INTEGRATED RESOURCE PLAN REPORT 2017-2018

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Contents

Introduction

For over 100 years, Salt River Project has successfully developed, maintained, and operated a resource portfolio that has played a significant role in the vitality and economic growth of the Phoenix metropolitan area, known as the Valley. This success has been founded on an unwavering dedication to delivering long-term resource value driven by the needs and interests of all of SRP's diverse customer base. The value of SRP's resource portfolio derives from diligent cost management, around-the-clock reliability, and responsible stewardship of natural resources.

The principal challenge in the preservation and enhancement of resource value is the inherent uncertainty of the future in which resources will be called on to perform. There is no way of perfectly predicting technological advancements, population growth, changes in consumer preferences, shifts in regulatory policy, and future fuel and capital costs. However, the resource decisions SRP makes today will determine the value of its resource portfolio for many years to come, over thirty years in some cases. The Integrated Resource Plan, or IRP, is the means by which SRP conducts a structured analysis of the most critical uncertainties and the many resource choices available.

Through the 2017-2018 IRP, a wide range of plausible futures are considered. Against each of these futures, which SRP calls "scenarios", several sets of resource choices, known as "portfolios", are evaluated through an analytical process known as scenario planning. Scenario planning is a best practice approach for making significant decisions in the face of future uncertainties and has long been employed by business both within and outside of the electric utility industry. Through scenario planning, SRP is able to clearly understand how different resource choices perform in a variety of future business environments in terms of those measures that are of most importance to its customers and other stakeholders. These measures fall within the categories of cost management, reliability, and environmental stewardship.

Recognizing that resource choices have a meaningful long-term impact on customers and connect to the interests of many stakeholders, SRP's IRP process goes beyond analytics to include an extensive stakeholder outreach component and the direct and close involvement of SRP's elected officials. Over the course of the process, which began in October 2016 and concluded in December 2017, more than twenty discussions were held with SRP's elected officials, five in depth stakeholder meetings were organized (plus several follow-up discussions), and twenty-six stakeholder interviews were conducted. The purpose for this outreach was to ensure that SRP's work was properly informed by and responsive to customer, stakeholder, and elected official perspectives and questions. These groups were involved throughout the entire process.

The IRP conclusions comprise a set of strategic resource directions regarding the development of SRP's future resource portfolio. The IRP does not, itself, make or recommend specific resource choices. In order to avoid the increased risk that comes with making a specific choice before necessary to do so, such choices are evaluated closer to the time of actual need. The IRP conclusions provide a long-term lens against which specific near-term choices can be more fully evaluated. To the extent a near-term resource choice is within the strategic guidelines of the IRP conclusions, SRP can know that the choice is appropriately responsive to future uncertainties and reflects the input of its customers and other stakeholders.

SRP recognizes that there are no perfect answers that completely address all complexities, uncertainties, customer preferences, and stakeholder interests. However, SRP believes that the process was conducted in accordance with best practices, involved a balanced and representative set of stakeholders, and reflects the input of SRP elected officials. Accordingly, the conclusions reached should be considered sound and well-balanced.

As this process would not have been possible without the time and commitment of many individuals and organizations, SRP would like to sincerely thank all those that had a part in the success of the IRP, including its Board and Council, its many valued stakeholders, and the employees who were involved in the analysis and communication of the IRP work. SRP would also like to thank consultants, Dr. Marty Rozelle, who facilitated the workshops to ensure effective communications, and Pace Global, who provided independent review of and input on the modeling assumptions and the analytical process and also provided valuable supporting analysis.

Executive Summary

Throughout the IRP process a significant number of critical issues were analyzed and reviewed with stakeholders and SRP's elected officials. The issues deemed to be critical are those that have the greatest potential to impact costs, risk profile, reliability, customer satisfaction, and communities. In most cases, the issues are neither strictly favorable nor strictly unfavorable. The role of the IRP is to position SRP's resource portfolio in a manner such that most of the issues and developments result in a favorable situation for SRP's resource mix. The strategic issues at the heart of this IRP are summarized in the following list. The order is not indicative of significance as the significance can vary across future scenarios.

Demand growth and usage patterns: What may the cumulative impacts be on peak demand, usage patterns, and energy sales from significant growth in customer-side resources (primarily solar and batteries) and electric vehicle adoption?

New resource technology: What are the opportunities associated with continuing cost reductions and technological improvements of wind, solar, and energy storage technologies? What new technologies are emerging to manage demand from the customer-side of the meter at costs below that of building new generation? What kind of generation, transmission, distribution, and communications system transformations would be required to support very large moves towards renewable resource technologies, for example something greater than 30% of the energy mix?

Natural gas prices: Both near and long-term natural gas prices are extremely low, thereby challenging the historic cost advantages of coal and nuclear generation as baseload resources. However, a significant and rapid shift to natural gas could create an unacceptable level of exposure to market prices. How much is too much?

The economy: What sort of population can be expected in the Phoenix Metropolitan Area? What sort of industries may become more prominent here over time? How might interest rates and inflation change over time?

Climate change and environmental policy: What would the long-term impacts of increasing temperatures and/or decreasing precipitation be for SRP's service territory? How might environmental policy develop in response? How should an electric utility manage its own sustainability direction in the absence of regulations?

Consumer preferences: How are consumer preferences changing from where they had previously been? How might they be the same? How can SRP provide resource portfolio options for those that have specific goals in that area?

The challenges facing nuclear power: Large format nuclear power in the United States is in a difficult situation with new projects running well over-budget and some existing facilities being retired in response to low gas prices. Will small modular technology provide a better answer?

The growth of organized regional markets: Improved regional coordination can help lower the costs associated with the integration of significant amounts of renewable energy resources and create new opportunities to reduce costs by taking better advantage of regional supply and demand diversity. To what extent can these benefits be realized in practice?

As the future of these issues is largely unpredictable, SRP utilized a scenario planning approach in order to analyze them in a disciplined manner. Business drivers beyond the control of SRP were grouped into a set of three scenarios, while resource alternatives were grouped into a set of four portfolios.

The Scenarios

These are internally consistent narratives of different plausible futures used to test ranges of assumptions in key drivers, not meant to predict the future or designate any one as more likely than another.

Breakthrough

This scenario is characterized by ever-increasing technological advancement, economic stability, and significant changes in customer behavior. A generational shift upends many current norms and expectations of consumer behavior; housing density increases, public transportation is expanded, electric vehicles are purchased at a rate equal to that of standard cars, global climate change receives policy support. Accelerating the pace of change are rapid technological improvements in renewable technologies and batteries which allow customers to produce an even larger share of their own energy requirements but still remain connected to the utility grid. Demand side advancements in energy efficiency and building codes lead to a reduction in per person energy and capacity demand.

Roller Coaster

The future is defined by volatility. While the drivers come from various forces, a new economic cycle hits about every ten years, beginning with the Chinese Economic Contraction of 2025. The impact of each cycle is magnified by highly leveraged economy and increasingly polarized political sphere, which cause swings in policy and many key drivers. Each cycle rivals the 2000-2010 decade in impact on SRP's operations, including dramatic growth and the Great Recession. Commodity prices, regional housing markets, and other economic indicators experience strong cyclical bubbles and gluts as uncertainty prevents supply growth from matching the timing of demand growth.

Desert Contraction

Global competition and consolidation initiates the exodus of several large industrial loads, along with the associated employees and population from Arizona. In addition, persistent higher temperatures and less rainfall lead to significant drought events that impact both the Colorado and Gila River watersheds. Longer periods of heat advisories and higher fall temperatures negatively impact the year-round residency rates. New high water prices and conservation mandates inhibit recruitment of new industry. The population growth plateaus in Arizona until 2030 when the local climate and lost jobs have a severe effect on Arizona's economy. In the 2040's, Arizona experiences a negative population growth rate as water issues and prolonged heat events make the Valley a less desirable location for year-round residency.

The Portfolios

The portfolios are broadly constructed resource themes used to test the relative strengths and weaknesses of different resource mixes against different future scenarios. The portfolios are designed to maximize strategic learning and are not intended to lead to analysis where one of them is identified as "best." Rather the learnings from each portfolio are consolidated into an overall strategic direction.

2037 Energy Mix	Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4
Energy Efficiency	12%	9%	9%	9%
Renewables	50%	23%	23%	23%
Nuclear	16%	20%	16%	16%
Natural Gas	22%	25%	22%	44%
Coal	0%	23%	30%	8%
Other Demand Side	High	Moderate	Moderate	Moderate
Batteries	High	Low	Low	Low

Note: The specific percentages shown are meant to differentiate between the portfolios. Actual percentages are determined by the demand projects and fuel prices specified in individual future scenario definitions.

Through the analytical process, each portfolio was tested against each future scenario and a set of metrics was generated to evaluate performance. These metrics include impact on electricity costs, financial flexibility, cost stability and predictability, reliability, emissions, water use, and coal ash. Prior to drawing strategic conclusions, the raw results were shared with stakeholders and SRP's elected officials. Based on their feedback, SRP incorporated a load forecast that had growth rates significantly below the previous low forecast and a renewables portfolio that incorporated an increased amount of wind generation.

Based on the final analytical results and extensive discussion with SRP's elected officials and stakeholders, the following strategic conclusions and actions were finalized.

Recommended 2017-2018 IRP Strategic Conclusions and Actions

Fundamental Objective

Reliably serving retail load remains the fundamental objective of SRP's generation portfolio. The path by which that portfolio has been and will continue to be constructed follows a rigorous and disciplined analytical process that incorporates 1) Board policy, 2) sustainability goals (in particular the CO_2 commitment), 3) customer demand, 4) regulations, 5) technological advancement, 6) customer costs, 7) customer satisfaction, 8) cost stability, and 9) key financial indicators. It is this discipline that ultimately determines resource choice rather than a pre-determination of what is best.

IRP Process Findings

- SRP's IRP scenarios as presented, which include Breakthrough, Roller Coaster, and Desert Contraction, are sufficiently comprehensive in terms of scope and range of assumptions considered for the purposes of strategic learning.

- The measures by which SRP evaluates resource plan performance and likelihood of successful execution are clear and consistent with stakeholder expectations. These measures include Resource Portfolio Costs, Financial Flexibility, Cost Stability, CO_2 Emissions, Water Use, Coal Ash, and Grid Reliability. IRP analysis seeks a reasonable balance of each metric; policy, where it exists, drives specific targets or target ranges for the metrics.

- The four future resource portfolios tested are appropriate to SRP's regulatory and operational context and are sufficiently comprehensive in terms of the types of resources considered and the alternative mixes of these resource types, recognizing that the portfolios were designed to learn from and not to ultimately identify one as superior in all ways to the others.

Implementing SRP's Sustainability Goals

- Integrate SRP's 2035 Sustainability Goals into resource planning objectives so as to advance those goals. This includes accelerating the previous goal of reducing its CO_2 emission rate as measured on a pounds of CO_2 per MWh basis by 40% by 2043 with a requirement to reach a similar emission rate of 728 pounds per MWh by 2035. This represents an additional 18% reduction in CO_2 emission rate by 2035 relative to the former goal. The achievement of this target will require a mix of 1) reductions in energy from coal, 2) increases in energy from renewable resources, 3) continued investments in energy efficiency, 4) preservation of SRP's nuclear and hydro generation assets, and 5) additional energy from natural gas-fired generation.

- Reducing CO_2 emissions is one of SRP's overarching sustainability objectives. CO_2 emissions is the best overarching target because it enables SRP to best manage the costs and reliability considerations of greater reductions in emissions. Therefore, maintain the planned transition from the Sustainable Portfolio Principles (SPP) framework, after the current goal sunsets in 2020 and has been met, to a long-term commitment to reducing SRP's CO_2 emission rate, with the following provisions:
    - The achievement of the target follows a cost effective discipline, accounting for the uncertainty in future cost projections. This discipline also may mean utilizing other approaches to reducing

emissions including, but not limited to, the replacement of coal energy with natural gas and renewable energy resources, new nuclear generation, water conservation, healthy forest initiatives, self-directed customer renewables, and efforts to aid in the reduction of CO_2 emissions from the transportation sector.
  - Continue to look for ways to communicate SRP's sustainable resource actions and portfolio performance with an emphasis on timeliness and transparency.

- Conduct a generation portfolio water usage intensity analysis and seek to establish a goal or goals for an appropriate reduction in generation portfolio water usage intensity based on that analysis.

Strategic Direction for Specific Resource Types

Coal Generation

Pursue further deliberate, meaningful reductions in the amount of energy in SRP's portfolio produced by coal generation. The pace of such reductions to be dictated by remaining plant life, financial implications, market economics, transmission system reliability preservation, broader sustainability goals, and customer costs. Coal plant closures are one of the most significant actions that can be taken to transform a resource portfolio impacting economics, emissions, and water usage. Moreover, there are significant implications for employees and the impacted communities that need to be taken into consideration and addressed such as job training, education, and support for economic development.

<u>Potential Implementation Actions:</u>

- Proactively seek further opportunities to exit coal plant ownership over the next 15 years, which may have implications for depreciation timelines.
- Seek low cost replacement capacity opportunities along the lines of the recent Gila River purchases.
- Work with communities and employees well in advance of coal plant closures to assist in the development of an overall transition plan.
- Consider the adoption of carbon constrained fleet dispatch that keeps coal plants available during critical times, recognizing, however, that certain minimum capacity factors are required for the economic viability of coal resources.

Natural Gas Generation

Until other reliable, peak capacity options become cost effective as demonstrated by actual market pricing, natural gas-fired generation is likely to constitute the majority of capacity additions required to address A) peak hour demand growth, B) the loss of peak capacity due to coal plant retirements, C) the need for increased system flexibility driven by the operating characteristics of intermittent generation such as wind and solar resources, and D) the most economic peak hour system reliability complement to renewable technologies.

Potential Implementation Actions:

- Prior to making any financial commitments to major equipment or construction contracts for new-build generation, issue all-source RFPs for the planned capacity. That capacity will explicitly include the opportunity for cost competitive and viable energy storage and demand response options.
- Continue to pursue the siting and permitting efforts for the Copper Crossing Energy Center in Pinal County to create a viable option for new peaking generation that may be necessary to meet peak demand growth.
- Evaluate options for existing legacy gas units, such as Agua Fria Generating Station, e.g. repowering, replacement, upgrades, etc.

Renewable Energy and Energy Storage

Continue to cost effectively add an "all of the above" mix of new renewable energy resources and integrated energy storage systems as a critical element in maintaining energy resource mix diversity, reducing CO_2 emissions, and limiting exposure to natural gas market price volatility. The specific amount of renewable energy added and the pace of those additions will be driven by the same principles that drive all other resource decisions. Furthermore, develop and promote new options for customers and communities to assist in the realization of their own renewable energy and/or sustainability goals.

Potential Implementation Actions:

- Under today's assumptions, this would mean the addition of 500-1000 MW of new renewables over the next 10-15 years. These additions would grow if costs drop more quickly and be further expanded by the development of cost effective storage technologies.
- Issue an RFP for 100 MW of solar to be online by 2021 and give large commercial and industrial customers the opportunity to be the direct beneficiaries of the environmental attributes of these projects. Should the interest from customers be greater than 100 MW, SRP will issue a second RFP for an additional 100 MW.
- Develop additional "Green Energy" price plans to provide more options for customers to realize their own renewable energy goals while shielding non-participating customers from the costs and risks associated with those goals.
- Continue to explore renewable energy options with peak demand reliability including biomass, integrating storage with renewables and geothermal generation.
- Expand Kayenta solar to increase SRP's renewable energy portfolio in the near term and provide benefits to the Navajo Nation.

- Pursue jointly with the Navajo Nation/NTUA the development of 400 MW of new renewables on the Navajo Nation and offer customers the opportunity to participate in a portion of this development (subject to transmission availability).

Nuclear Generation

Continue to take measured steps necessary to develop and preserve the option for new nuclear generation in the mid-to late-2030's with a focus on small modular reactor technology (but not to the total exclusion of larger format technologies). Ensure that financial commitments are commensurate with the state of the technology and broader environmental, fuel, and capital cost risk considerations.

Potential Implementation Actions:

- Conduct initial site evaluation work and establish a robust Quality Assurance program.
- Deepen industry relationships to stay current with emerging developments and to have resources to draw on for assistance as needed.
- Become and/or remain involved in forums focused on the development and promotion of Small Modular Reactor (SMR) technology.
- Should the NRC approve an SMR design and other utilities experience success in the licensing and design aspects, consider taking additional steps towards the possible development of new nuclear generation.
- Pursue the acquisition of land and/or land options for potential new nuclear generation sites.

Energy Efficiency Programs

Continue to develop and promote a variety of cost-effective energy efficiency programs to reduce CO2 emissions, generation portfolio water usage intensity, exposure to natural gas market price volatility, and system costs, and to assist lower income customers. Focus on programs with proven peak demand reduction benefits. Increase efforts to develop viable, scalable, and cost-effective load management options that reduce capital costs, help customers manage electricity bills, preserve reliability, and enhance SRP's system capabilities for renewable resource integration. Expand reporting to estimate the amount of energy efficiency reflected in the current load forecast in addition to programs currently being implemented.

Potential Implementation Actions:

- Target program development and funding on energy efficiency programs and demand response programs that are focused on peak demand reductions. Compare these options to other resource alternatives and specifically include energy efficiency and demand response in RFPs to meet peak needs.
- Develop mechanisms for reporting the total amount of energy efficiency embedded in SRP's customer load forecast (to the extent such can be estimated)

Market Resources

Continue with the implementation of Energy Imbalance Market participation as planned and participate in discussions relative to future regional market expansion possibilities. Should such possibilities be in the best interests of SRP's customers from an economic and reliability perspective, take further steps to help develop and participate in such market expansion.

