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Kerri A. Carnes
Manager
State Regulation and Compliance

Mail Station 9712
PO Box 53999
Phoenix, Arizona 85072-3999
Tel 602-250-3341
Kerri.Carnes@aps.com

March 1, 2016

Docket Control
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

RE: Arizona Public Service Company's Preliminary 2017 Integrated Resource Plan; Docket No. E-00000V-15-0094.

Attached, please find Arizona Public Service's Preliminary 2017 Integrated Resource Plan (IRP), as required by the IRP Timeline approved in Decision No. 75269 (September 16, 2015).

If you have any questions regarding this information, please contact Kerri A. Carnes at (602) 250-3341.

Sincerely,

Kerri A. Carnes

KC/kr
cc: Parties of Record

Copies of the foregoing delivered/mailed this 1st day of March, 2016, to:

Janice Alward
Legal Division
Arizona Corporation Commission
1200 W. Washington
Phoenix, AZ 85007

David Berry
Western Resource Advocates
P.O. Box 1064
Scottsdale, AZ 85252-1064

Thomas Broderick
Utilities Division
Arizona Corporation Commission
1200 W. Washington
Phoenix, AZ 85007

Bradley Carroll
Tucson Electric Power Company
88 East Broadway Blvd.
Mail Stop HQE910
P.O. Box 711
Tucson, AZ 85702

Jennifer Cranston
Gallagher & Kennedy, P.A.
2575 East Camelback Road
Phoenix, AZ 85016-9225

Kristin Mayes
The Kris Mayes Law Firm
3030 N. 3rd Street, Suite 200
Phoenix, AZ 85012

Dwight Nodes
Administrative Law Judge
Arizona Corporation Commission
1200 W. Washington
Phoenix, AZ 85007

Michael Patten
Attorney
SNELL & WILMER L.L.P.
One Arizona Center
400 E. Van Buren Street, Suite 1900
Phoenix, AZ 85004-2202

Daniel Pozefsky
Chief Counsel
RUCO
1110 W. Washington, Suite 220
Phoenix, AZ 85007

Jeff Schlegel
SWEEP
1167 W. Samalayuca Dr.
Tucson, AZ 85704

Michael Sheehan
Senior Director, Fuel and Resource Planning
Tucson Electric Power & UNS Electric
88 E. Broadway Blvd. MS HQW803
Tucson, Arizona 85701

PRELIMINARY

2017 Integrated Resource Plan

Filed in Compliance with ACC Decision 75269

March 01, 2016

As part of the preparation for the Preliminary 2017 Integrated Resource Plan, APS held a public IRP Stakeholder Workshop on 02/09/16 that covered topics ranging from changing load shapes to resource procurement for its upcoming Request for Proposal. The full agenda included:

IRP Process
Energy Demand Forecast and Economic Conditions
Evolving Load Shape, Markets and Resource Implications
Clean Power Plan Overview
Resource Needs
Action Plan Update
EIM Overview
Energy Efficiency
Renewable Energy Program
Technology
Assumptions, Portfolios & Sensitivities
2016 All Source Request for Proposal (RFP) Solicitation Overview

Presentations from the IRP Stakeholder Workshop can be found at www.aps.com/resources

TABLE OF CONTENTS

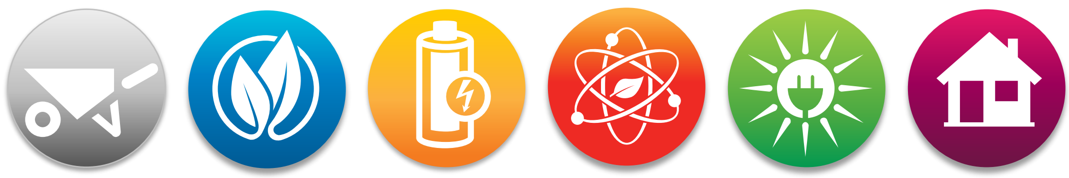
PRELIMINARY PLAN HIGHLIGHTS

Load Forecast
Page 9

+2.7%

APS forecasts that over the course of the 2017-2032 Planning Period, annual load will increase by 2.7% and annual retail sales by 2.6%, prior to the effects of energy efficiency (EE) and rooftop solar generation. The forecast is based on expectations for population growth, increased saturation of personal electronics, the trends toward larger homes, greater economic activity and greater metropolitan infill.

