this report SRP has already added several sustainable resources to its portfolio including energy efficiency, conservation programs, solar, landfill gas, low impact hydro, large hydro, fuel cells, wind, and geothermal.

The Sustainable Portfolio will increase resource diversity, reduce emissions, conserve water, and help SRP respond to new regulations. SRP's approach to renewable resource acquisition is to maintain flexibility in order to respond to changes in technology and cost. This approach

helps to lower costs for SRP customers. SRP is committed to sustainable resources; since August 2004, SRP has committed over \$150 million in solar incentives to approximately 20,000 customers and since May 2008 SRP has paid \$153 million in energy efficiency incentives to customers, resulting in more than 12.5 million MWh saved. In addition, in FY16, the percent of SRP's total year-end retail energy requirements met by incremental Energy Efficiency Programs was 1.83%. SRP exceeded its annual retail energy requirement target of 1.75%.

### **Purchase Commitments**

Purchases provide flexibility and mitigate the risk related to the timing of the actual resource need. Through this highly flexible mechanism, capacity and energy can be purchased for years, months, weeks, days, and even just a few hours. SRP evaluates a variety of purchase commitment options in the resource planning process, including firm wholesale market purchases and unit contingent purchases that are tied to the availability of specific power generation resources. An important consideration in these evaluations is counterparty risk as the continued availability of the purchase under the negotiated terms may be dependent upon the financial health of the supplier. Other considerations include the availability of necessary transmission capacity, market liquidity, and the characteristics of individual generating facilities. SRP evaluates opportunities for additional purchases on a continual basis.

### **Demand-Side-Management Programs**

Demand-Side-Management (DSM) programs are typically characterized by peak load reduction and energy conservation. SRP examines market opportunities based on customer technologies and estimates of the market potential for DSM programs.

For residential customers, SRP encourages energy efficiency in the new home market through the ENERGY STAR Homes program. ENERGY STAR Homes adheres to strict energy efficiency standards that typically save 35% or more on heating/cooling costs. SRP educates its customers on energy efficiency through the Home Performance with ENERGY STAR program, interactive educational web tools, and offers multiple rebate programs.

SRP also provides residential customer Time-of-Day price plan options that feature lower energy prices during off-peak hours and higher prices during specific on-peak hours Monday through Friday. There are four plans to choose from depending on which works best for the customer's lifestyle. Although participating customers benefit directly from lower energy bills, all SRP customers ultimately benefit. Reducing the peak demand on SRP's system can lower fuel expenses, defer the building of new power plants, and reduce required reserves.

SRP's M-Power Price Plan is a prepayment plan that gives the customer control over their budget and cash flow. Using an SRP M-Power smart card, the customer can buy power any time in the amount the customer chooses. There are more than 120 SRP PayCenter machines in grocery stores, convenience stores and across the Phoenix metro area. The customer enjoys

the convenience of no monthly bills or late charges. There is an equipment deposit and a small refurbishment fee for the in-home display unit.

For commercial and industrial customers, SRP promotes efficient lighting, heating, ventilating, and air conditioning technologies for new commercial facilities as well as retrofit projects, and continues to provide pricing options through time-of-use price plans. Interruptible riders are also currently included in the plan and will be considered as options in future plans.

Demand-side-management (DSM) programs implemented during FY17 were responsible for reducing energy consumption by 2,557,512 MWh. As the economy improves, DSM programs help manage growth in energy usage by encouraging conservation and customer investments in energy-saving technologies. By partnering with its customers to manage their usage, SRP can better manage the cost to supply electricity. Through energy conservation and peak demand reductions SRP gives its customers more control over their energy usage and monthly bills. SRP will continue to pursue DSM programs as a means of reducing peak demand and energy conservation.

## **Nuclear**

Interest in nuclear generation is expected to increase in the future based on technological advances, its low variable cost, and lack of greenhouse gas emissions. Palo Verde is currently the only nuclear facility in SRP's generation portfolio and plays a significant role in providing low-cost, reliable base load generation. Challenges associated with building new nuclear generation include its high capital cost, long permitting time requirements, spent fuel storage issues, and an uncertain political and regulatory environment.