Potential Implementation Actions:

- Should EIM participation result in the expected customer benefits (or greater), look to further opportunities to participate in broader regional markets, such as a western regional ISO.

New Technologies

Pursue pilot projects and research and development efforts and collaborate with others to encourage the development of and support for innovative applications of new power generation, load management, energy storage, and electrification technologies through active participation in industry research and development organizations.

Potential Implementation Actions (areas to explore):

- Grid modernization
- Load management
- Energy storage (utility scale and behind-the-meter)
- Carbon reduction technologies
- Electrification
- Power plant efficiency upgrades
- Transmission and distribution efficiency upgrades

Future IRP Cycle

With the desire to have continuing, substantive discussions with SRP elected officials and stakeholders, SRP will establish a 5-year cycle for future IRP processes. SRP will also add reporting and stakeholder involvement in the interim years to provide updates on the continual evaluation and development of new resource options.

- The next full IRP process, including stakeholder engagement, would begin in October 2021 and conclude by about the end of 2022.
- In August 2018, 2019, 2020, and 2021, present to the Board Power Committee and District Council near-term resource action plans that are consistent with the strategic conclusions of the IRP and to compare IRP assumption ranges to updated projections for key business drivers.
- In September 2019 and 2021, hold an IRP stakeholder workshop to provide updates on the implementation of SRP's resource strategy. Present on topics of stakeholder interest, listen to comments, and respond to questions.
- In February 2019, 2020, 2021, and 2022, add an appendix to the publicly available IRP document that provides an update on near-term significant resource planning, development, and acquisition activities and a discussion of the business environment. These updates would also be publicly available.

SRP Overview and Background

SRP is the oldest multipurpose federal reclamation project in the United States. Its long history, beginning in 1903, predates Arizona's statehood. Today SRP consists of two entities. The first is the Salt River Valley Water Users' Association (the Association), a private corporation, that was formed to build Roosevelt Dam, the necessary water infrastructure for growth. SRP's Association is one of the largest raw-water suppliers in Arizona. The Association manages a system of dams and reservoirs in the 13,000 square-mile watershed, and is responsible for the construction, maintenance, and operation of a supply system that delivers water to a 375 square-mile service area.

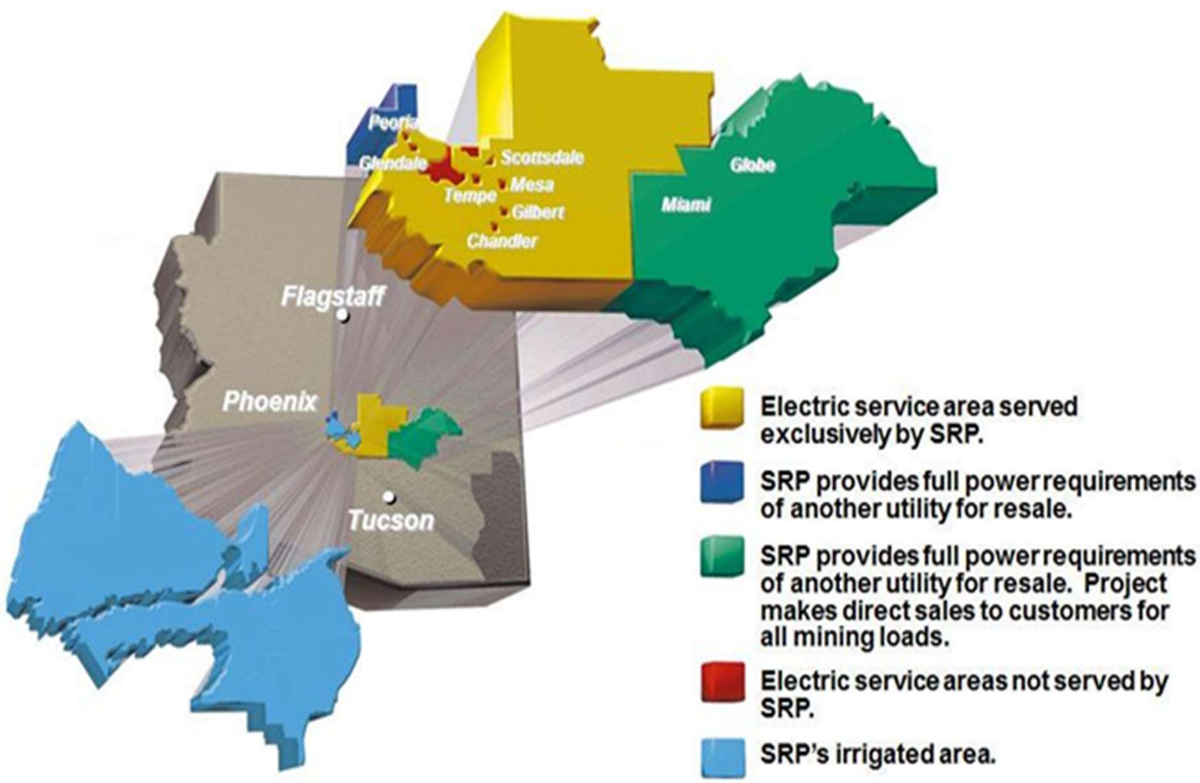


Figure 1- SRP's Service Territory

The second is the Salt River Project Agricultural Improvement and Power District (the District), a political subdivision of Arizona. SRP's District is one of the nation's largest public power utilities. Its service territory spans three Arizona counties amounting to 2,900 square-miles, including most of the metropolitan Phoenix Area. SRP is an integrated utility that owns and operates an electric system that generates, purchases, transmits, distributes electric power, as well as meters and bills for electric services provided to residential, commercial, industrial, and agriculture power users.

Unlike other large electric utilities in Arizona, which are investor-owned and regulated by the Arizona Corporation Commission, SRP is governed by a publicly elected Board and Council. The Boards of the District and Association establish the policies, approve annual budgets and major contracts, and set water rates and electric prices for SRP. The Councils enact and amend bylaws relating to the governance of SRP and approve the issuance of bonds.

Today SRP's Association supplies nearly 800,000 acre-feet of water annually and the District delivers power to more than a million customers. In the face of an increasingly dynamic and complex energy environment, SRP still holds the same core values as in the beginning, strengthening the community and remaining stewards to the environment while anticipating future growth and delivering an exceptional customer experience.

SRP Today

SRP serves its electricity customers by operating and maintaining a diverse mix of resources. These include SRP-owned and participation power plants such as coal, nuclear, and natural gas, as well as sustainable energy options such as hydroelectric generation, renewable technologies, and energy efficiency programs. These resources are located near the Valley, close to SRP's service territory, and in more remote regions within Arizona and out-of-state. This diversity is an integral component to preserving reliability, ensuring competitive market prices for SRP customers, and providing a foundation for continued economic growth for the Valley. The geographic diversity of these resources can be seen in Figure 2.

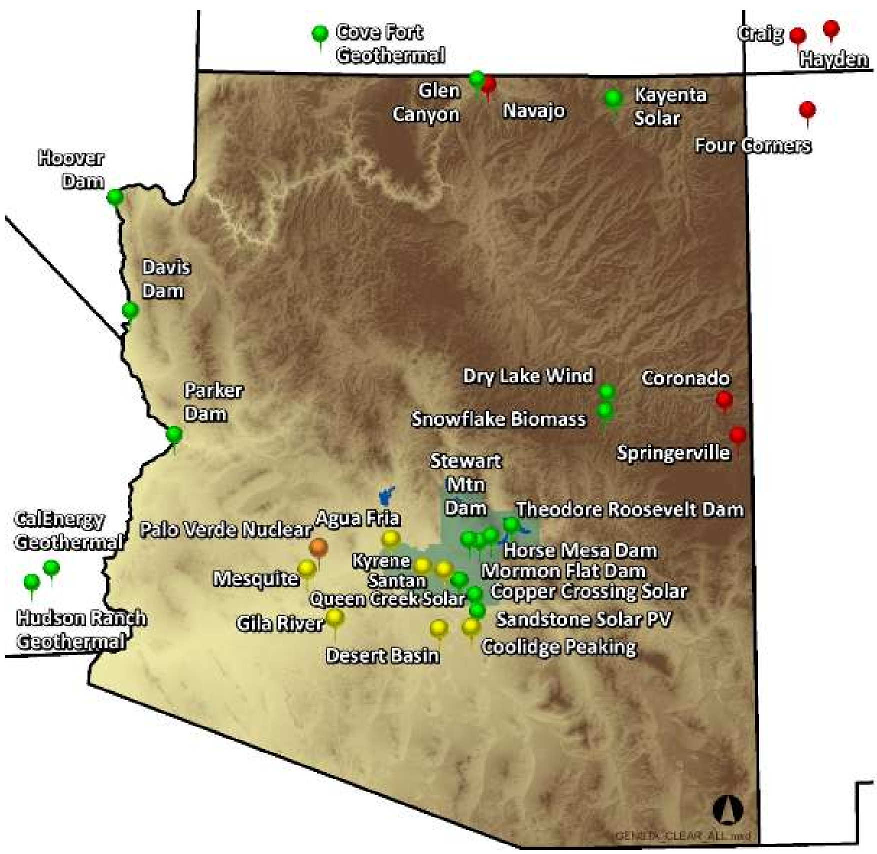
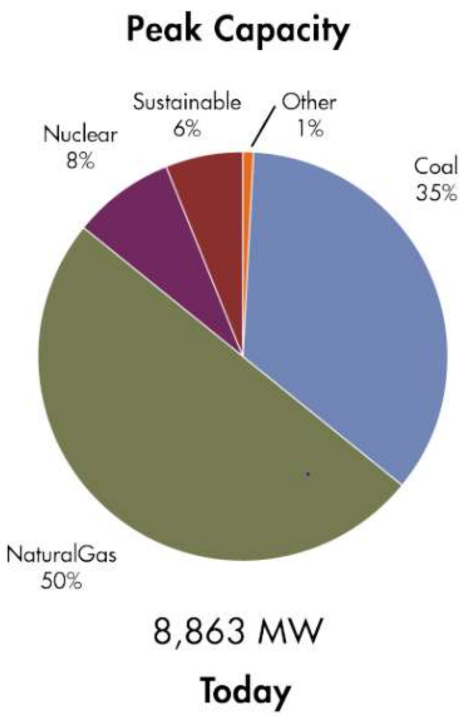


Figure 2 - SRP's Energy Resources

Note: Plants located in Utah and Colorado are not shown in accurate location on the map above for scaling purposes. Craig and Hayden are located in northwest Colorado. Cove Fort Geothermal is located near central southwest Utah.

SRP's resource mix can be viewed as capacity or energy. SRP must reliably match demand with supply at any given instant. The instant at which SRP's system supplies the highest demand is shown in the capacity chart in Figure 3. This represents the summary of total resources needed to meet peak summer demand. The energy chart illustrates the relative contribution of each resource type on an annual basis. Fiscal Year (FY) 2018's budget projected a little over half of SRP's customers' annual energy needs were provided by coal-fired generation. The remaining demand was met by natural gas, nuclear, sustainable resources, and other[1] resources. FY18 year-to-date actuals estimate coal to be a lower percentage of energy than budgeted and natural gas to be higher than budgeted due to natural gas prices being lower than anticipated in FY18. SRP's resource mix will change as resources retire or contracts expire, and as new resources are added to the portfolio.



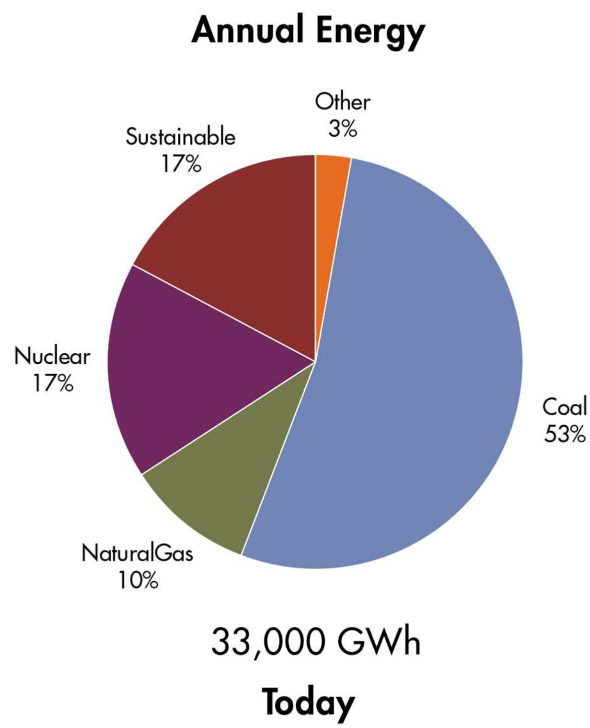


Figure 3 - SRP's Fiscal Year 2018 Budgeted Resource Mix

Resource Planning

The goal of SRP's resource planning process is to develop a long-term resource strategy to meet customers' and other stakeholders' expectations of low-cost, reliable power while demonstrating exemplary natural resource conservation and stewardship. The work is extensive and is conducted on a year-round basis. SRP annually reviews and updates its plan to identify how best to secure the power necessary to meet the growing electricity needs of its customers at the best value. Numerous areas of SRP are involved in the collection, creation, and analysis of quantitative and qualitative data that feed into the planning process. This planning process looks at load projections and market conditions to identify customer demand and flexibility needs, and analyzes market supply, construction schedules, renewable proposals, and customer options.

[1] "Other" represents economic short term market purchases and managing resource portfolios for districts within SRP's balancing area.

Resource Characteristics

To ensure that the right types of resources are integrated to serve peak demand, SRP analyzes the tradeoffs arising from the characteristics of different resource types. Technology selection, usage profile, capital cost, operating cost, and environmental regulations have to be considered when determining the appropriate resource to fit demand.

Technology Selection

An important part of planning is identifying new technologies that can fill a need in the resource plan. SRP developed a framework for evaluating and ranking new and future technologies to determine what's eligible for inclusion in its resource plan and IRP process. This process is conducted annually and studies operational and design track records, commercial availability, and actual cost trends for all identified resources. This ensures SRP is designing its future generation portfolio to be cost-effective and reliable while incorporating proven new technology advancements that are in the best interest of customers.

Usage Profile

Power plants can be divided into three broad categories based upon their expected usage: baseload, intermediate, and peaking. Baseload resources are designed to produce power on a continual basis every hour of every day. These tend to have high capital costs but low fuel costs. Intermediate resources are designed to "follow the load." This means that as the customer demand for electricity rises and falls throughout the day their output can be increased or decreased to match. Peaking resources also follow the load, but do so over a limited number of hours a year and are capable of being available very quickly.

Certain resources such as wind and solar do not fit within the framework of baseload, intermediate, and peaking. These are considered "variable resources." These resources produce energy when the wind is blowing or the sun is shining. The output from these resources cannot be controlled to match customer demand. As such, the other resources must help to compensate for the variability in the output of wind and solar.

Capital Costs

The production of electricity is a capital intensive business. In much the same way as operational characteristics differ across generation technologies, so do the capital costs of the various technologies. Capital costs include initial costs to construct the facilities necessary to generate power and costs associated with improving existing facilities. These include the costs necessary to construct the power plant itself as well as costs for the fuel supply infrastructure (such as pipelines for gas units), transmission lines to connect the plant to where the energy is used, and water supply infrastructure.

Operating Costs

Each resource option also has associated operating costs that can differ across technologies and fuel types. Some costs vary based on how much the facility is run. These costs include such things as fuel and consumables necessary to maintain the facilities. Additionally, there are fixed costs that are incurred regardless of how much the plant runs such as taxes, insurance, salaries and other facility costs.

Environmental Regulations

In recent years, the complexity and extent of environmental regulations affecting traditional generation resources has created significant uncertainty about the long-term viability of these resources within SRP's resource plan. Environmental constraints are increasing and accelerating. While this is difficult to predict and manage as part of strategic planning, SRP monitors the latest political developments and utilizes the latest guidance and insight to inform its generation portfolio.

Core Resource Principles

A resource strategy is built on three foundational aspects: developing ideas about what the future might look like, including an analysis of future load, weighing viable resource options, and evaluating the resource portfolio through SRP's core resource principles, which guide the development process to ensure SRP appropriately balances all important considerations.

SRP has six Core Resource Principles that guide decision making during the planning process to meet future resource needs. The principles seek a balance between long and short term financial considerations, service reliability, and environmental impacts, while ultimately prioritizing customer satisfaction and valuing stakeholder input. SRP strives to understand the inherent tradeoffs among the principles and establish a strategy that fully considers and balances all of them.

Manage Costs
Deliver exceptional resource value by keeping prices low through diligent, long-term oriented cost management.

Ensure Reliability
Meet, and in some cases, exceed industry standards to provide a dependable supply of electricity to all SRP customers.

Practice Exemplary Environmental Stewardship
Reduce environmental impact of SRP’s operations by reducing emissions, using less water and energy, and by creating less waste. SRP can pass those savings on to customers, and everyone can enjoy the benefits of a better environment.

Long-term View
Develop a long-term resource strategy to ensure a reliable, responsible, and robust system for future generations. The long-term view ensures that SRP is making the right decisions today to support its customers and stakeholders in the future.

Measure Success Through the Eyes of Our Customers
Respond to changing consumer expectations by providing safe, reliable, and affordable power while being leaner, greener, and even more customer-centric. SRP prides itself in serving the needs of customers and goes to great lengths to continually exceed expectations.