Portfolios / Scenarios
Page 11



Coal Strategy | Carbon Reduction Portfolio | Battery Energy Storage Systems | Small Modular Reactors (SMR) | Expanded Renewables | Expanded Demand Side Management

Resource Technologies
Pages 10,14,15

- Natural gas
- Renewable generation
- Energy storage
- Energy efficiency (EE)
- Demand response (DR)
- Microgrids
- Nuclear (large-scale and small modular)
- Coal

Sensitivities
Page 10

- Natural gas prices
- Carbon dioxide (CO2) prices
- Load forecast
- Technology pricing

Action Plan
Page16

- Conduct All Source Request for Proposal (RFP) and plan for future needs
  - Conduct RFP in March 2016 for 2020 delivery
  - Begin initial site planning for post-2020 resource needs
- Complete Solar Innovation Study
  - 75-home study on advanced technologies
  - 125-home study based on third-party custom-designed technology packages
- Complete Solar Partners Program and related pilots
  - APS-owned rooftop solar research and development program
- Complete customer solar project
  - Construct 40 MW SAT solar project
- Complete initial microgrid projects
  - Partner with customers to develop on-site backup generation
- Participate in CAISO-Energy Imbalance Market
  - Go-live date: October 2016
- Complete Ocotillo Modernization Project
  - Replace 1960s steam generators with quick-start natural gas CT units
- Further develop and implement coal strategy
  - Continue to implement Cholla Power Plant strategy and evaluate continuing role of Navajo Generating Station

Introduction

The energy paradox that has been building momentum in Arizona and other solar-rich regions is no longer a theoretical possibility; it is an operational reality. On one hand, as the state's economy recovers from the recession, the forecast for peak energy demand is on the rise. On the other hand, in a state that boasts the #2 national ranking in total solar installations[1], the net demand for non-summer mid-day energy is on a decline. The divergent nature of these two trends requires utilities to not only re-examine how to balance supply with demand, but also how to plan for the future. Having sufficient resources to meet peak load is no longer the only objective; having the right type of resources and a wide spectrum of customer options are also necessary and will become more so as solar energy continues to grow not only in APS's service territory, but regionally as well.

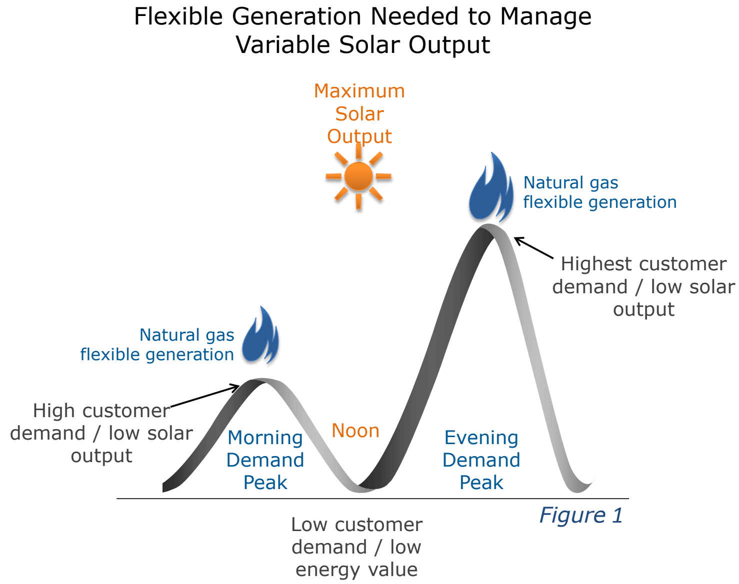


Figure 1

To meet these challenges, APS is focused on:

- **Evolving Load Patterns** – As more variable generation enters the resource mix, the more loads decline during midday hours then rapidly ramp up towards the evening hours. This trend is redefining what resources are needed to respond to the increasing peaks and troughs of today's demand profile.