The FY18 Resource Plan does not include any new nuclear generation; however, SRP continues to monitor technological and other developments related to future nuclear generation options.

## **Hydroelectric**

SRP has several existing sources of hydroelectric generation (as described in the Existing Electric Utility System Infrastructure and Sustainable Portfolio Initiatives sections of this report). This technology remains core to SRP's resource portfolio. New large-scale hydroelectric facilities are unlikely in the planning horizon due to limited opportunities, high capital costs, and environmental impact concerns; however, SRP does consider opportunities to maximize value of current hydro assets. Before SRP brings a hydroelectric plant offline for maintenance, evaluations are done to determine the cost effectiveness of upgrading any of the power generation equipment.

## **Existing System Improvements**

SRP's existing generation assets have been, and will continue to be, an integral part of SRP's resource plans. These generating stations historically have achieved high availability and low forced outage rates as compared to the industry average. SRP units are designed with more equipment redundancy to enhance reliability, such as having two boiler feed pumps rather than one, or spare transformers at the plants in case of emergencies. SRP's excellent generation fleet track record can also be attributed to prudent operational and maintenance practices. SRP continually evaluates technology options to improve reliability, operational efficiency, system flexibility, and environmental impacts.

SRP has implemented a number of improvements to existing facilities including major environmental controls at CGS and NGS that have significantly reduced NO<sub>x</sub> emissions. New systems are being added at CGS to further reduce NO<sub>x</sub>, mercury, and SO<sub>2</sub> emissions.

In 2010, SRP built a new backup transmission and generation control center. The Emergency Center is a fully redundant facility that adds a layer of reliability to SRP's power delivery system. SRP continues to examine prospects for cost effective improvements at its existing facilities.

## **Energy Imbalance Market Participation**

After the FY18 Resource Plan was created, SRP announced its plan to join the Western Energy Imbalance Market (EIM) operated by the California Independent System Operator (CAISO) in April of 2020. The EIM is an automated, real-time energy market that strives to match the lowest cost electric supply with demand every five minutes. SRP's view is that EIM participation will result in:

- A more efficient use of transmission
- Benefits from geographically diverse loads and resources
- A new option in addition to existing energy market activity
- Lower SRP system operating costs

## FY18 Resource Plan Summary

Table 2 shows existing generation resources, purchases, and planned resources.

**Table 2**  
**FY18 Resource Plan Summary<sup>4</sup>**

<b>Resource Requirements</b>	<b>FY18 2017</b>	<b>FY19 2018</b>	<b>FY20 2019</b>	<b>FY21 2020</b>	<b>FY22 2021</b>
Retail Peak w/o DSM Impacts	7820	7925	7736	7878	8078
<b>Demand Side Resources</b>					
Existing Customer Distributed Renewables	-62	-38	-4	-4	-4
Demand Response and Retail Interruptible	-41	-64	-80	-100	-100
HVAC & Lighting Codes & Standards	-242	-274	-301	-326	-347
Energy Efficiency	-51	-95	-107	-142	-182
M-Power Program	-80	-81	-82	-84	-86
Residential Programs	-343	-314	16	31	46
<b>Total Demand Side Resources</b>	<b>-820</b>	<b>-865</b>	<b>-559</b>	<b>-625</b>	<b>-673</b>
Retail Peak w/ DSM Impacts	7000	7060	7177	7253	7405
Other Firm Loads and Sales	172	169	169	92	92
Reserves	943	966	947	962	991
<b>Total Supply Side Resource Requirement</b>	<b>8115</b>	<b>8195</b>	<b>8293</b>	<b>8307</b>	<b>8488</b>
<b>Existing Supply Side Resources</b>					
Conventional Generation	6808	6806	6806	5840	5840
Renewable Generation	269	269	269	269	269
Conventional Purchases	966	944	944	644	644
Renewable Purchases	305	286	221	221	221
<b>Total Existing Resources</b>	<b>8348</b>	<b>8305</b>	<b>8240</b>	<b>6974</b>	<b>6974</b>
<b>New Supply Side Resources (Committed and Planned)</b>					
Short-term Reserve Purchases	0	0	0	725	225
CalEnergy Geothermal	18	18	80	87	87
Apple Purchase	38	21	4	4	4
Battery	0	10	10	10	10
Future Peaking/Intermediate Resources	514	514	514	514	1186
Future Renewable Resources	0	18	11	14	17
<b>Total Supply Side Resource Additions</b>	<b>570</b>	<b>581</b>	<b>619</b>	<b>1354</b>	<b>1529</b>
<b>Total Supply Side Resources</b>	<b>8918</b>	<b>8886</b>	<b>8859</b>	<b>8328</b>	<b>8503</b>