Transparency
Engage stakeholders and SRP’s elected officials in a transparent resource planning process that is responsive to questions and input.

Resource decisions today will have a significant, long-term impact on SRP's retail customers, stakeholders, and communities. Therefore, it is important to make careful decisions and balance their future impacts. The IRP process assists in determining the best strategic path forward for preserving the value customers receive well into the future.

Implementation of 2013-2014 IRP Conclusions

During the 2013-2014 IRP process, the stakeholders achieved consensus on seven elements which formed SRP's strategic direction for resource decisions. That strategic direction was directly informed by the stakeholder feedback SRP received and the conclusions drawn through the process has since guided resource decisions for the last few years.

Element	Strategic Resource Direction
Coal	A deliberate meaningful reduction
Nuclear	Preserve the option for future new nuclear
Natural Gas	An increasing role for natural gas to meet demand, reduce CO_2 intensity, and integrate increasing amounts of renewables
Renewables	Add a diverse mix of new renewable energy resources
CO_2 Reduction	Pursue other cost effective options to reduce CO2 emissions intensity
Energy Efficiency	Promote cost-effective energy efficiency and other load management options
Technology	Encourage the development of and support for power generation, load management, and energy storage technologies

The first strategic conclusion addressed the exposure and risk related to coal-fired generation by pursuing a deliberate, meaningful reduction in the amount of energy in SRP's portfolio produced by coal. In 2017, the owners of Navajo Generating Station (NGS) voted to exit the plant by the end of 2019. NGS was identified as the third largest emitter of carbon dioxide (CO_2) in the United States and combined with the lowest natural gas prices seen in decades, it had become increasingly difficult to balance NGS's cost and emissions with SRP's financial and sustainability objectives.

Reductions are also planned at two other coal plants. SRP receives 124 megawatts (MW) from Unit 1 of the Craig Generating Station, located in Northeast Colorado. This unit is scheduled for closure in 2025. Additionally, the Coronado Generating Station near St. Johns, Arizona will curtail operations during non-peak months as a result of an agreement with the EPA in lieu of installing additional emissions reduction equipment to Unit 1. It is anticipated that from 2018 to 2025 SRP's resource mix will experience over a 20% reduction in energy produced by coal.

The second strategic conclusion protects resource choices in the future by allowing SRP to take the appropriate steps necessary to develop and preserve the option for new nuclear generation. This strategy does not commit SRP to new nuclear resources, rather it allows the company to take some of the smaller early steps that are part of the development cycle. A small team is currently conducting work to understand what constitutes a good location as well as developing a quality assurance program.

SRP has pursued a few low-cost natural gas resources since the last IRP that align with the strategic direction to increase the role that natural gas plays in the resource plan. Natural gas provides the ability to help meet increases in customer demand, reduce SRP's CO_2 emission rate, and helps ensure reliability in a system with increased levels of wind and solar generation. SRP acquired Unit 4 of the Gila River Power Station on May 31, 2017. This 550-MW unit was purchased for $100 million, which allowed SRP to postpone the construction of a new natural gas plant. In October 2017, SRP's Board approved the purchase of Units 1 and 2 of the same gas plant with Unit 1 being utilized to serve retail customers and replace a large portion of the capacity lost with the upcoming exit from NGS, while Unit 2 capacity is being sold to Tucson Electric Power. These purchases allowed SRP to defer additional costs of building new generation. The price associated with these acquisitions represents a fraction of the cost to build new generating facilities, which allows SRP to manage costs for its customers.

Another strategic conclusion from the last IRP process was to add a diverse mix of new renewable energy resources as a critical element to reduce SRP’s CO_2 emission rate. Shortly after the 2013-2014 IRP process, SRP entered into a power purchase agreement for the Sandstone Solar Facility, a 45 MW facility that currently is the largest solar resource in SRP’s portfolio. Sandstone Solar produces enough green power to supply more than 8,000 homes, which reduces carbon emissions by more than 88,800 metric tons annually. SRP also signed an agreement with the Navajo Tribal Utility Authority (NTUA) to purchase the environmental attributes from the 27.5 MW Kayenta Solar Facility, with the hope that this project will pave the way for future energy projects on the Navajo Nation. SRP added 18 MW of geothermal by 2020 to an existing 87 MW power purchase agreement (PPA) with Cal Energy. SRP has also implemented customer-dedicated green energy programs for large commercial and industrial customers.

Beyond renewables, the IRP concluded that other cost effective options, such as the electrification of transportation, would also be considered and implemented as a means of meeting SRP’s strategic objectives and reducing its CO_2 emission rate. Since then, SRP continues to expand its plug-in electric vehicle (EV) fleet with a goal of 100% of sedans to be electric by 2021. Additionally SRP supports employees with access to EV workplace charging stations at 18 SRP facility locations. SRP has also implemented an Electric Vehicle Price Plan, similar to the Time-Of-Use Price Plan, with opportunity for customers to save by charging vehicles during lower-priced super off-peak hours.

An important topic in the 2013-2014 IRP discussions was the capital expense of procuring peak generation. One way to avoid that capital cost is by encouraging customers to reduce peak demand. Therefore, SRP's strategic resource conclusions also call for promoting cost-effective energy efficiency and other load management options. Since that last engagement, SRP's portfolio of 20 energy efficiency programs has resulted in 1,697,000 MWh of energy savings. These programs continue to focus specifically on reducing the peak load and have contributed between 124 to 135 MW of load reduction each year over the past three years, resulting in cost savings for all SRP customers. To reduce peak demand SRP has implemented programs such as the Time-of-Use Price Plan (TOU), interruptible and demand response (DR) programs to offer to SRP customers. The TOU price plan prices electricity differently during certain parts of the day encouraging customers to use less energy during on-peak hours.

Interruptible programs are offered to large industrial customers, which allows SRP to change electricity use for a predetermined amount of time at a participating business to help reduce peak demand. SRP has also launched a behavioral demand response (BDR) pilot program, a voluntary program by which residential customers reduce their electricity use when demand on the grid is expected to be particularly high, typically on very hot summer days. When such an occurrence is predicted, SRP schedules what's called an "event." Program participants are notified of the event and have the ability to opt-in to participate. Choosing to participate in an event means the customer agrees to make simple changes to their electricity use for a predetermined amount of time at their home. This could involve reducing air conditioning use, delaying use of large appliances, turning off lights, and running pool pumps during lower-cost hours.

The last strategic conclusion focuses on future technologies. The goal was to collaborate with others to encourage the development of and support for the innovative application of new power generation, load management, and energy storage technologies through active participation in industry research and development organizations. SRP has historically been deeply involved in ongoing research and development programs within the industry. In the fall of 2016, SRP issued a Request for Proposal, or RFP, for large, utility-scale battery storage projects. As a result of that RFP, SRP has executed contracts for two projects. The first is a stand-alone 10 MW battery storage project and the second is a combined solar and battery project, consisting of a new 20 MW solar facility paired with a 10 MW battery installation. These projects will equip SRP with the necessary operational, procurement, and design knowledge to integrate additional utility-scale batteries as the pricing becomes more cost-effective.

The strategic conclusions from the 2013-2014 IRP process have impacted SRP's ongoing system transformation and SRP expects the current IRP process to have similar influences.

2017-2018 IRP Process

For the 2017-2018 IRP, SRP used a rigorous process called scenario planning that is widely practiced across many industries and is used to understand the risks and opportunities with different planning choices. Along with this practice, SRP also employed the expertise of Pace Global, an energy consulting company, to act as an independent reviewer of the assumptions and data inputs used for the analysis. This provided SRP and its stakeholders with validation of the processes and assumptions.

The involvement of SRP's stakeholders was an important part of the IRP process that allowed all participants to benefit from a balanced cross-section of viewpoints. These are members of the community that represented environmental policy, energy efficiency, the solar industry and water policy. Additionally, there were advocates for SRP's customers such as large industrial, commercial and residential, as well as low income groups and Native American interests.

The stakeholders participated in a series of meetings that spanned from January through October 2017 where they were invited to comment and ask questions on the planning materials shared. Their feedback helped to shape the framework of the resource portfolios and scenarios that were used in the analysis, as well as influenced the development of the final conclusions.

In addition to external stakeholders, several members of SRP's Board and Council attended the stakeholder meetings.

SRP used scenario planning, an industry best practice, as the method for investigating possible futures and resource decision-making in the 2017-2018 IRP Process. Pace Global, a third party consultant, performed stochastic sensitivity analysis for the IRP to quantify the risk associated with gas price and carbon cost exposure.

Scenario Planning for Data Analysis and Risk Planning

Long-term scenario planning is a strategic analysis utilized across a broad collection of business, military, and government organizations. Business surveys have demonstrated the popularity of scenario planning. In 2015, Bain Company surveyed 1,067 organizations and of those organizations 60% used or planned to use scenario planning as a fundamental part of their business.[2]

Scenario planning includes the development of diverse future scenarios, uniquely characterized with different market and external conditions. The scenarios are meant to represent wide-ranging paths to assist organizations in evaluating responses to changes in their operating environment. These broad futures are what make the scenario planning process a leading tool in preparing and planning for business disruptions, as focusing on a "base scenario" in strategy development can often leave organizations unprepared for deviations from expected conditions.

Scenario planning is SRP's selected method for the IRP, but SRP utilizes other methods of evaluation for other planning processes. SRP produces a new demand forecast each year, based on then-current market conditions. SRP then determines a near-term resource action plan using the long-term strategic directions from the IRP as a guide for these resource decisions. This resource plan is then evaluated and a near-term financial plan is developed. These results are transparently shared with SRP's Board in public meetings, with elements provided to Western Electricity Coordinating Council (WECC), North American Electric Reliability Corporation (NERC), and Federal Energy Regulatory Commission (FERC) to participate in collaborative regional planning. SRP also performs probabilistic or stochastic modeling to evaluate resource adequacy and the ability to respond to other potential risks.

Scenario Development

The resources SRP invests in today have to withstand the risks and uncertainties of any future. Therefore, SRP chose to include the development of scenarios, or plausible futures, to help simulate how different resource investments will perform in an uncertain future.

Developing a scenario planning exercise starts with identifying the key drivers that will affect SRP's business environment. They are generally considered to be beyond SRP's control, but have a direct or indirect impact on the resource decisions that SRP makes. Questions that the electric utility industry faces include: How are customers going to be using energy in the future? What will the political and economic environments be like? Will fuel prices go up or down? What next-generation technologies will be commercially available? These

[2] Brief, B. (2015, June 10). Management Tools 2015 - Bain & Company, www.bain.com/publications/articles/management-tools-and-trends-2015.aspx.

translate into important drivers that influence SRP: customer demand, environmental regulations, fuel prices, and technology costs.

Scenarios are then developed by creating internally consistent storylines or futures, and translating these drivers into quantifiable assumptions. The scenarios are not designed to be predictive, but rather to represent a broad range of possibilities. In this way, decisions that SRP makes in terms of resource choices can be tested against a wide swath of futures to analyze which resource strategies work best inmost futures, and to help SRP identify tradeoffs. The scenarios created for the 2017-2018 IRP are called Breakthrough, Roller Coaster, and Desert Contraction.

Scenario 1: Breakthrough

This scenario is characterized by ever-increasing technological advancement, economic stability, and significant changes in customer behavior. SRP's customer growth continues at a moderate and steady pace to provide for overall increases in energy consumption, but a generational shift upends many current norms and expectations of consumer behavior. While electric vehicles are purchased at a rate equal to that of standard cars, customers produce an even larger share of their shrinking per-customer energy requirements due to efficiency improvements, more widespread adoption of renewable technologies and batteries, and increasing housing density. Global climate change receives national policy support for carbon emission reductions in line with the Paris Agreement. Technological advances allow for significant reductions in photovoltaic and battery costs and some reductions in the cost for other renewable technologies. Similar expansion of natural gas extraction technology allows for expanding global gas supply, easily meeting or outpacing natural gas from the energy sector to prevent significant price increases.

Customer Demand	• Overall energy consumption increases
Natural Gas Prices	• Supply chain efficiencies lead to long term low price stability
Environmental Costs	• National carbon policy adopted
Economy	• Southwest population growth rates remain high, near historic norms
Technology Costs	• All renewable costs decline • Solar and battery costs decline significantly

Scenario 2: Roller Coaster

This future is defined by volatility. While the drivers come from various forces, a new economic cycle hits about every ten years, beginning with a global economic contraction in 2025. Each cycle rivals the 2000-2010 decade in impact on SRP's operations, including both dramatic growth and slightly negative growth. The impact of each cycle is magnified by a highly leveraged economy and increasingly polarized political sphere, which causes swings in policy which does not provide the consistency necessary to implement and enforce any national climate policy. Stop-gap negotiations between the EPA and power plant owners perpetuate long-term uncertainty about continued operation of coal fired power plants. Commodity prices, including natural gas, regional housing markets, and other economic indicators experience strong cyclical bubbles and gluts as uncertainty prevents supply growth from matching the timing of demand growth. This oscillation impacts the costs for construction of renewable and thermal generation technologies.

Customer Demand	• Cyclical ups and downs correlating with the economy
Natural Gas Prices	• Supply and demand imbalance provides pricing volatility, similar to historic norms
Environmental Costs	• No new policies are adopted • No existing policies are repealed
Economy	• Varying housing cycles affect growth • Employers slow to hire after layoffs
Technology Costs	• No significant long-term decrease • Dependence on fluctuating commodity prices

Scenario 3: Desert Contraction

The final scenario describes a southwestern U.S. that is particularly affected by climate change. Persistent higher temperatures and less rainfall lead to significant drought events that impact both the Colorado and Gila River watersheds. Longer periods of heat advisories and higher fall temperatures negatively impact the year-round residency rates. Electric vehicles do not gain a significant share of the new car market. Increases in efficiency further reduce each customer's energy consumption. New high water prices and conservation mandates inhibit recruitment of new industry. In addition, global competition and consolidation initiates the exodus of several large industrial loads, along with their associated employees from Arizona. The population growth plateaus in Arizona until 2030 when the local climate and lost jobs have a severe effect on Arizona's economy. National climate policy responds strongly to the conditions seen in the Southwest, with high carbon costs leading to widespread coal generation retirements and increases in natural gas demand, which pushes natural gas prices higher. All new generation requires dry cooling, with the exception of effluent (a high-priced commodity) for nuclear generation.

Customer Demand	• Flat energy demand • Peak demand increases due to severe summer
Natural Gas Prices	• Coal retirements increase natural gas demand • Increase in natural gas prices
Environmental Costs	• Aggressive national carbon and water policy
Economy	• National growth bypasses southwest • Large employers leave
Technology Costs	• Slight decreases
Water	• Restricted for all sectors

These scenarios are designed to capture the broad potential of plausible future worlds. They are not meant to predict any particular future; however, they test significant ranges in the key drivers that will have the greatest influence on how robust SRP's generation portfolio choices will be in each future, including gas prices, load forecasts, and future cost assumptions for both mature and emerging technologies.

Portfolio Development

While SRP cannot predict the future or control future drivers, SRP does control the resource decisions made. When the load grows, or older resources retire, SRP must select a resource option to serve customer demand, or in some cases, reduce customer demand. Each resource choice comes with a set of different tradeoffs. These tradeoffs include capital cost, operational cost, environmental impacts, water use, reliability, and asset life.

Much like scenarios, SRP designed future resource portfolio themes that focus on a wide range of resource options. The goal for the IRP is not to pick a preferred portfolio, or compare with a “base-case”, but rather to test these themes against each possible future scenario to identify the resource strategies that work well under most cases. The four chosen portfolio themes are Aggressive Renewables, New Nuclear, Asset Preservation, and Natural Gas Emphasis.

Aggressive Renewables

The first portfolio retires the entirety of the existing coal generation stations (more than 3,000 MW) in SRP’s current portfolio by calendar year 2038. Replacement resources are heavily influenced by renewables including wind, solar photovoltaic, and geothermal generation. This portfolio is unique compared to the other portfolios due to the fact that this portfolio was designed to meet the specified target of meeting 50% of retail load with renewable energy by fiscal year 2037. To support aggressive amounts of renewables, natural gas peaking units are also added to the portfolio, in addition to 1,000 MW of batteries. In conjunction with these generation resources, this portfolio also carries the highest level of demand response (DR) programs and energy efficiency (EE). This portfolio was tested in a simulation model to meet the 50% renewable energy target; however, the actual pursuit of such a portfolio would require extensive operational level, transmission system, and regional market analysis to test the true feasibility. Note that the EE in the portfolio only captures that which SRP incentivizes and takes into consideration the persistence of energy savings.