- **Changing Resource Needs** – Flexible generation is particularly suited to manage increasingly dynamic operating conditions. The Ocotillo Modernization Project is one example of how APS is responding to this need, while other examples include battery storage and other advanced technologies.

- **Increasing Market Participation** – Market solutions can provide another layer of flexibility by offering platforms such as the California Independent System Operator (CAISO) Energy Imbalance Market (EIM) which not only pools resources from participating utilities but also adds five- and fifteen-minute transaction capabilities.

- **Enhancing Customer Engagement** – Advanced grid technologies are transforming energy systems to fit a 21st century model. Two-way communications between APS and its customers and other technologies such as Advanced Distribution Management

Systems (ADMS), Communicating Fault Indicators and Integrated Volt/VAR Control are expected to be deployed to improve reliability, elevate customer satisfaction and provide the foundation for further innovations to come.

- Clean Power Plan – The Clean Power Plan (CPP) is a comprehensive regulation aimed at reducing nationwide carbon emissions from existing electric generating units by 32%. To achieve that goal, the Environmental Protection Agency (EPA) assigned each state a reduction target, with Arizona's being 33.6%. On February 09, 2016, the Supreme Court issued a stay on the enforcement of the CPP. APS continues to monitor the legal challenges to this regulation and to plan for potential compliance in the event the CPP is ultimately upheld.

Providing a Platform for the Future

APS's 2014 Integrated Resource Plan (IRP) focused on the need for flexible generation to manage these challenges – a theme that is expected to remain dominant in the 2017 IRP. Critical in helping achieve a dynamic equilibrium, rapidly responding units can be ramped down or turned off when solar energy production is at its highest, then ramped up to meet customer needs as the sun starts to set. This ability to meet both minimum and maximum load requirements within hours increases system costs, yet accommodates the impact that variable generation has on the electric system and helps integrate the increasing levels of solar generation that are forecast to grow well beyond the requirements of Arizona Corporation Commission's (ACC) Renewable Energy Standard (RES).

The challenge to integrate increasing variable resources is shaping a future of expanded solutions

Providing customers a seamless and reliable energy platform under these evolving operating conditions will require more than just new generation types. It will require a diversified array of solutions. In April 2015, APS announced its decision to participate in the EIM which is not only expected to provide cost savings to customers, but also to allow access to a large and diverse pool of resources that can quickly respond to the variability of renewable energy resources and their effects on net customer demand profiles. Other solutions include advanced grid technology investments to improve reliability and provide for data analytics of real-time system needs and performance.

Finally, as new solutions become part of the operating system, the evaluation of traditional resources will also come into play. While APS continues to execute its plans for the Four Corners Generating Station, its focus turns to its remaining coal facilities. The Cholla Power Plant and the Navajo Generating Station have key decisions ahead and will be evaluated relative to how APS can reliably and affordably continue serving customers' energy needs.

Evolving Load Patterns

The new norm in solar abundant regions with slow population growth and high levels of rooftop solar generation like Arizona is declining minimum loads and sharply changing patterns of maximum loads. To examine these new demand shapes, the focus has shifted from traditional load curves (total demand before the effects of customer and other variable resources) to net load curves (total demand after accounting for customer and other variable energy resources). Figures 2 and 3 illustrate the difference in net load curves during summer and non-summer months. The difference is particularly evident in the non-summer months when overall demand is low and renewable energy resources have the effect of producing a dual peak – one in the morning and a larger one in the evening. The effect is less in the summer months as variable energy resource impacts are diluted across higher overall demand.