<sup>4</sup> The information is consistent with the FY18-FY22 Resource Plan and represents a snapshot in time that balances many factors. Given the dynamic nature of the electric industry it is likely that some elements of this plan will change over time.

**FY18 Resource Plan Summary (GWh)**

<b>Resource Requirements</b>	FY18 2017	FY19 2018	FY20 2019	FY21 2020	FY22 2021
Retail Peak w/o DSM Impacts	32,599	33,533	34,597	35,520	36,482

**Demand Side Resources**

Existing Customer Distributed Renewables	-348	-378	-408	-437	-466
Demand Response and Retail Interruptible	0	0	0	0	0
HVAC & Lighting Codes & Standards	-1,131	-1,267	-1,395	-1,506	-1,603
Energy Efficiency	-436	-627	-823	-991	-1,161
M-Power Program	-297	-302	-308	-316	-324
Residential Programs	-809	-893	-969	-1,033	-1,085
<b>Total Demand Side Resources</b>	<b>-3,021</b>	<b>-3,467</b>	<b>-3,903</b>	<b>-4,283</b>	<b>-4,639</b>

Retail Peak w/ DSM Impacts	29,578	30,066	30,694	31,237	31,843
----------------------------	--------	--------	--------	--------	--------

Other Firm Loads and Sales Reserves	N/A	N/A	N/A	N/A	N/A
	0	0	0	0	0

<b>Total Supply Side Resource Requirement</b>	<b>29,578</b>	<b>30,066</b>	<b>30,694</b>	<b>31,237</b>	<b>31,843</b>
---	---------------	---------------	---------------	---------------	---------------

<b>Existing Supply Side Resources</b>	FY18 2017	FY19 2018	FY20 2019	FY21 2020	FY22 2021
Conventional Generation	26,094	26,309	25,544	24,245	24,595
Renewable Generation	269	273	273	273	273
Conventional Purchases	1,422	1,596	2,237	2,899	2,616
Renewable Purchases	1,299	1,282	1,214	1,213	1,210
<b>Total Existing Resources</b>	<b>29,085</b>	<b>29,459</b>	<b>29,268</b>	<b>28,629</b>	<b>28,693</b>

<b>New Supply Side Resources (Committed and Planned)</b>	FY18 2017	FY19 2018	FY20 2019	FY21 2020	FY22 2021
Short-term Reserve Purchases	0	0	0	353	33
CalEnergy Geothermal	141	251	631	683	682
Apple Purchase	150	150	149	148	147
Battery	7	15	15	15	15
Future Peaking/Intermediate Resources	655	590	1,062	1,788	2,045
Future Renewable Resources	19	62	62	177	291
<b>Total Supply Side Resource Additions</b>	<b>973</b>	<b>1,066</b>	<b>1,919</b>	<b>3,163</b>	<b>3,212</b>

<b>Total Supply Side Resources</b>	<b>30,058</b>	<b>30,526</b>	<b>31,187</b>	<b>31,793</b>	<b>31,905</b>
------------------------------------	---------------	---------------	---------------	---------------	---------------

## **ACTION PLAN AND PERFORMANCE VALIDATION**

As shown on page 43, Table 2 summarizes the major elements of SRP's action plan. In addition to submitting an IRP every five years, WAPA's IRP regulations also require SRP to submit an annual IRP progress report that describes accomplishments achieved pursuant to SRP's action plan. SRP will continue to submit an annual IRP progress report – SRP's latest annual IRP progress report submittal was approved by WAPA in October 2016.