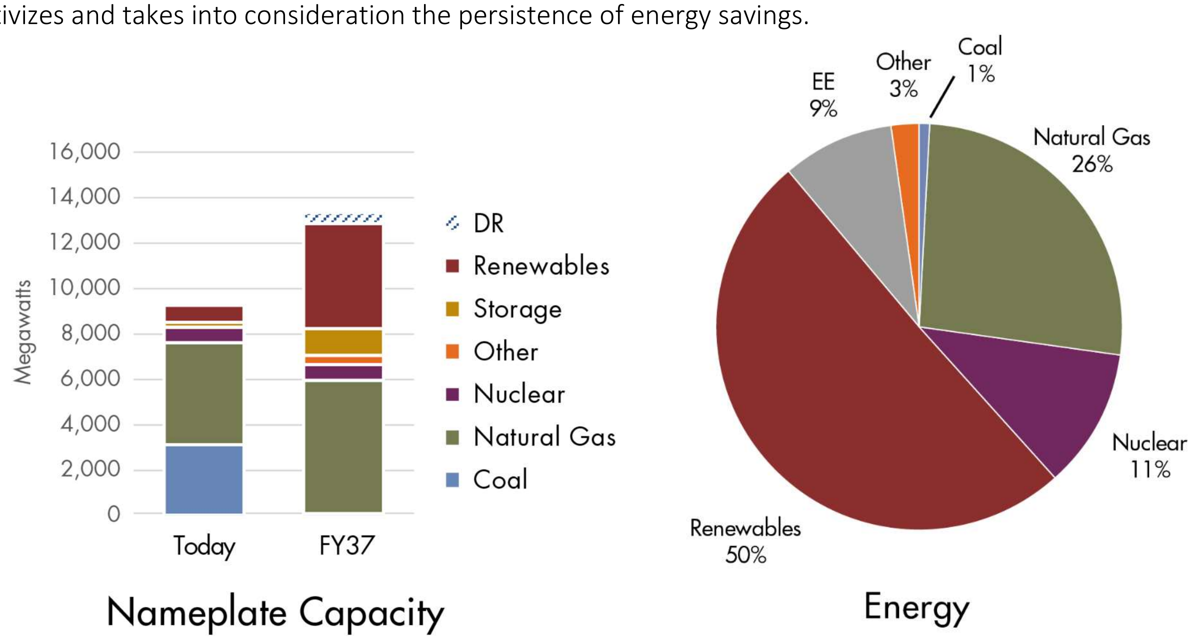


Figure 4 - Aggressive Renewables Portfolio Nameplate Capacity Additions & Energy Sources, Roller Coaster Scenario, Fiscal Year 2037

New Nuclear

The second portfolio retires 50% of the existing coal generating stations by the calendar year 2038. Replacement resources include natural gas peaking units, but also include two 250-MW blocks of nuclear generation. It takes up to 15 years or more to site, permit and construct a new nuclear facility, so the first block of nuclear generation comes online in FY36, the second in FY40. Renewables, natural gas peaking, and moderate energy efficiency and demand side programs also meet a portion of load growth.

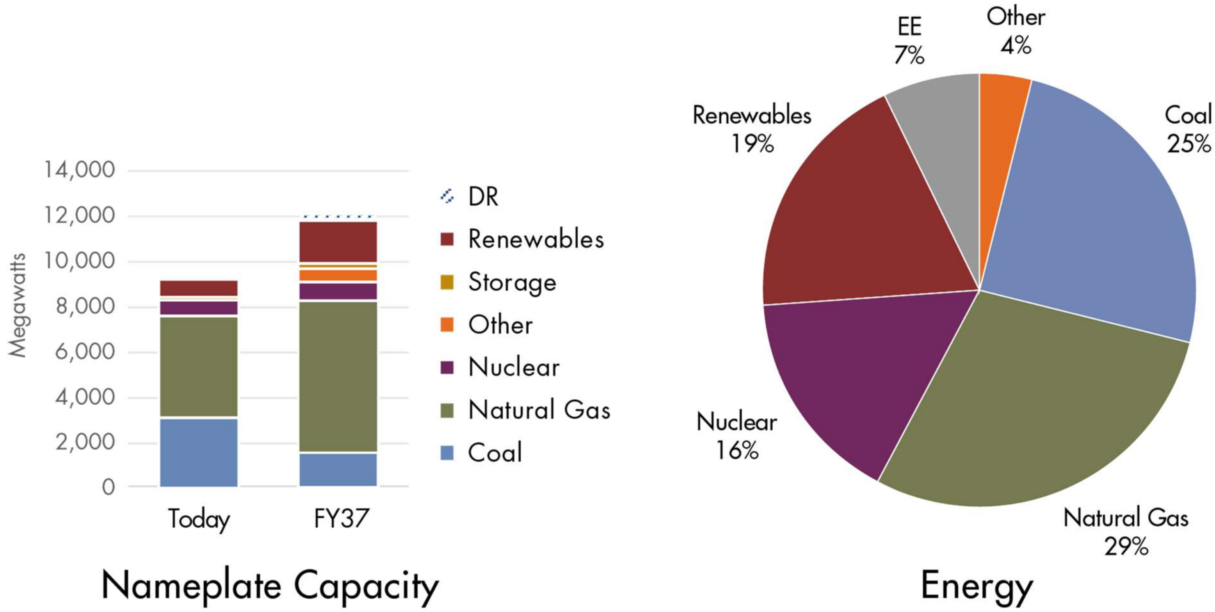


Figure 5 – New Nuclear Portfolio Nameplate Capacity Additions & Energy Sources, Roller Coaster Scenario, Fiscal Year 2037

Asset Preservation

New resource choices require capital investment. The third portfolio focuses on limiting new capital investment by maintaining existing assets and minimizing retirements outside of the currently announced coal generating stations (NGS and Craig Unit 1). Load growth in this portfolio is met with a combination of renewables and natural gas peaking units. Demand side and energy efficiency programs reflect moderate assumptions.

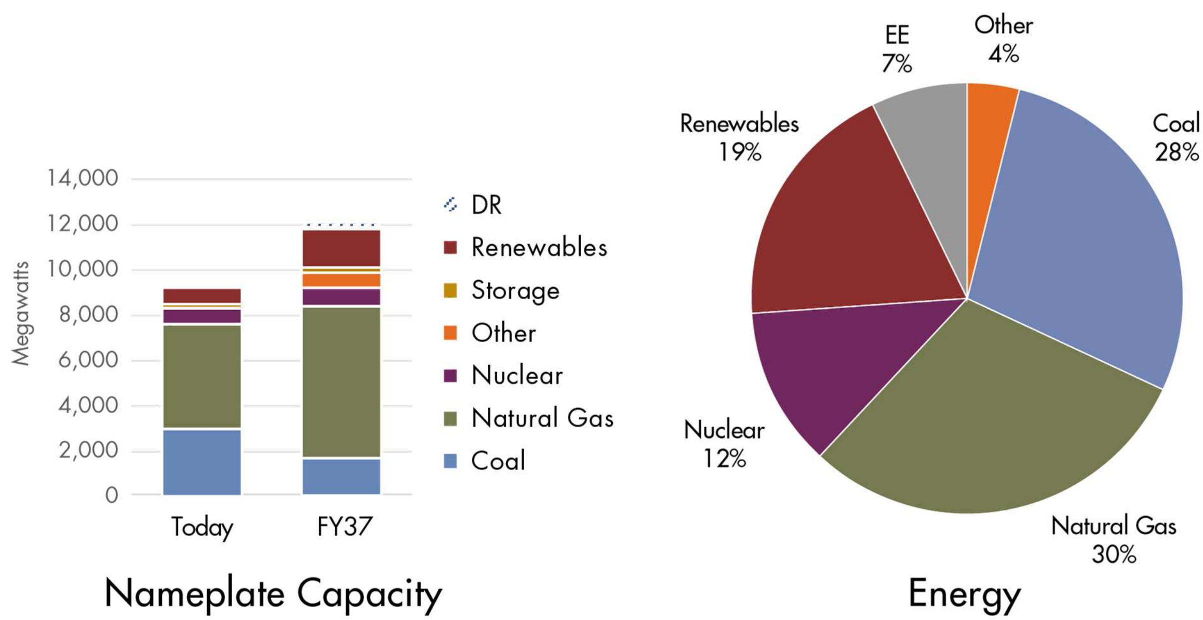


Figure 6 – Asset Preservation Portfolio Nameplate Capacity Additions & Energy Sources, Roller Coaster Scenario, Fiscal Year 2037

Natural Gas Emphasis

The last portfolio retires 90% of the existing coal generation stations by calendar year 2038. Replacement capacity is met by combined cycle natural gas plants. Future load growth is met by a combination of natural gas peaking and renewable generation. Demand side and energy efficiency programs reflect moderate assumptions.

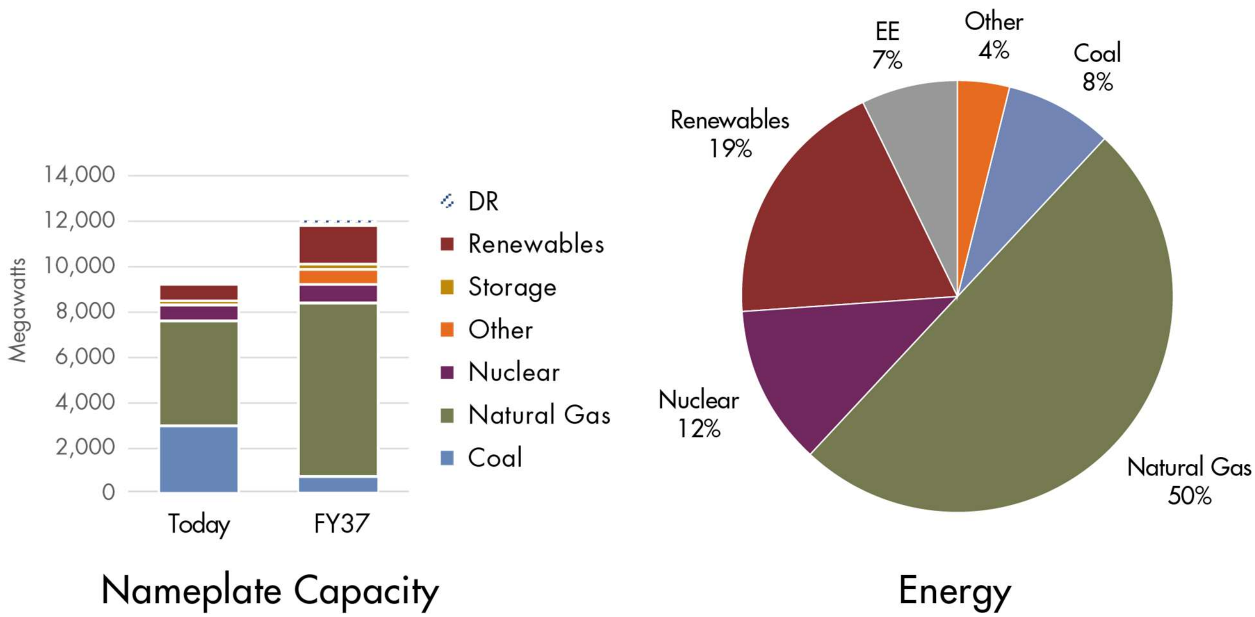


Figure 7 – Natural Gas Emphasis Portfolio Nameplate Capacity Additions & Energy Sources, Roller Coaster Scenario, Fiscal Year 2037

All of these portfolios follow the guidelines of the 2013-2014 IRP conclusions, which is to develop a more diverse and less carbon-intensive portfolio. By testing these portfolio themes, SRP can develop resource strategies to determine which paths work well under most futures.

Analysis and Results

To test the four resource portfolios, each portfolio is considered in light of the three future scenarios by inputting load forecasts, gas price forecasts, demand side programs, carbon costs, technology costs, and resources into a cost production modeling software. These combinations of portfolios and scenarios represent twelve distinct model simulations. The simulations analyze every hour over the twenty-year planning horizon and optimize how the generating fleet serves SRP customers' energy needs. The analysis measured the performance of the portfolios through key planning metrics including costs, environmental stewardship, and reliability.

The results include forecasted energy mixes for each of the twelve cases. Figure 8 compares these forecasted cases with the projected FY18 energy mix. One noticeable outcome is that bar heights differ within a portfolio. This is a result of the different load forecasts input for each scenario. The Breakthrough Scenario forecasts the most energy sales in FY37, whereas Desert Contraction anticipates the least.

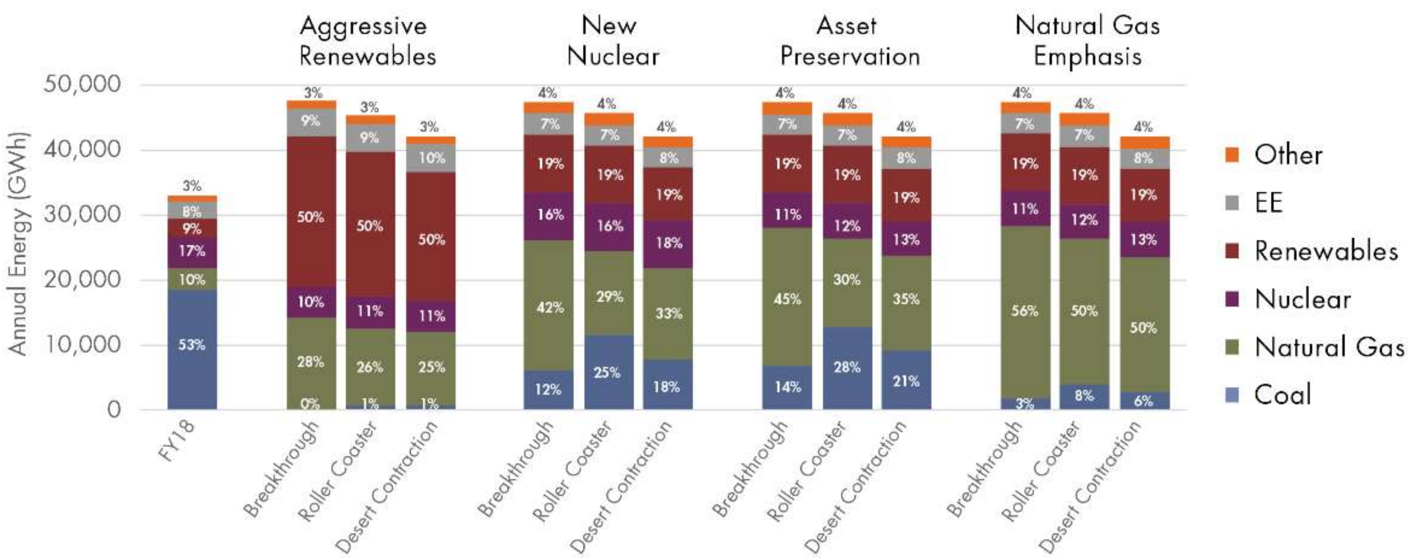


Figure 8 - Fiscal Year 2037 Retail Energy Mix Comparisons

The energy mix results of each portfolio meet the targeted portfolio themes design: Aggressive Renewables Portfolio meets 50% of energy needs with renewable resources; the New Nuclear Portfolio installs a block of 250 MW of nuclear generation online by FY37, the Asset Preservation Portfolio has the most coal generation available in FY37, and the Natural Gas Emphasis Portfolio produces the most energy from natural gas resources.

In every case resource diversity tends to increase by FY37, generation from coal resources is a smaller percentage of the resource mix and a smaller total energy output, and generation from flexible natural gas resources plays a larger role.

SRP evaluated the performance of these twelve cases through the lens of each of the following metrics: total cost, fixed cost, carbon intensity, water intensity, total coal ash and natural gas utilization to learn about the performance and tradeoffs of the four portfolios.

Total Cost

Total cost is the metric that measures the cost to operate SRP's generating system through FY37. Total cost includes items like fuel expenses, carbon costs, operating expenses, demand-side program expenses, capital costs, new resource system integration costs, decommissioning obligations, and taxes. The total costs metric is meant to provide guidance as to what the real world implications could be for various resource decisions. The metric of total cost is important from a financial and reliability perspective. The costs that are incurred are a direct result of meeting customers' needs reliably. The total costs can vary widely between different scenarios and portfolios. These costs affect when and how much SRP is required issue new bonds and change prices. As a result, it is important that SRP make wise investment decisions to maximize the value of the energy provided.

Total cost is shown in Figure 9. The Asset Preservation Portfolio is the least expensive portfolio in each scenario, although the cost differences between the Asset Preservation Portfolio and the next-least expensive portfolio are relatively small. The Aggressive Renewables Portfolio is the highest cost portfolio in two of the three scenarios. This may seem counterintuitive given the recently reported low cost of renewable energy technology and the expectation that those costs will likely continue to decline. The cost driver in this instance is the inability of low cost renewable energy to produce power over the peak system hours. The lowest cost renewable energy resource is solar; however, on the hottest summer days, the system demand reaches its highest point late in the afternoon when solar output is dropping due to the setting of the sun. This means that another resource must be added to the system to provide power over the peak system hours. In a more traditional resource portfolio, SRP would rely primarily on natural gas-fired generation to provide that service. However, in an aggressive renewables portfolio, battery storage and other more expensive renewable energy technologies that are capable of providing power over the peak system hours need to be add to the system. Such technologies include geothermal and biomass power. As battery technology matures, the additional costs of an aggressive renewables portfolio will decline; SRP's strategic conclusions account for this possibility.