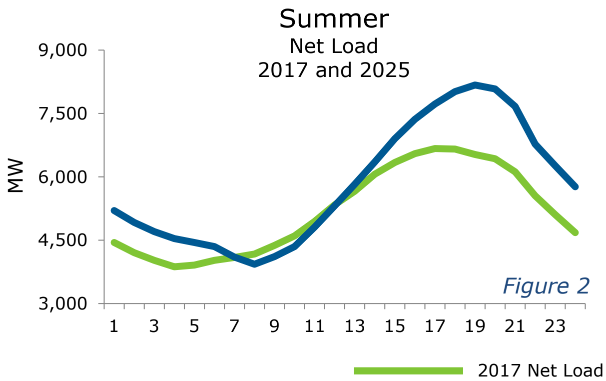


Figure 2

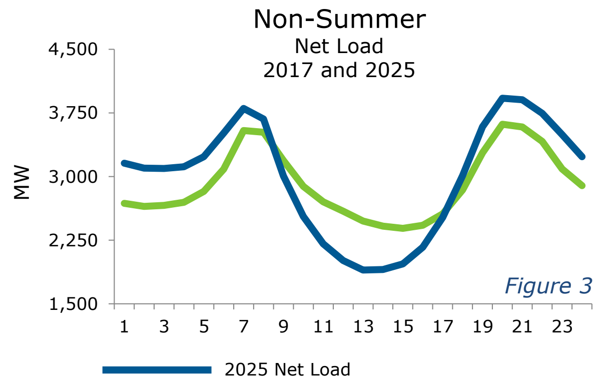


Figure 3

As solar energy expands its contribution to the portfolio mix, the difference between load and net load curves will become more significant, especially in non-summer months. With that difference, two factors emerge: solar generation in the midday hours causing the need to ramp generating units down or turn them off to make room, and the need to quickly respond to increasing demand in the early evening hours as the sun sets.

In terms of wholesale market pricing, solar generation is impactful. In regions with high penetration of variable energy resources, such as the West, short-term market prices of electricity have fallen to zero and then gone negative at times – meaning the buyer gets paid to take electricity because there is too much energy on the system. This phenomenon is a price signal from the wholesale power markets that there is more generation than demand. Because utilities continue to have less flexible generation resources in their portfolios, making room for low or negatively priced wholesale power can be difficult. Although forecast increases in load from population growth and advances in energy storage technologies can act as a slight offset, they will not approach the growth rate of variable energy resources and their impacts on wholesale pricing and resource portfolios.

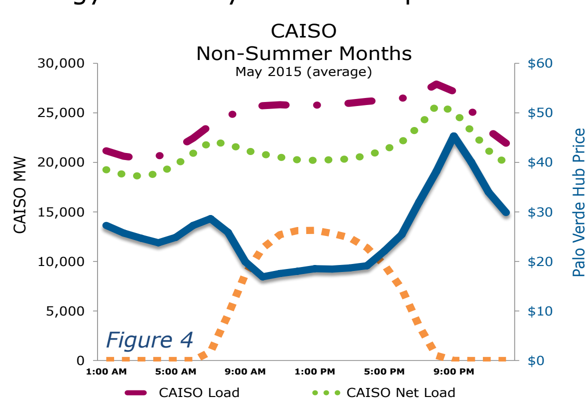


Figure 4

Changing Resource Needs

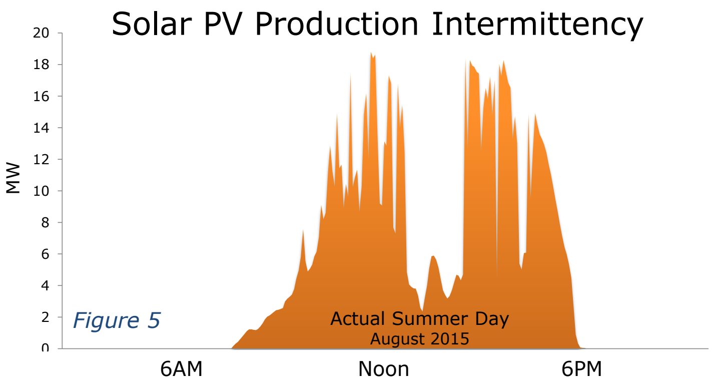


Figure 5

Higher penetration levels of variable energy resources, related changes in net demand patterns and continued low natural gas pricing have challenged the traditional diverse resource mix model. What has not changed is the need to continuously balance supply and demand. Providing a platform to integrate these increasingly dynamic operating conditions requires a transformation in the traditional utility resource portfolio towards more flexibly dispatched peaking resources. Figure 5 illustrates the variability of solar generation for which fast-starting, fast-ramping resources are ideally suited. Incorporating flexible resources into the portfolio will not only help counter-balance the variability and unique needs of a more renewable-driven mix, it will allow customers to benefit from the changing wholesale market prices produced in midday hours when solar production is at its highest.