## **PUBLIC PARTICIPATION**

This draft edition of SRP's FY18 Resource Plan has been made available for public review and comment during the 30-day period beginning Thursday, August 31, 2017 and ending Friday, September 29, 2017. SRP has made copies of the draft report available by contacting the Secretary's Office at SRP.

A public notice of the opportunity to receive a copy of this document and submit questions and/or comments regarding the draft report was published in *The Arizona Republic* (Phoenix, Arizona), the *East Valley Tribune* (Mesa, Arizona), and *The Arizona Daily Star* (Tucson, Arizona) between August 27, 2017 and August 30, 2017.

## **PUBLIC NOTICE**

Public Notice is hereby given that the Salt River Project Agricultural Improvement and Power District (SRP) has prepared and is making available for public comment and review an Integrated Resource Plan Filing that is being submitted to the Western Area Power Administration pursuant to Section 114 of the Energy Policy Act of 1992 (P.L. 102-486) and 10 CFR Part 905. This Integrated Resource Plan Filing has been prepared and will be submitted on behalf of SRP, Town of Gilbert, Fort McDowell Yavapai Nation, and Salt River Pima-Maricopa Indian Community.

The Integrated Resource Plan Filing is available for public review on weekdays beginning, Thursday, August 31, 2017, through Friday, September 29, 2017, from 8:30 a.m. to 5:00 p.m., at SRP's Corporate Secretary's Office located in the SRP Project Administration Building, 1521 N. Project Drive, Tempe, Arizona 85281. Copies may be obtained by calling SRP's Corporate Secretary's Office at (602) 236-5005 weekdays during business hours. Members of the public are invited to review and submit written comments on this Integrated Resource Plan Filing addressed to: SRP's Corporate Secretary (PAB215) and mailed to: P.O. Box 52025, Phoenix, Arizona 85072-2025 or hand-delivered to: 1521 N. Project Drive, Tempe, Arizona 85281. The deadline for receipt of public comments is Friday, September 29, 2017 at 5:00 p.m.

## COMMON TERMS

### Term/Acronym

### Definition

ADEQ	Arizona Department of Environmental Quality
APS	Arizona Public Service
Association	Salt River Valley Water Users' Association
ASU	Arizona State University
BART	Best Available Retrofit Technology
BGEPA	Bald and Golden Eagle Protection Act
BPI	Building Performance Institute
CAA	Clean Air Act
CAISO	California Independent System Operator
CCR	Coal Combustion Residuals
CGS	Coronado Generating Station
CO <sub>2</sub>	Carbon Dioxide
CRSP	Colorado River Storage Project
CWA	Clean Water Act
EIM	Energy Imbalance Market
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FIP	Federal Implementation Plan
FY	SRP Fiscal Year: May 1 - April 30 (For example, FY18 is May 1, 2017 through April 30, 2018.)
GHG	Greenhouse Gas
GWh	Gigawatt-Hours
HAP	Hazardous Air Pollutant
HERS	Home Energy Rating System
hp	Horsepower
HVAC	Heating, ventilation, and air conditioning
IECC	International Energy Conservation Code
IRP	Integrated Resource Planning
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-Hours

LED	Light-emitting Diode
LNB	Low NO <sub>x</sub> Burners
MATS	Mercury and Air Toxics Standard
MBTA	Migratory Bird Treaty Act
MW	Megawatt
MWh	Megawatt-Hours
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NGS	Navajo Generating Station
NO <sub>x</sub>	Nitrogen Oxides
NSPS	New Source Performance Standards
NSR	New Source Review
NTUA	Navajo Tribal Utility Authority
Palo Verde	Palo Verde Nuclear Generating Station
PM10	Particulate Matter
ppb	Parts per billion
QSP	Qualified Service Provider
SCR	Selective Catalytic Reduction
SIP	State Implementation Plan
SO <sub>2</sub>	Sulfur Dioxide
SRP	Salt River Project
SRSG	Southwest Reserve Sharing Group
SPP	Sustainable Portfolio Principles
USBR	United States Bureau of Reclamation
Valley or Valley of the Sun	Greater Phoenix Metropolitan Area
VOC	Volatile Organic Compounds
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council