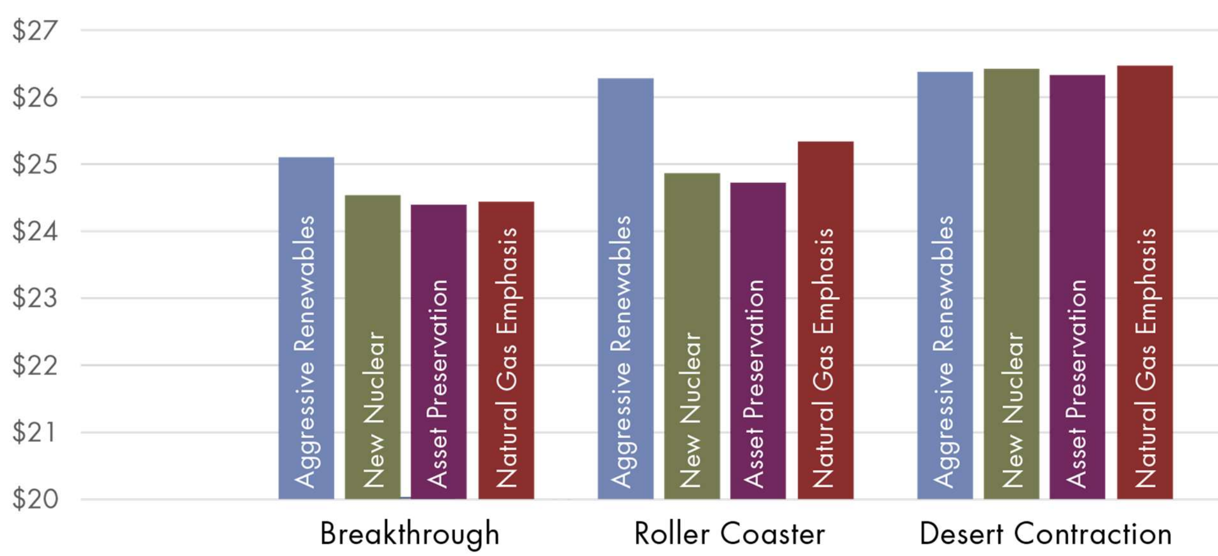


Figure 9 - Total Cumulative Costs through Fiscal Year 2037, $Billions, Present Value

The comparisons in Figure 9 demonstrate total cost in absolute dollars, but each scenario has a different load forecast. For example, the Desert Contraction scenario produced the highest costs for each portfolio, even though energy sales in the Desert Contraction scenario are lower than the other two scenarios. To better understand this relationship, Figure 10 shows SRP's cost per MWh (a unit of energy sales) in FY37. In every case, the real cost to SRP for energy in 2037 is higher than the cost for energy today.

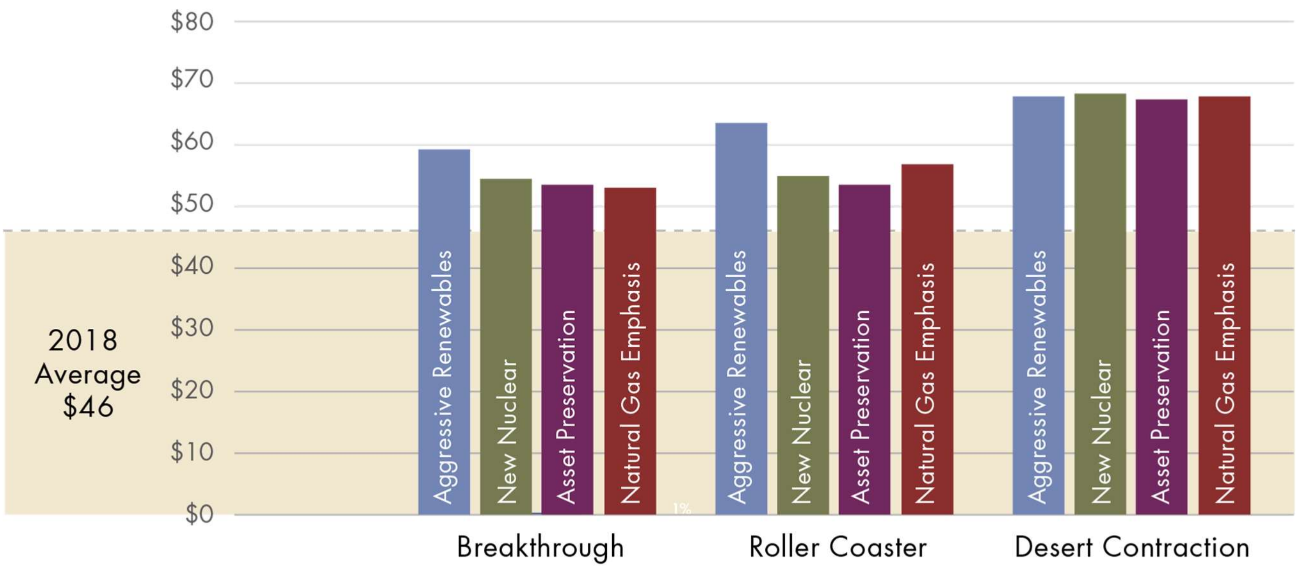


Figure 10 - Total Cost per MWh in Fiscal Year 2037 Compared to FY2018 Average Cost per MWh, in 2017 dollars

SRP analysis indicates that the cost advantage from preserving existing assets is not dramatic relative to other resource options. Also, a 50% renewable energy portfolio is not a least-cost resource mix based on current cost assumptions, even with substantial carbon benefits. While all portfolios include substantial investment in renewable energy resources, the aggressive renewable portfolio required more expensive technologies, such as geothermal, to meet the prescribed 50% renewable energy target. As a result, SRP analysis indicates that a prescribed renewable energy target does not consistently produce lowest-cost energy.

Fixed Costs

Fixed costs include the costs that are incurred independent of how much a plant is operated. This includes plant development costs, fixed operating and maintenance costs, and fixed payment for power purchase agreements. The risk associated with high fixed costs means SRP could pay for resources that are not providing benefits to serve customer demand as planned. While the predictability of fixed costs has served SRP well in prior decades, minimizing fixed expenses preserves SRP's financial flexibility to respond to changing market conditions.

Figure 11 illustrates cumulative fixed expenses (with capital amortization) through FY37. An amortized expense spreads capital costs, associated with development and construction, over the life of the plant. The Aggressive Renewables Portfolio has the largest amount of fixed costs. The reason being is that certain renewable resources, such as wind and solar, have very low operating costs and the vast majority of their costs are incurred prior to or during construction. Therefore, they have low operating costs, but high fixed costs. The other portfolios are comparable, although the Asset Preservation Portfolio is slightly lower due to the utilization of existing resources to minimize new construction costs.

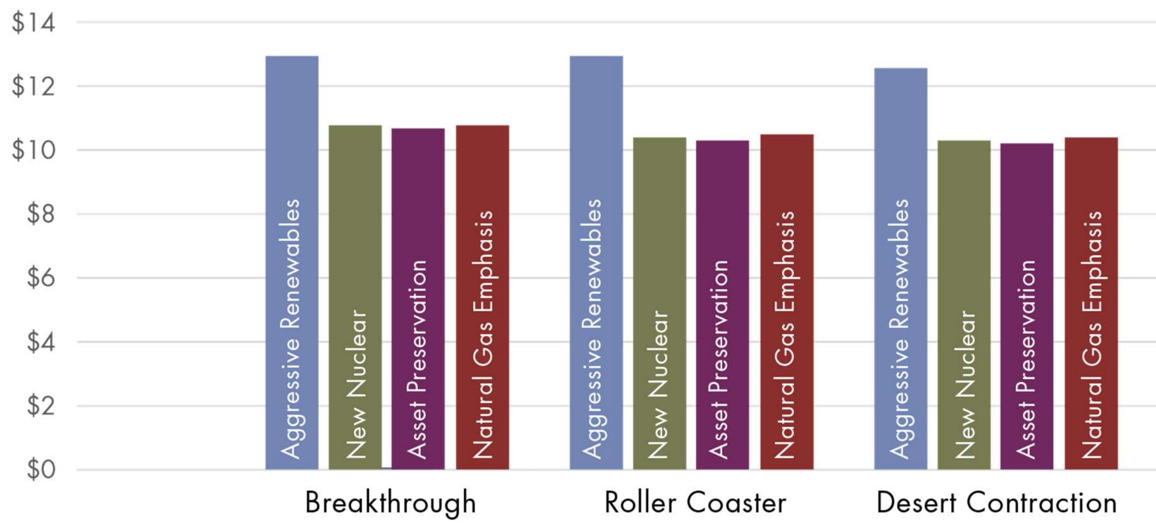


Figure 11 - Fixed Costs, Amortized Capital, Cumulative Present Value through Fiscal Year 2037, $Billions

Figure 12 represents an expensed capital fixed cost valuation, which means costs are recognized as they are incurred instead of being expensed over the life of the plant. The largest difference between the amortized and expensed capital cost valuations is in the New Nuclear Portfolio, which has substantial fixed capital costs related to the construction of new nuclear generation. This reflects the large financial commitment associated with new nuclear generation. While the expense would ordinarily be amortized over the life of the facility, this expensed view highlights the financial risk if the facility does not operate for the full planned life of the plant.

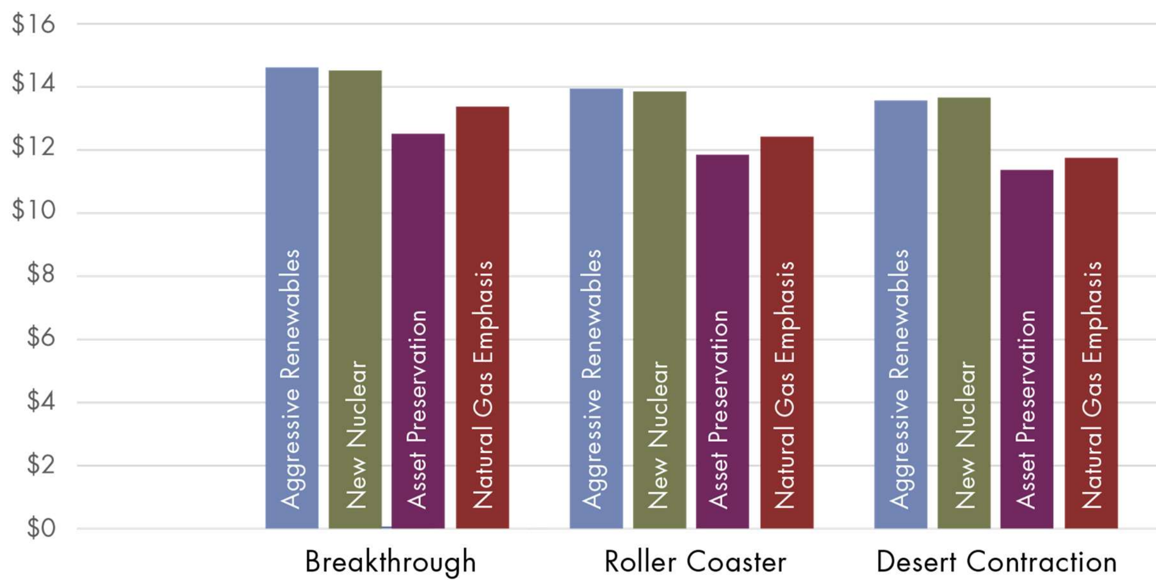


Figure 12 - Fixed Costs, Expensed Capital, Cumulative Present Value through Fiscal Year 2037, $Billions

Carbon Intensity

While all other metrics are measured based on a 20-year planning horizon associated with the IRP, carbon intensity is compared to a previously adopted SRP carbon target. SRP measures the overall carbon intensity of its system as a key planning metric.

During the 2013-2014 IRP process, SRP adopted a goal to reduce carbon intensity 40% from fiscal years 2014 to 2043. The FY14 historic carbon intensity, as well as the FY43 target is shown as vertical lines in Figure 13.[3]

Figure 13 demonstrates the carbon intensity range of each portfolio. This range is driven by the scenario in which the portfolio is simulated. Only the Asset Preservation Portfolio does not meet the 2043 carbon intensity target, even when simulated under the Desert Contraction conditions that incorporates substantial carbon costs. In the New Nuclear Portfolio, replacing 500 MW of capacity with new nuclear meets the carbon intensity target, so long as a carbon tax is in place, such as in the Desert Contraction and Breakthrough scenarios. The Aggressive Renewables and Natural Gas Emphasis Portfolios each retire most or all of SRP's coal assets, and that reduction in carbon allows both portfolios to easily meet SRP's 2043 target.

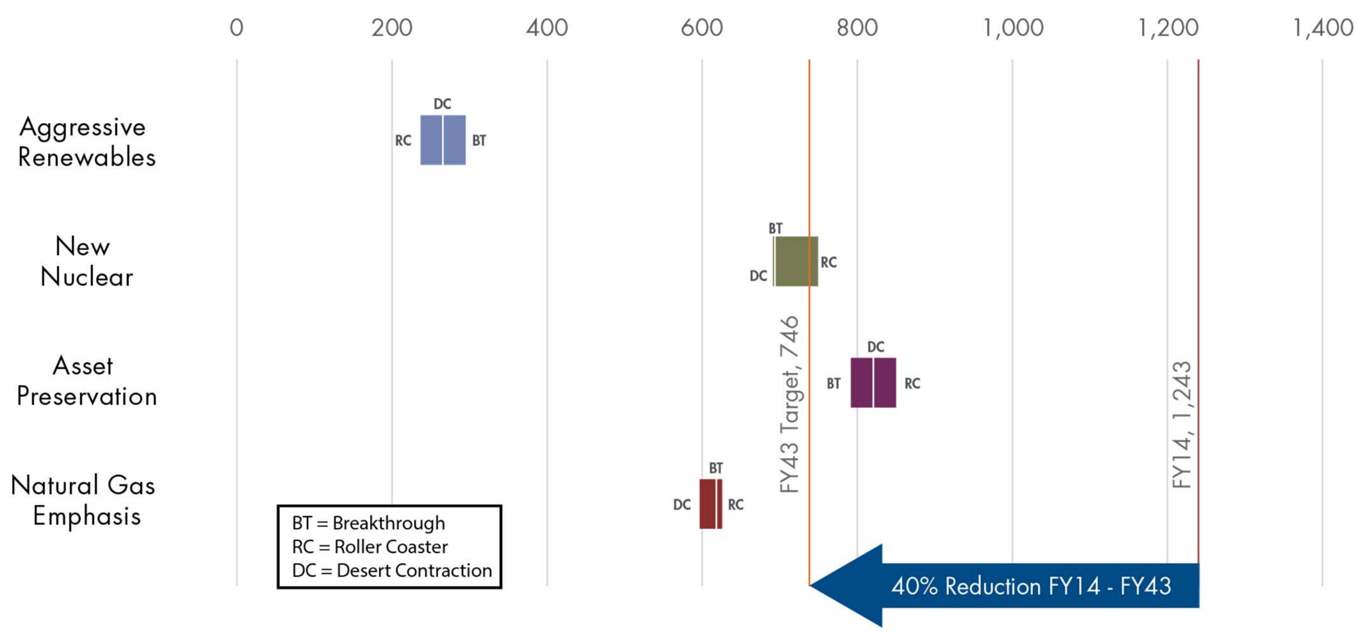


Figure 13 – Fiscal Year 2043 Carbon Intensity (pounds of CO2/MWh)

[3] During the 2017-2018 IRP process, the SRP Board of Directors approved the SRP 2035 Sustainability Framework and Goals (SRP 2035). This includes accelerating the previous goal of reducing its CO2 emission rate as measured on a pounds of CO2 per MWh basis by 40% by 2043 with a requirement to reach a similar emission rate of 728 pounds per MWh by 2035. This represents an additional 18% reduction in CO2 emission rate by 2035 relative to the former goal. The IRP analysis was performed and measured based on the 2043 goal, but moving forward carbon intensity will be measured and compared to the new 2035 goal of 35% by 2035 from a 2016 basis.

Water Intensity

While SRP has not established a water intensity target, benchmarking these simulations will facilitate development of goals that focus on water intensity reduction.

Figure 14 demonstrates that the FY18 level of water intensity is 475 gallons per MWh, and water intensity per MWh is reduced in every portfolio tested. SRP believes that newly constructed gas generation in Arizona is likely to rely on air cooling rather than water-based cooling. Therefore, future gas generation constructed to meet growing demands or replace retired capacity will allow for the reduction in SRP's water intensity.

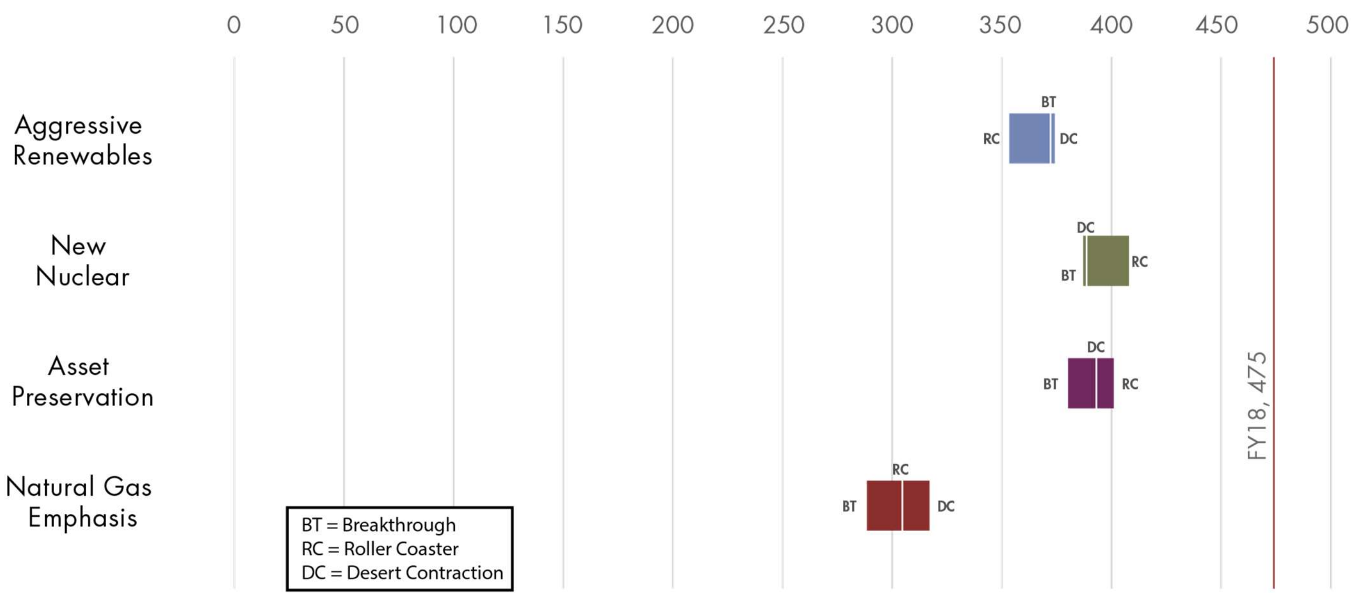


Figure 14 – Fiscal Year 2037 Water Intensity (gal/MWh)

The reliance on new, dry-cooled gas generation in the Natural Gas Emphasis Portfolio produces a lower water intensity than the other three portfolios. Water intensities in Aggressive Renewables, New Nuclear and Asset Preservation are influenced by their reliance on water-based cooling for geothermal, nuclear, and coal assets.