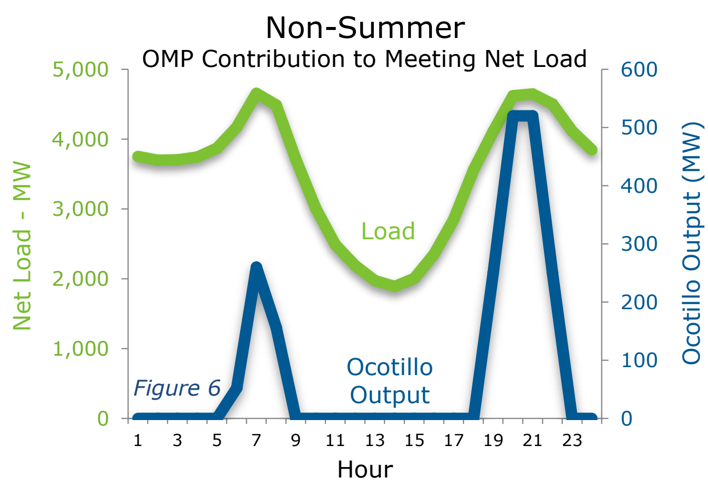


Figure 6

The Ocotillo Modernization Project (OMP) currently underway is an example of how APS is responding to the flexible resource needs on its system. The project, scheduled to be completed in 2019, consists of replacing two 1960s-era steam generators with five fast-starting, fast-ramping natural gas combustion turbine (CT) units with capacities of 102 MW each. Figure 6 uses the net load graph for a non-summer month and illustrates how OMP's operational characteristics may respond to the dual peaks created by solar penetration. To manage the challenges of meeting peak summer demand, APS plans to also add market combined cycle (CC) natural gas units to its system during the 2017-2032 Planning Period. In Arizona, having both types of natural gas-fired resources is important for a balanced natural gas fleet.

As technologies advance, so do flexible options. Battery storage, small reciprocating engines and updated customer price signals are some of the solutions also being proposed. Similar to CTs, small reciprocating engines are fast-starting and fast-ramping, making them well-suited for managing the variability of renewable resources. While still not economically viable or sufficiently mature for wide-scale deployment, battery storage may offer similar flexibility by capturing solar energy produced during daylight hours, then sending that energy to the grid in the evening when it is most needed by customers. With its ability to both consume energy and supply it, battery storage may become an important part of APS's future resource picture.

Increasing Market Participation

APS's 2014 Integrated Resource Plan's focus on flexibility was based on three defining energy market trends: (1) increased penetration of renewable energy, which requires a transformation of the fleet toward higher levels of flexible generation to integrate it; (2) the favorable price outlook for natural gas, which makes the development of natural gas based flexible assets economically viable; and (3) the technological advancements that provide for enhanced real-time management of the electric system and related energy dispatch, a critical component to accommodate the variability that comes with increasing penetration of renewable energy.

As these trends are as prevalent across the Western region as they are in APS's service territory, the flexibility concept can be applied on an even broader scale. Every hour of every day, APS transacts with regional wholesale market participants to bring affordable, reliable electric service to our customers. Those interactions have long been a part of meeting load, managing APS's system and contributing to the overall reliability of the regional electric system. It is a natural evolution then to extend that ability to access markets from a bilateral transaction model to a more structured inter-system pool to provide APS with an added layer of real-time flexibility and economic opportunity. Within the Western Interconnection, the most comprehensive approach to respond to these changes and still maintain the participating utility's autonomy is the CAISO's EIM.

Figure 7

Last April APS announced its decision to participate in the EIM. The annual cost savings to APS customers from these benefits are expected to be approximately $7 million. Although significant, the economic benefits were not the sole determinant in the decision. Optimizing generation dispatch across multiple participants gives EIM participating utilities more tools to provide a platform to integrate growing renewable energy supplies. Traditionally, utilities have had to dispatch their own generation to handle demand/supply imbalances, supplementing any remaining needs by transacting bilaterally in the day-ahead and hourly wholesale markets. The EIM not only pools resources from participating utilities, it also adds five- and fifteen-minute capabilities to further optimize resource decisions.