Coal Ash

When coal is used as a fuel, a portion of burned coal becomes ash. SRP actively looks for opportunities to market the ash products for recycling, as some of it can be used in building materials. The remainder is stored in dry landfills. As seen in Figure 15, a portfolio's reliance on coal generation is very strongly related to the amount of coal ash that is produced. As SRP's coal reliance decreases from current levels in every portfolio, coal ash production also decreases.

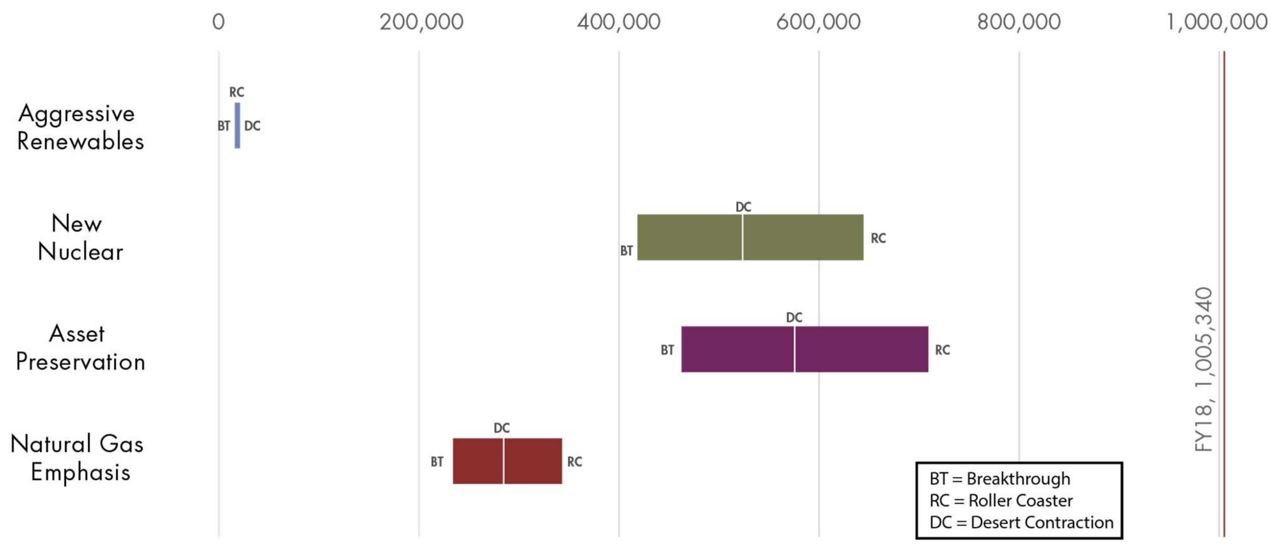


Figure 15 - Fiscal Year 2037 Coal Ash (Tons)

Natural Gas Utilization

Because natural gas prices have fluctuated historically, natural gas burns can be an indicator of market exposure and price instability.

Figure 16 illustrates that every portfolio uses substantially more gas than SRP uses today, which means total expenses will be more heavily influenced by the gas markets.

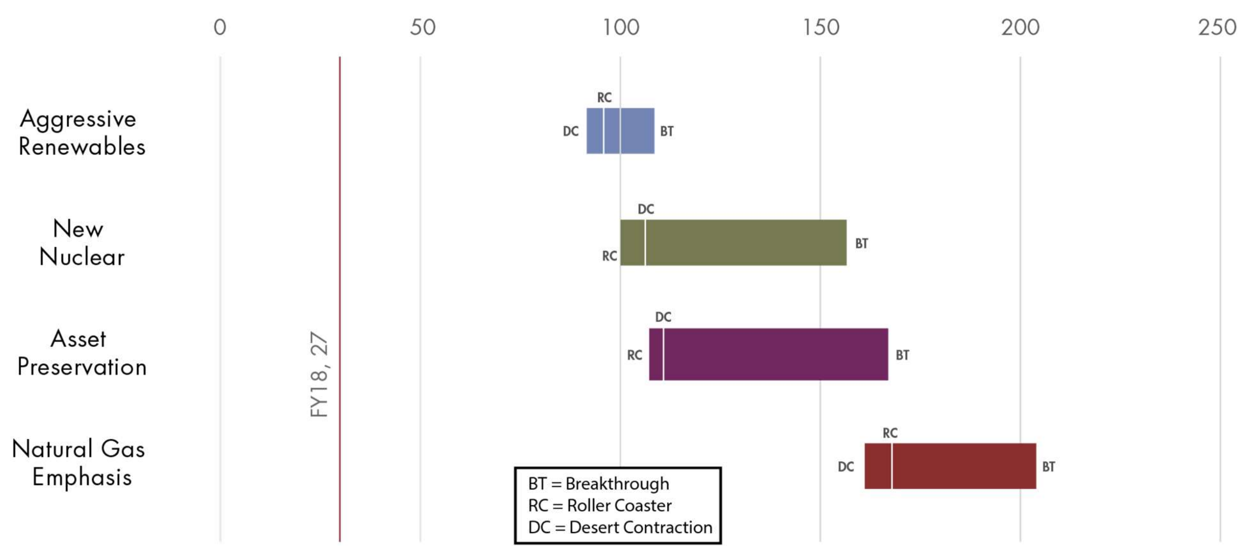


Figure 16 - Fiscal Year 2037 Natural Gas Consumption (Millions of MMBTUs)

Discussion of Sensitivity Analysis

During SRP's discussion of initial results with stakeholders, two primary concerns were communicated to SRP staff. First, stakeholders were concerned that SRP's low demand growth assumption in the Desert Contraction scenario was too high in the mid-term to capture the characteristics of a true low-growth environment. Second, stakeholders were concerned that reliance on geothermal generation in the Aggressive Renewables Portfolio was influencing high water consumption and high costs. To be responsive to stakeholder input, SRP ran sensitivity cases that alter those assumptions. These cases were designed to test the robustness of the conclusions from the 12 previous cases and to provide any additional insights.

Low-Growth Sensitivity Scenario

Figure 17 illustrates the four additional cases run to test sensitivity to the load growth assumption. By design, the Aggressive Renewables Portfolio still achieves 50% renewable energy. In other cases, each portfolio maintains its characteristics within the low-growth sensitivity scenario. Under the low growth assumption, the percentages of renewables and nuclear increase in New Nuclear, Asset Preservation and Natural Gas Emphasis Portfolios because these technologies were installed as a fixed level of capacity.

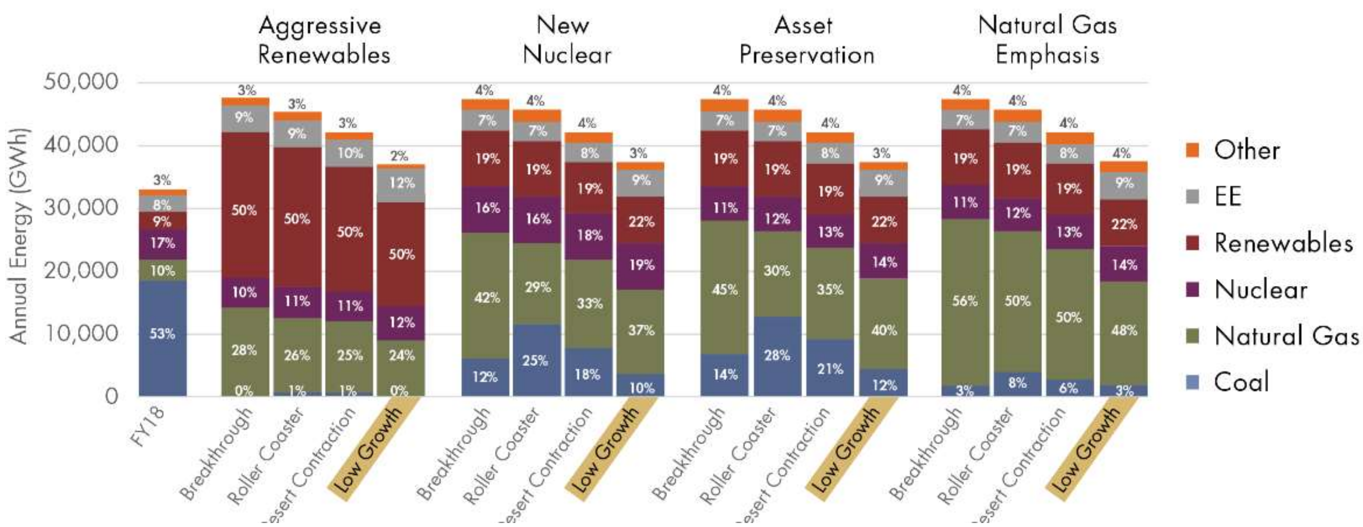


Figure 17 - Fiscal Year 2037 Retail Energy Mix Comparisons Including a Low Load Growth Sensitivity Scenario

SRP analysis concluded that several metrics were not considerably influenced by the growth assumption. This included water intensity, FY37 cost per MWh, and fixed cost metrics. Measures strongly correlated with the amount of energy produced were strongly influenced by a lower energy assumption. These metrics include total costs and total carbon emissions.

Another discovery is that low energy growth facilitates lower carbon intensity, as illustrated by the yellow diamonds in Figure 18. This is because New Nuclear, Asset Preservation and Natural Gas Emphasis portfolios maintained a constant capacity of new renewable resources, and additional growth is generally served by new gas generation, which brings up the average carbon intensity by emitting approximately 870 to 1100 pounds per MWh. Since renewables maintain a constant capacity in the portfolios they represent a larger share of the resources in low load growth scenarios, lessening the need for natural gas generation from an energy perspective.

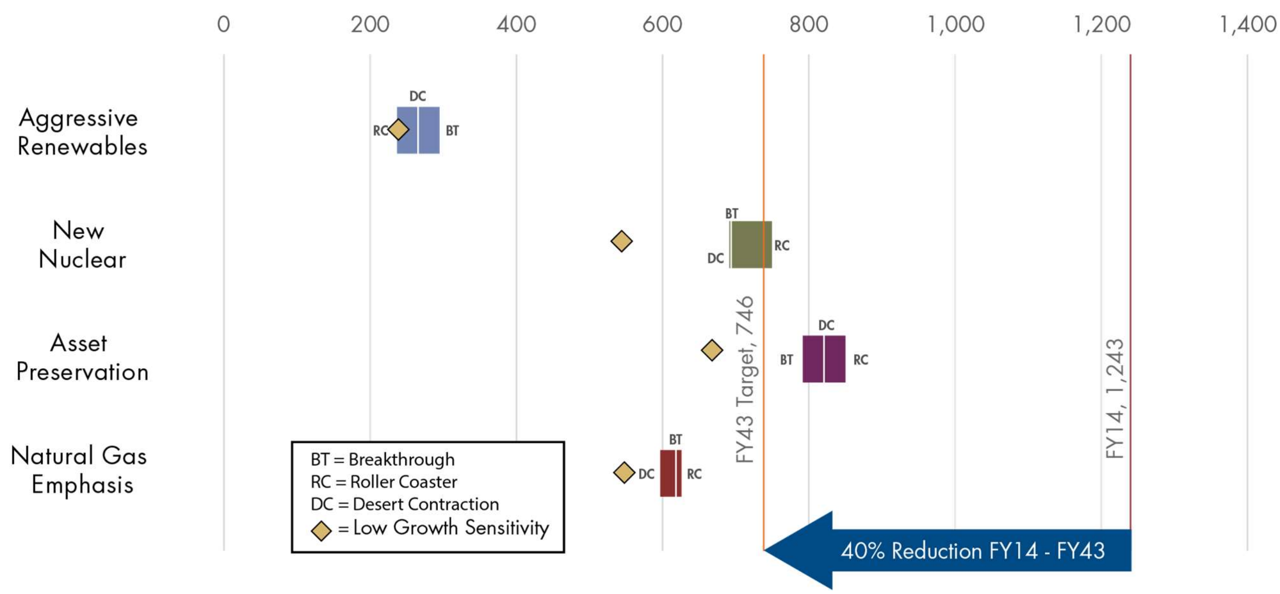


Figure 18 – Fiscal Year 2043 Carbon Intensity Including a Low Load Growth Sensitivity Scenario (lbs./MWh)

This sensitivity analysis indicates that the previously-discussed conclusions are generally consistent with a lower growth rate assumption, except that low growth may allow SRP to meet the 2043 carbon intensity goal without additional coal retirements.

As illustrated by the yellow diamonds in Figure 19, each portfolio's total carbon emissions can be reduced significantly in the low growth sensitivity scenario compared to the three scenarios. Because scenarios demonstrate external business drivers that are not under SRP's control and total carbon emissions are so heavily influenced by scenarios, SRP believes that total carbon emissions is not the most effective metric to demonstrate system transformation or SRP's effectiveness as an environmental steward. However, given the wide variety of positive growth assumptions, it is notable that SRP anticipates lower total carbon emissions in FY37 than present levels in all future cases.

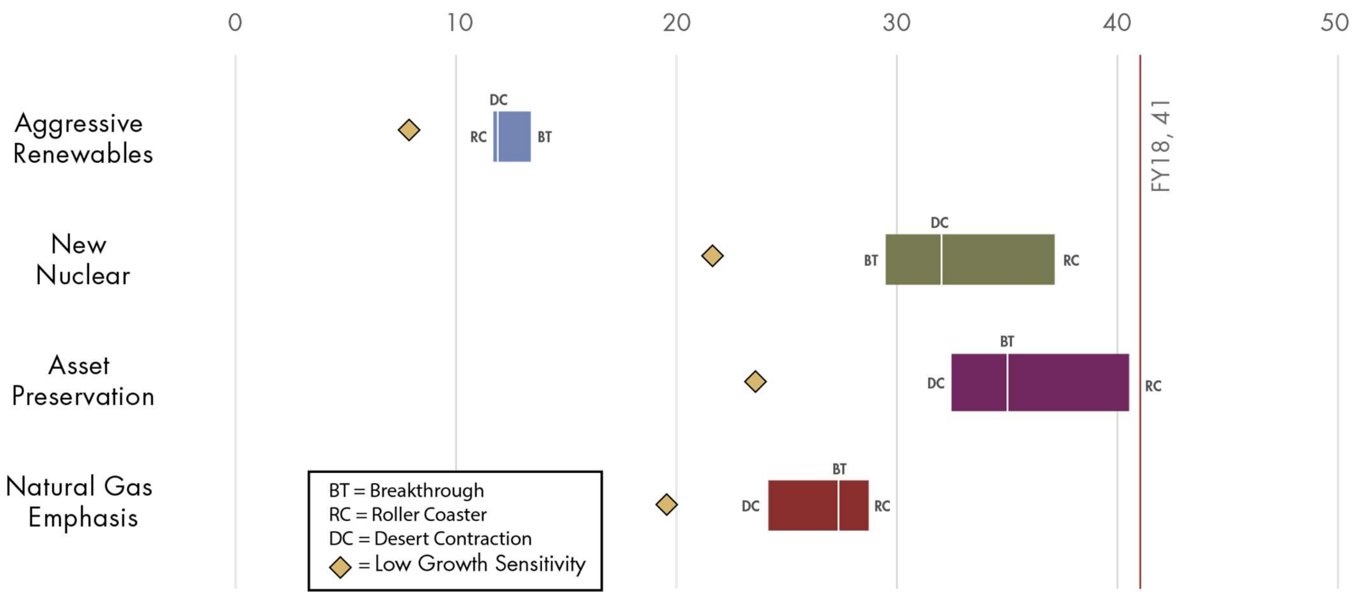


Figure 19 – Fiscal Year 2037 Total Carbon Emissions including a Low Load Growth Sensitivity Scenario (Billions of Pounds)

Renewable Selection Sensitivity Portfolio

To test the sensitivity of renewable technology selection, SRP removed roughly 600 MW of geothermal generation from the Aggressive Renewables Portfolio and added approximately 1500 MW of wind by Fiscal Year 2037. SRP found that several metrics are not sensitive to renewable portfolio selection, including carbon intensity, total carbon emissions, and coal ash.

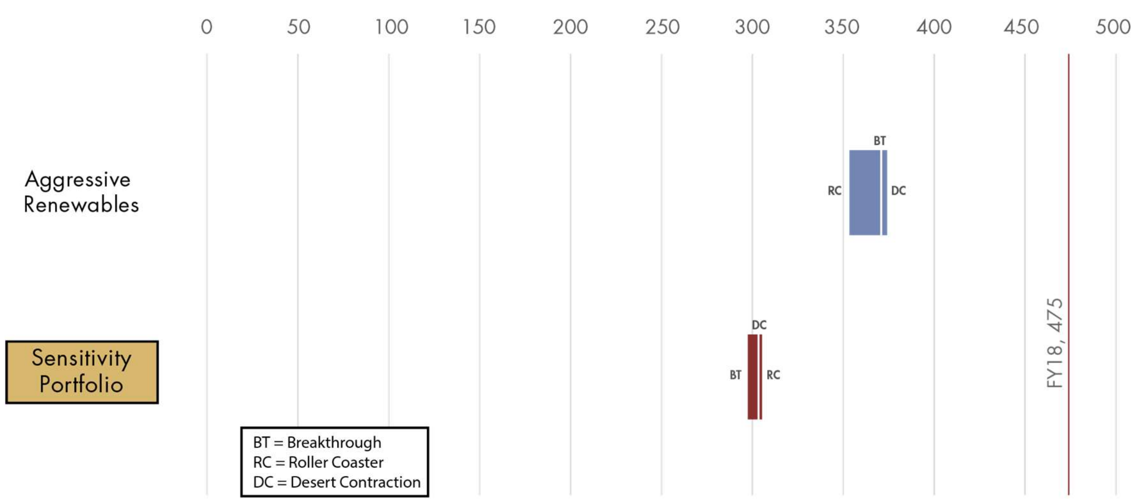


Figure 20 – Fiscal Year 2037 Water Intensity for Aggressive Renewables Portfolio and the Renewable Technology Selection Portfolio (gallons/MWh)

However, as Figure 20 illustrates, water intensity is sensitive to renewable technology selection. The Aggressive Renewables Portfolio includes a large amount of geothermal, which is water cooled. Replacing this geothermal with wind reduces water intensity. Wind is also cheaper than geothermal energy, therefore the sensitivity portfolio is $60 to $200 million cheaper than the Aggressive Renewables Portfolio, though the relative positioning of portfolios is not substantially effected, as shown in Figure 21.

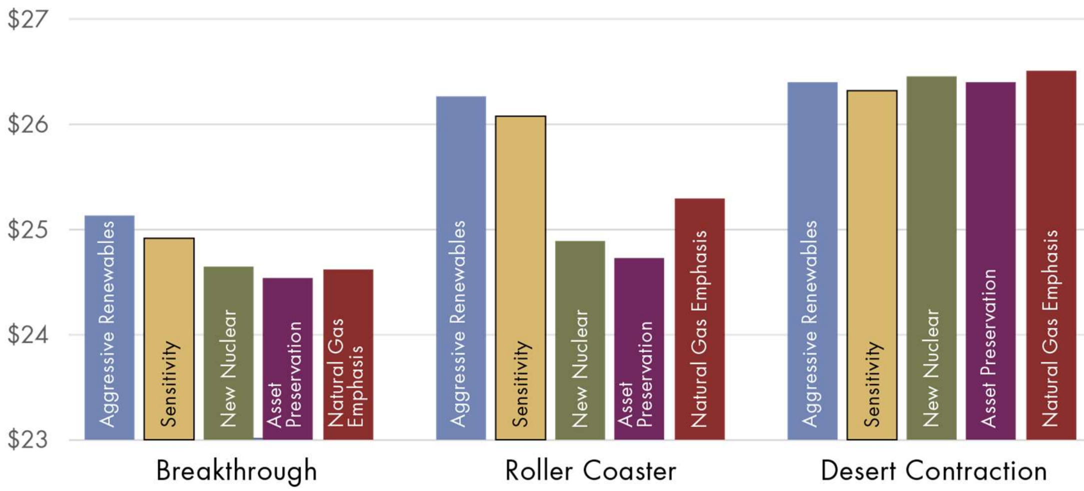


Figure 21 – Total Cost through Fiscal Year 2037 Including Renewable Technology Selection Portfolio (Present Value, $Billions)

These results suggest that SRP consider equally all renewable technology as it pursues more renewable generation. Different technologies will provide different cost characteristics, energy profiles, and may have different environmental impacts. Given this consideration, however, the conclusions from the previously-discussed results are consistent with a portfolio with a different renewable technology ratio.

Discussion of Stochastic Analysis

Because of time constraints, SRP engaged a third party consultant, Pace Global, to perform sensitivity analyses to quantify the risk associated with gas price and carbon cost exposure, concurrent with SRP's own sensitivity analysis above. For inputs, Pace Global was asked to replace the standard IRP assumptions with a range of expected natural gas prices and carbon costs. While scenarios were designed to provide bookends to evaluate a wide variety of economic impacts, Pace Global used distributions across stochastic iterations to analyze the effect over a continuum of values.

The distributions in Figure 22 reflect Pace Global's view on reasonably expected values. These distributions were used to validate natural gas prices or carbon costs assumption in the IRP analysis. The randomly selected input was run through a regional model to determine how SRP's cost of production would change within the Roller Coaster Scenario for the Aggressive Renewables, New Nuclear and Natural Gas Emphasis Portfolios. The sensitivities are illustrated in Figure 23.

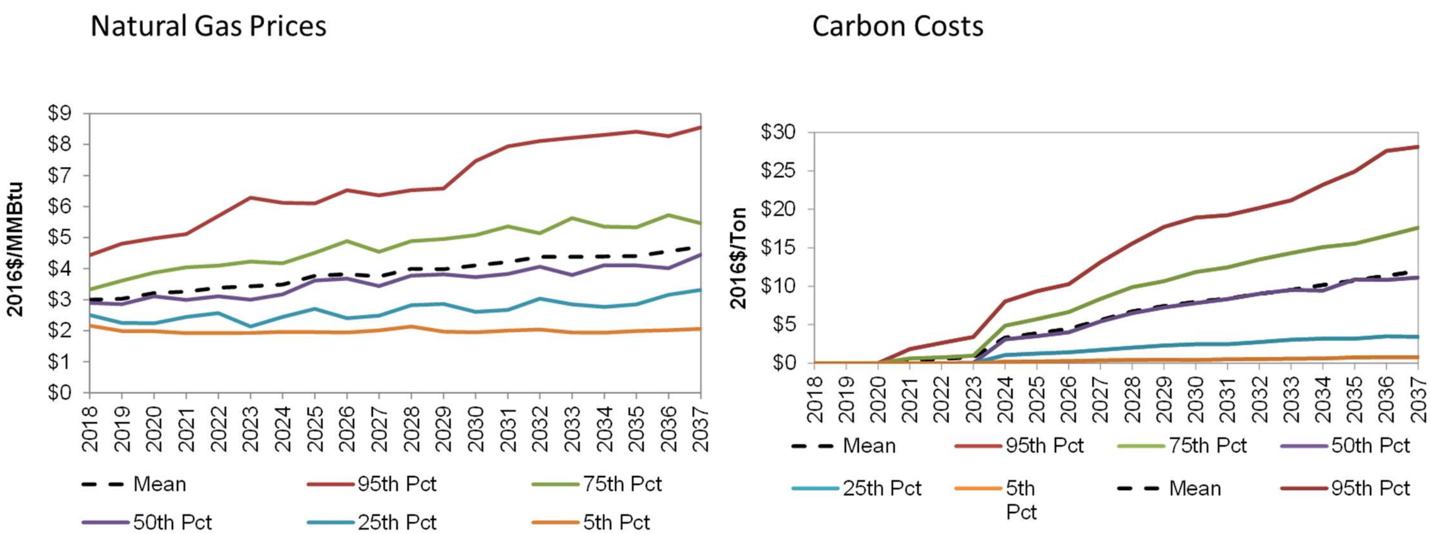


Figure 22 - Distribution Ranges for Stochastic Analysis (Source: Pace Global, 2017)

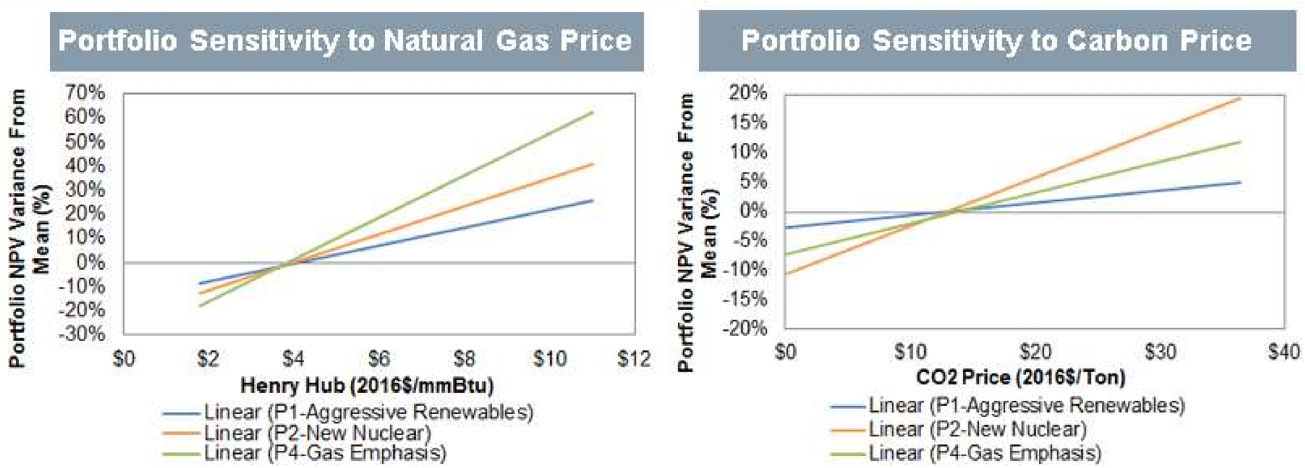
Pace Global identified the following conclusions:

- The Natural Gas Emphasis Portfolio was the most sensitive to changes in natural gas prices due to the high reliance on gas generation and associated fuel cost exposure relative to other portfolios.
- The New Nuclear Portfolio was sensitive to changes in carbon prices due to the relatively high amount of coal generation over the forecast period. The Asset Preservation Portfolio was not included in this analysis, but would likely have demonstrated a slightly stronger sensitivity to carbon prices due to its higher coal generation.
- Due to the higher share of energy purchased under fixed cost power purchase agreements in the Aggressive Renewables Portfolio, it demonstrated the least amount of variance with changing carbon and natural gas prices.

- Natural gas prices were found to drive greater changes in portfolio costs over the forecast period per dollar change in market price relative to carbon. However, the wide range of potential carbon prices over the forecast period has the potential to drive an equal or potentially greater magnitude of change in the total portfolio cost.
- As the share of coal-fired generation decreases in all portfolios, the sensitivity to changes in carbon prices lessens late in the forecast period, with the Aggressive Renewables Portfolio showing an almost negligible impact from changes in carbon prices in 2037, due to the heavy reliance on non-emitting generation sources.

Correlation of Key Market Drivers to Portfolio Cost (2037)

PACE GLOBAL A Siemens Business



% Change in Portfolio Cost Driven by $1 Change in Market Driver Cost

	Natural Gas	Carbon
P1 – Aggressive Renewables	3%	0.1%
P2 – New Nuclear	6%	0.6%
P3 – Gas Emphasis	8%	0.3%

Figure 23 - Correlation of Key Market Drivers to Portfolio Cost (2037) - Pace Global

The results of the analysis fueled discussion amongst SRP staff, management, Board and Council members, and stakeholders. These results and discussions, paired with the following considerations became the foundation for the 2017-2018 IRP strategic conclusions.

Transmission System Implications

SRP's generation is an integral piece to serving SRP's customers, but that cannot be achieved without a reliable power delivery system. SRP proactively identifies and develops effective delivery system solutions to serve current and future electric customers. These solutions are based on a high standard of safety, regulatory requirements, established reliability criteria, risk assessment, and economic analysis.

SRP operates and maintains 2,418 miles of three-phase power lines at voltages of 69–500 kilovolts (kV). These power lines, combined with additional equipment such as circuit breakers and transformers, make up the transmission system.

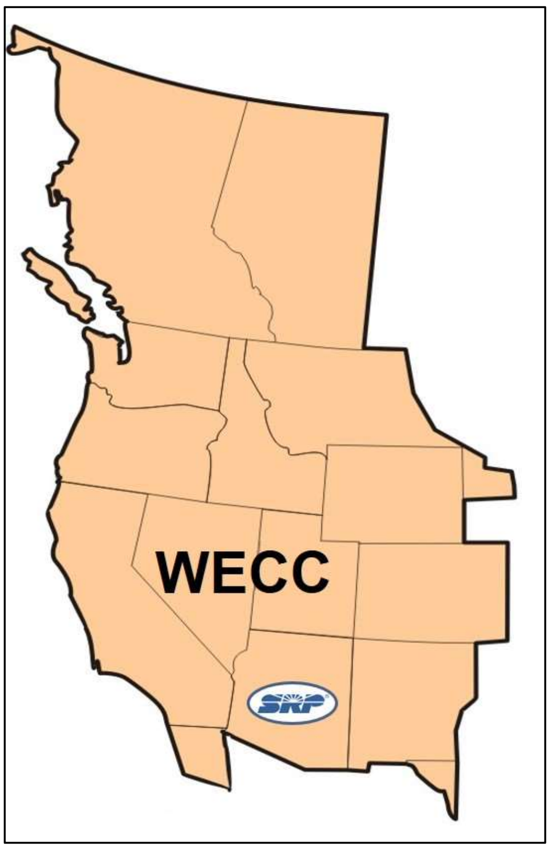


Figure 24 - SRP is within the geographical boundaries of WECC

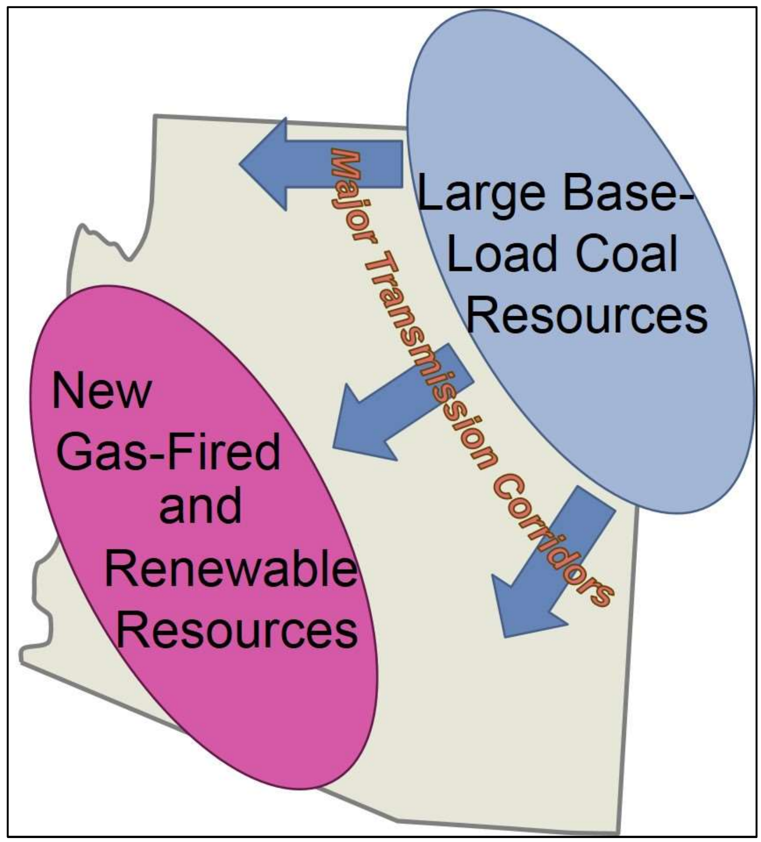


Figure 25- Major transmission corridors provide secondary support to load centers

SRP's grid is also part of a much larger grid, called the Western Electricity Coordinating Council (WECC) as referenced in Figure 24. The type and location of resources on SRP's grid is important. Historically, large baseload resources were located far from SRP service territory. The latest trend in the energy sector is the replacement of baseload generation with more flexible natural gas and solar generation located close to customers. These changes pose challenges not only to the resource mix, but also how power is delivered to customers.

This shift in resource location from north and eastern regions to west and south of the Valley will impact the transmission system. Today, Arizona utilities are already seeing transmission system impacts from retirement of coal units.

This resource shift has implications to the grid serving the Phoenix metropolitan area. Some of the transmission-related challenges facing utilities are system voltage control through balancing of load imports, greater fluctuations in frequency and the ability to ride-though momentary events due to a decrease in system rotational inertia, development of short-circuit issues at load centers caused by an increase in clustering of new solar and natural gas generation, and increased risk of interruption due to forest fires. SRP has responded to these regional challenges by proactively engaging with other utilities to learn from their best practices, changing operational baseload parameters to adapt to a new marketplace, installing specialized equipment in strategic locations to handle and optimize variable power flow, increasing application of automated protection equipment, and collaborating with the U.S. Forest Service to help improve forestry practices of mitigating forest fires. SRP will continue to embrace these changing times and new challenges affecting the grid to make a more resilient and more reliable transmission system.

The portfolios tested in the IRP were analyzed with an understanding of these current and future challenges, as indicated in the table below. Adopting more inverter based technology, such as in the Aggressive Renewables Portfolio, will pose more power delivery system challenges than the Asset Preservation portfolio, which maintains current generators.