EIM participation is voluntary and does not require APS to join the CAISO. Utilities that participate in the EIM do not relinquish control of their generating or transmission assets, and they maintain all of their respective system reliability and compliance responsibilities. The EIM is designed to complement each utility's existing energy trading practices and does not alter an individual utility's resource planning and procurement responsibilities. Each EIM participant is required to procure or develop sufficient resources to meet its own unique customer demand needs and to satisfy its own operational requirements such as having sufficient flexible ramping capabilities to meet non-summer net load curve challenges.

Enhancing Customer Engagement

With new technologies, changing customer preferences and an evolving resource mix, energy systems across the country are being transformed to fit a 21st century model. This new model is expected to not only pave the way for a more interactive relationship between APS and its customers but also between customers and the energy they use.

One example of how these technologies will benefit customers is the strategic deployment of advanced two-way communicating devices that allow the utility to monitor the electric system in real time, while providing timely information to customers, enabling them to manage their individual energy needs. In July 2014, APS reached full deployment of advanced meters (AMI) with 1.25 million meters installed, including 30,000 solar production meters, which on an average day provide 40 million data points.

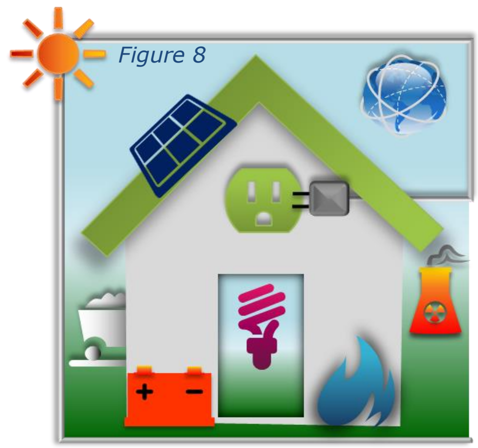


Figure 8

Other technologies include (1) Advanced Distribution Management System (ADMS), which provides the distribution system the enhanced operational platform similar to what is used for the transmission system, (2) Communicating Fault Indicators that can detect and locate problems on the system in real time to enable faster power restoration and (3) Integrated Volt / VAR Control, a software application that provides round-the clock voltage management, including self-adjustments to ensure voltage levels stay within a pre-determined range. During the 2017-2021 Action Plan Period, APS expects to increase the deployment of these technologies and others to improve reliability, elevate customer satisfaction and provide the foundation for further innovations to come.

Energy efficiency (EE) opportunities are also providing customers a greater role in managing how they use energy. New and emerging technologies such as home energy management systems and smart thermostats offer customers new opportunities for managing their energy use and, importantly, peak demand. As these devices become more economic and integrated with each other, customer systems will offer automatic responses to changing utility price signals in real time, optimizing the operation of key appliances and energy systems to manage peak demand and reduce costs. APS is currently conducting the Solar Innovation Study to further explore these integrated distributed energy resource solutions and the benefits they can provide. Future APS planning efforts will increasingly incorporate this integrated distributed energy resource perspective in developing resource plans.

As advancements continue to permeate the industry, adjustments to current programs and technologies will also be needed. Avoided costs have decreased due to low natural gas and wholesale power prices, challenging the cost-effectiveness of some Demand Side Management (DSM) programs, particularly those that incent savings during midday hours when solar generation is at its highest and wholesale power prices are among their lowest. Consistent with system resource needs, DSM programs will need to focus on energy savings during late afternoon and early-evening high-demand periods, and provide less focus on midday savings. This can be done by carefully targeting savings to the load profiles that best fit resource needs and integrating energy efficiency with load shifting and demand response opportunities such as Behavioral Demand Response and Smart Thermostat Demand Response Programs.

Clean Power Plan

Supreme Court Stay of Clean Power Plan

On February 9, 2016, the Supreme Court issued a stay on the enforcement of the EPA's Clean Power Plan (CPP). The stay will remain in effect while legal challenges to the CPP are resolved in the U.S. Court of Appeals - D.C. Circuit and during any further appeal to the Supreme Court. APS continues to monitor the legal challenges to the CPP and continues to plan for potential compliance in the event the CPP is ultimately upheld.