Portfolio	Challenge	Significance	Rating
Aggressive Renewables	Technology Dependence Timeline Locational	High to Moderate High Moderate	High
New Nuclear	Technology Dependence Timeline Locational	Low Low Moderate	Low
Asset Preservation	Technology Dependence Timeline Locational	Low Low Low	Lowest
Natural Gas Emphasis	Technology Dependence Timeline Locational	Moderate Low Moderate	Moderate

Coal Retirement Shutdown Implications

It is important to note that the resource shift from coal to gas has other implications beyond grid stability. For many decades, the power industry counted on coal-fired generation as the least cost resource that could operate day and night to serve retail load reliably. These resources were an important part of a utility's generation mix to help keep operating costs low. They were often located in remote areas with entire communities having developed nearby to support the plant workers.

The industry has been seeing a change in the economics of these resources as the price of natural gas continues to decline to record lows. Through technology and drilling improvements, more natural gas can be extracted at lower production costs. These trends make natural-gas resources a viable long-term and economic alternative to coal power.

Part of SRP's mission is to provide affordable energy to customers and to act as stewards of the environment by reducing CO_2 emissions rates. SRP recognizes that this may mean further reductions to the reliance on coal-fired resources. However, such decisions are not made lightly.

Closing coal-fired resources has many implications to the employees as well as the communities that support those plants. In the case of the Navajo Generating Station, SRP is committed to helping employees through this transition with career and financial planning services, including finding possible positions elsewhere within SRP. SRP is also working with the Navajo Nation on economic development opportunities such as partnering on renewable energy projects like the Kayenta Solar Project.

Going forward, SRP will be faced with other important decisions that will potentially transform the electric system. These decisions will consider the best interests of all of SRP's customers as well as the implications to affected employees and their communities. SRP will continue to work closely with communities and employees to address the significant implications associated with the potential retirement of coal generation assets in the future.

Recommended 2017-2018 IRP Strategic Conclusions and Actions

SRP's resource planning process utilizes scenario planning techniques, evaluations of current trends in today's business environment, and a stakeholder process for gathering and sharing insights. Collectively, this provides a framework and strategic direction pathway for future resources. Overall, the objective of this process is to incorporate a long-term, flexible resource plan that is capable of embracing the challenges and uncertainties of tomorrow's world. At the conclusion to the stakeholder process, SRP shared these recommended resource directions with stakeholders and Board and Council for their understanding and acknowledgement.

The following sections are the formal conclusions developed as part of the 2017-2018 IRP Process.

Fundamental Objective

Reliably serving retail load remains the fundamental objective of SRP's generation portfolio. The path by which that portfolio has been and will continue to be constructed follows a rigorous and disciplined analytical process that incorporates 1) Board policy, 2) sustainability goals (in particular the CO_2 commitment), 3) customer demand, 4) regulations, 5) technological advancement, 6) customer costs, 7) customer satisfaction, 8) cost stability, and 9) key financial indicators. It is this discipline that ultimately determines resource choice rather than a pre-determination of what is best.

IRP Process Findings

- SRP's Integrated Resource Planning scenarios as presented, which include Breakthrough, Roller Coaster, and Desert Contraction, are sufficiently comprehensive in terms of scope and range of assumptions considered for the purposes of strategic learning.

- The measures by which SRP evaluates resource plan performance and likelihood of successful execution are clear and consistent with stakeholder expectations. These measures include Resource Portfolio Costs, Financial Flexibility, Cost Stability, CO_2 Emissions, Water Use, Coal Ash, and Grid Reliability. IRP analysis seeks a reasonable balance of each metric; policy, where it exists, drives specific targets or target ranges for the metrics.

- The four future resource portfolios tested are appropriate to SRP's regulatory and operational context and are sufficiently comprehensive in terms of the types of resources considered and the alternative mixes of these resource types, recognizing that the portfolios were designed to learn from and not to ultimately identify one as superior in all ways to the others.

Implementing SRP's Sustainability Goals

SRP prides itself on its history of environmental stewardship. In 2004, 2006, and 2011, the Sustainable Portfolio Principles (SPP) were established and strengthened in an effort to promote the adoption of renewable resources. These goals will be met in 2020, and will signal a time for change. In SRP's last IRP, that change was the adoption of a more explicit CO_2 emission rate goal: a reduction of 40% over 30 years beginning in fiscal year 2014. In conjunction with the 2017-2018 IRP process, SRP looked at accelerating this goal. This resulted in SRP's 2035 Sustainability Goal.

- Integrate SRP's 2035 Sustainability Goals into resource planning objectives so as to advance those goals. This includes accelerating the previous goal of reducing its CO_2 emission rate as measured on a pounds of CO_2 per MWh basis by 40% by 2043 with a requirement to reach a similar emission rate of 728 pounds per MWh by 2035. This represents an additional 18% reduction in CO_2 emission rate by 2035 relative to the former goal. The achievement of this target will require a mix of 1) reductions in energy from coal, 2) increases in energy from renewable resources, 3) continued investments in energy efficiency, 4) preservation of SRP's nuclear and hydro generation assets, and 5) additional energy from natural gas-fired generation.

- Reducing CO_2 emissions is one of SRP's overarching sustainability objectives. CO_2 emissions is the best overarching target because it enables SRP to best manage the costs and reliability considerations of greater reductions in emissions. Therefore, maintain the planned transition from the Sustainable Portfolio Principles (SPP) framework, after the current goal sunsets in 2020 and has been met, to a long-term commitment to reducing SRP's CO_2 emission rate, with the following provisions:
    - The achievement of the target follows a cost effective discipline, accounting for the uncertainty in future cost projections. This discipline also may mean utilizing other approaches to reducing emissions including, but not limited to, the replacement of coal energy with natural gas and renewable energy resources, new nuclear generation, water conservation, healthy forest initiatives, self-directed customer renewables, and efforts to aid in the reduction of CO_2 emissions from the transportation sector.

    - Continue to look for ways to communicate SRP's sustainable resource actions and portfolio performance with an emphasis on timeliness and transparency.

- Conduct a generation portfolio water usage intensity analysis and seek to establish a goal or goals for an appropriate reduction in generation portfolio water usage intensity based on that analysis.

Strategic Direction for Specific Resource Types

Coal Generation

A continued reliance on coal-fired resources poses significant uncertainty in the futures studied. This can be seen through potential carbon regulation resulting in higher costs and potential closures following a timeline that does not best allow for a smooth resource transition. It also poses operating limitations as more renewable resources are integrated onto the system. Additional renewables require more flexible complimentary resources to help with ramping and peak needs, and coal does not provide that flexibility.

Pursue further deliberate, meaningful reductions in the amount of energy in SRP's portfolio produced by coal generation. The pace of such reductions to be dictated by remaining plant life, financial implications, market economics, transmission system reliability preservation, broader sustainability goals, and customer costs. Coal plant closures are one of the most significant actions that can be taken to transform a resource portfolio impacting economics, emissions, and water usage. Moreover, there are significant implications for employees and the impacted communities that need to be taken into consideration and addressed such as job training, education, and support for economic development.

Potential Implementation Actions:

- Proactively seek further opportunities to exit coal plant ownership over the next 15 years, which may have implications for depreciation timelines.
- Seek low cost replacement capacity opportunities along the lines of the recent Gila River purchases.
- Work with communities and employees well in advance of coal plant closures to assist in the development of an overall transition plan.
- Consider the adoption of carbon constrained fleet dispatch that keeps coal plants available during critical times, recognizing, however, that certain minimum capacity factors are required for the economic viability of coal resources.

Natural Gas Generation

Natural gas will serve as an important peak-capacity resource in all likely futures. This conclusion primarily focuses on the capacity benefits of natural gas and is not meant to imply that this resource would constitute the majority of the energy sources for serving retail needs.

Until other reliable, peak capacity options become cost effective as demonstrated by actual market pricing, natural gas-fired generation is likely to constitute the majority of capacity additions required to address A) peak hour demand growth, B) the loss of peak capacity due to coal plant retirements, C) the need for increased system flexibility driven by the operating characteristics of intermittent generation such as wind and solar resources, and D) the most economic peak hour system reliability complement to renewable technologies.

Potential Implementation Actions:

- Prior to making any financial commitments to major equipment or construction contracts for new-build generation, issue all-source RFPs for the planned capacity. That capacity will explicitly include the opportunity for cost competitive and viable energy storage and demand response options.
- Continue to pursue the siting and permitting efforts for the Copper Crossing Energy Center in Pinal County to create a viable option for new peaking generation that may be necessary to meet peak demand growth.
- Evaluate options for existing legacy gas units, such as the Agua Fria Generating Station, e.g. repowering, replacement, upgrades, etc.

Renewable Energy and Energy Storage

Environmental stewardship is one of SRP's Core Resource Principles, carefully considered when exploring future resource options. Renewable energy, with the help of investment tax credits, production tax credits, and policy changes, has increased in demand among utilities across the nation, resulting in decreasing costs in manufacturing and construction. As a result, SRP has been acquiring more renewable resources onto SRP's system, which will benefit fuel diversity and support SRP's sustainability goals.

Continue to cost effectively add an "all of the above" mix of new renewable energy resources and integrated energy storage systems as a critical element in maintaining energy resource mix diversity, reducing CO_2 emissions, and limiting exposure to natural gas market price volatility. The specific amount of renewable energy added and the pace of those additions will be driven by the same principles that drive all other resource decisions. Furthermore, develop and promote new options for customers and communities to assist in the realization of their own renewable energy and/or sustainability goals.

Potential Implementation Actions:

- Under today's assumptions, this would mean the addition of 500-1000 MW of new renewables over the next 10-15 years. These additions would grow if costs drop more quickly and be further expanded by the development of cost effective storage technologies.
- Issue an RFP for 100 MW of solar to be online by 2021 and give large commercial and industrial customers the opportunity to be the direct beneficiaries of the environmental attributes of these projects. Should the interest from customers be greater than 100 MW, SRP will issue a second RFP for an additional 100 MW.
- Develop additional "Green Energy" price plans to provide more options for customers to realize their own renewable energy goals while shielding non-participating customers from the costs and risks associated with those goals.
- Continue to explore renewable energy options with peak demand reliability including biomass, integrating storage with renewables and geothermal generation.
- Expand Kayenta solar to increase SRP's renewable energy portfolio in the near term and provide benefits to the Navajo Nation.
- Pursue jointly with the Navajo Nation/NTUA the development of 500 MW of new renewables on the Navajo Nation and offer customers the opportunity to participate in a portion of this development (subject to transmission availability).

Nuclear Generation

There is significant progress being made around new nuclear technologies that could provide reliable, safe, and carbon-free generation in the future. However, the current development timeline for any such resource is measured in decades. While today's nuclear projects in the United States are experiencing significant obstacles, a combination of new technologies, efficiencies in permitting, and lower financial risk during construction may provide a compelling option for new nuclear resources. Therefore, it is important for SRP to pursue activities that preserve nuclear as a resource option.

Continue to take measured steps necessary to develop and preserve the option for new nuclear generation in the mid- to late-2030's with a focus on small modular reactor technology (but not to the total exclusion of larger format technologies). Ensure that financial commitments are commensurate with the state of the technology and broader environmental, fuel, and capital cost risk considerations.

<u>Potential Implementation Actions:</u>

- Conduct initial site evaluation work and establish a robust Quality Assurance program.
- Deepen industry relationships to stay current with emerging developments and to have resources to draw on for assistance as needed.
- Become and/or remain involved in forums focused on the development and promotion of Small Modular Reactor (SMR) technology.
- Should the Nuclear Regulatory Commission (NRC) approve an SMR design and other utilities experience success in the licensing and design aspects, consider taking additional steps towards the possible development of new nuclear generation.
- Pursue the acquisition of land and/or land options for potential new nuclear generation sites.

Energy Efficiency Programs

SRP recognizes that its customers want options to help reduce their energy consumption. During the IRP process, SRP has included an increasing percentage of customer resources such as energy efficiency, to contribute to future energy needs. This serves as the basis for energy efficiency programs to continue to play a significant role in the carbon-free resource mix as it has the potential to reduce peak demand at low cost.

Continue to develop and promote a variety of cost-effective energy efficiency programs to reduce CO_2 emissions, generation portfolio water usage intensity, exposure to natural gas market price volatility, and system costs, and to assist lower income customers. Focus on programs with proven peak demand reduction benefits. Increase efforts to develop viable, scalable, and cost-effective load management options that reduce capital costs, help customers manage electricity bills, preserve reliability, and enhance SRP's system capabilities for renewable resource integration. Expand reporting to estimate the amount of energy efficiency reflected in the current load forecast in addition to programs currently being implemented.

Potential Implementation Actions:

- Target program development and funding on energy efficiency programs and demand response programs that are focused on peak demand reductions. Compare these options to other resource alternatives and specifically include energy efficiency and demand response in RFPs to meet peak needs.
- Develop mechanisms for reporting the total amount of energy efficiency embedded in SRP's customer load forecast (to the extent such can be estimated).

Market Resources

As the region embarks on a changing marketplace, SRP deliberately looks for new opportunities to lower customer costs wherever possible. As a result, SRP will be joining the California ISO Energy Imbalance Market (EIM) in April of 2020 as a way to automatically find the lowest-cost energy to serve real-time customer demand across a wide geographic area. The economic advantage of participating in the EIM will improve the integration of renewable energy, which leads to a cleaner, greener grid.

Continue with the implementation of Energy Imbalance Market participation as planned and participate in discussions relative to future regional market expansion possibilities. Should such possibilities be in the best interests of SRP's customers from an economics and reliability perspective, take further steps to help develop and participate in such market expansion.

Potential Implementation Actions:

- Should EIM participation result in the expected customer benefits (or greater), look to further opportunities to participate in broader regional markets, such as a western regional ISO.

New Technologies

With the rapid pace of technology advancement, it is important for SRP to stay on top of the latest industry developments. SRP's technology screening program is a process designed to identify and rank new and emerging technologies based on their commercial availability and cost competitiveness and is used to identify when new technologies are ready to be included in future IRP's and resource plans.

Pursue pilot projects and research and development efforts and collaborate with others to encourage the development of and support for innovative applications of new power generation, load management, energy storage, and electrification technologies through active participation in industry research and development organizations.

Potential Implementation Actions (areas to explore):

- Grid modernization
- Load management
- Energy storage (utility scale and behind-the-meter)
- Carbon reduction technologies
- Electrification
- Power plant efficiency upgrades
- Transmission and distribution efficiency upgrades

Future IRP Cycle

SRP will establish a schedule for future updates on its resource plan and planning process to keep stakeholders informed and involved.

With the desire to have continuing, substantive discussions with SRP elected officials and stakeholders, SRP will establish a 5-year cycle for future IRP processes. SRP will also add reporting and stakeholder involvement in the interim years to provide updates on the continual evaluation and development of new resource options.

- The next full IRP process, including stakeholder engagement, would begin in October 2021 and conclude by about the end of 2022.
- In August 2018, 2019, 2020, and 2021, present to the Board Power Committee and District Council near-term resource action plans that are consistent with the strategic conclusions of the IRP and to compare IRP assumption ranges to updated projections for key business drivers.
- In September 2019 and 2021, hold an IRP stakeholder workshop to provide updates on the implementation of SRP's resource strategy. Present on topics of stakeholder interest, listen to comments, and respond to questions.
- In February 2019, 2020, 2021, and 2022, add an appendix to the publicly available IRP document that provides an update on near-term significant resource planning, development, and acquisition activities and a discussion of the business environment. These updates would also be publicly available.

Near Term Action Plans

In conjunction with the IRP conclusions, SRP is currently pursuing the following near-term actions to facilitate implementation of the resource strategy.

SRP has issued an RFP for 100 MW of new renewable energy. SRP is seeking green energy projects that could begin operation by the end of 2020, and will consider proposals for renewable facilities both in and outside of SRP's service territory in the greater Phoenix metropolitan area, including tribal lands. The renewable energy projects selected in the process are intended to help SRP expand its customer-dedicated green energy programs for large commercial and industrial customers.

SRP has identified the need for new incremental peaking power generation in the southeast portion of the SRP service area by 2022. This generation will need to quickly increase or reduce output (ramp), be flexible to support additional variable energy resources such as wind and solar generation, and provide reliable reserve capacity. SRP anticipates the release of an all-source RFP in 2018 to compare the cost and feasibility of resource alternatives such as energy storage and demand response options to building a new gas-fired peaking facility.

SRP will begin a process for evaluating the remaining life of existing coal resources, while addressing implications for both employees and the communities that support these coal stations. These implications also offer opportunity to aid in other elements of the resource strategy. For example, SRP's Board has approved participation in the expansion of Kayenta Solar to increase SRP's renewable energy portfolio in the near term and provide benefits to the Navajo Nation. Additionally, SRP is working jointly with the Navajo Nation to investigate development of 500 MW of new renewables on the Nation and offer SRP customers the opportunity to participate in a portion of this development.

SRP continues to prepare for entry into the Energy Imbalance Market by April 2020. The western EIM's advanced market systems automatically find the lowest-cost energy to serve real-time consumer demands of participating utilities. This market enables utilities to buy and sell power more efficiently in the hour before the energy is needed, with five-minute plant dispatching, which result in improved efficiencies and cost savings.

Next Steps in SRP's Integrated Resource Planning

SRP management and staff express appreciation for stakeholders and their participation in this process. Maintaining this discourse with stakeholders and elected officials will continue to produce a sound long-term strategic direction for future resources that balances customer costs, system reliability and sustainability measures. SRP's IRP cycle is designed to continue this discussion with future stakeholder workshops and with publicly available, annual appendices to this document, the first of which is anticipated in February of 2019.