Clean Power Plan - Overview

On August 3, 2015, the Environmental Protection Agency (EPA), under Section 111(d) of the Clean Air Act, finalized the Clean Power Plan (CPP). One of the most comprehensive regulations in the agency's history, the CPP is aimed at reducing overall carbon dioxide (CO2) emissions from existing electricity generating units (EGUs) by 32% by 2030. Although the overall goal is national, compliance is at the state level, with EPA assigning each state interim and final reduction targets and giving them the option to comply individually or as part of a multi-state effort.[2,3] The three building blocks determined by the EPA to comply with the CPP include: Building Block 1 - reducing the carbon intensity of electricity generation by improving the heat rate of existing coal-fired power plants; Building Block 2 – increasing generation from natural gas plants in exchange for reducing generation from coal-fired power plants; and Building Block 3 - increasing generation from zero-emitting renewable energy sources in exchange for reducing generation from existing coal-fired power plants.[4]

Arizona's state emission reduction target is 33.6%, slightly above the national target of 32%. In terms of emissions rate reduction, the state's goals from a 2012 baseline emissions rate of 1,552 lbs. of CO2/MWh include the interim 2022-2029 goal of 1,173 lbs. of CO2/MWh and the final 2030 goal of 1,031 lbs. of CO2/MWh.[5]

While APS's Coal Strategy as outlined in the September 2014 IRP Supplement was not designed with compliance to the CPP in mind, APS anticipates that it will be in a position to meet its compliance requirements should the CPP be upheld. This projection is based on the assumption that ADEQ will select a rate-based compliance plan. Should the ADEQ select a mass-based compliance plan, additional compliance costs beyond what are contemplated in the Coal Strategy will likely be required. In addition, further compliance costs may arise as EPA determines whether, or how, the CPP will be implemented on the Navajo Nation, as currently proposed by the EPA.

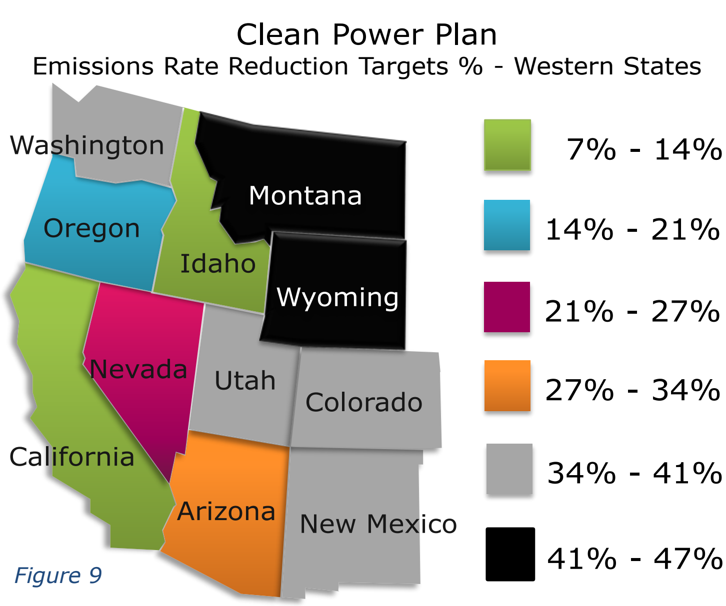


Figure 9

Load Forecast

Evaluation of Load Forecasting Techniques

As required in Decision No. 75068, APS submitted on October 30, 2015 a re-examination of its load forecasting techniques. The re-examination focused on the components which have the largest impact on overall load growth: population growth forecast (and by extension, the residential customer growth forecast), the residential use per customer forecast, and the commercial & industrial (C&I) customer electricity demand forecast. To determine the validity of its current techniques, APS tested six different models for its residential use per customer forecast and five different models for its C&I demand forecast. Although the conclusion of these assessments was that the current models remain the preferred method for developing projections, APS will continue to periodically re-examine methodologies as part of good business practice.

Load Forecast Highlights

APS currently forecasts that annual peak demand will increase by 2.7% and annual retail sales by 2.6%, prior to the effects of energy efficiency (EE) and rooftop solar generation during the 2017-2032 Planning Period. For residential customers, the forecast increase is based on the expectation for larger homes, increased saturation of electronics and higher proportion of APS customers living in the lower desert areas, where temperatures are generally higher than in other parts of our service territory. For C&I customers, the forecast is based on greater economic activity and the increase in related occupied commercial building floor space.

2.7%
Peak Demand Growth before EE and Rooftop Solar Generation

2.6%
Retail Sales Growth before EE and Rooftop Solar Generation

Economic Conditions Highlights

Population growth is the most influential variable in developing a load forecast, providing the basis for several other forecast components such as growth in households and residential customers. The most variable element of population growth is net migration because it is the most sensitive to near-term business cycle effects. In an effort to enhance the modeling and development of the net migration forecast, APS contracted with the Economic and Business Research Center at the University of Arizona to develop a modeling framework which will help ensure that fundamental shifts in migration patterns and behavior are made more transparent in future projections.

2.1%
Population Growth

1.3%
Net Migration Contribution to Growth

Resource Planning – Model, Sensitivities & Uncertainties

Model

The 2017 IRP will document a comprehensive analytical process aimed at meeting future customer needs, achieving regulatory goals and managing environmental impacts during the 2017–2032 Planning Period.

Resources expected to be included in the 2017 IRP are natural gas, nuclear (both large-scale and small modular), renewable energy (on both sides of the meter), coal, energy efficiency, demand response and new technologies such as energy storage. To analyze these resources, APS uses the Ventyx suite of products, including PROMOD and Strategist.

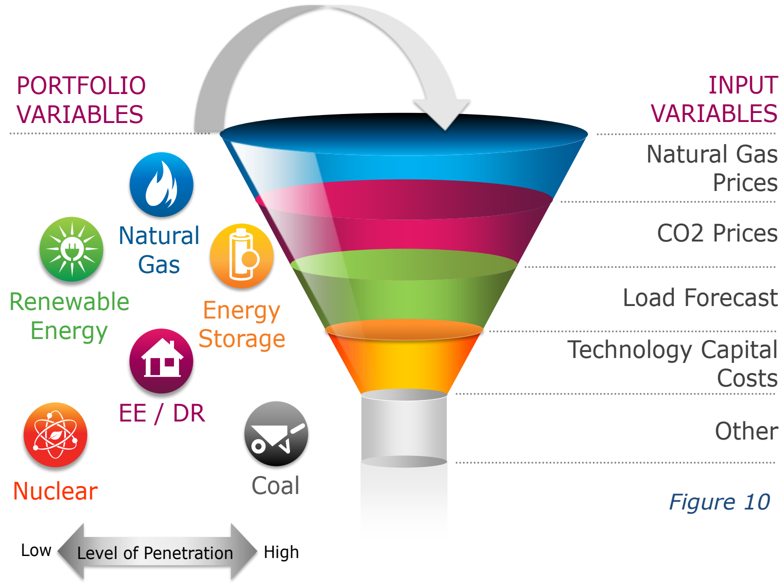


Figure 10

Sensitivities

To create the final portfolios, resources considered for testing in the 2017 IRP will be evaluated in various combinations under parameters specific to each portfolio. These portfolios will then be analyzed by stressing key input variables such as natural gas prices, CO_2 prices, technology capital costs and load forecast sensitivities to determine the resiliency of each combination of resources under a variety of conditions.

Natural Gas Prices
$ Based on 9/30/2016 Henry Hub forward markets

CO2 Prices
$
- Low: $0
- Base: California markets
- High: TBD in 3Q2016

Technology Capital Costs (Installed)
$ $300 - $6,500 ($ /kW)

Load Forecast Sensitivities
% 90% - 110% of Forecast

Uncertainties

Notwithstanding that much of the planning process is quantitative in nature, there is also a significant qualitative assessment that includes considerations such as environmental regulation risks, natural gas pipeline availability risks, market capacity contracting risks, and the risks of the technological maturity and energy production capability of new technologies. Although more intangible than the quantitative risks, uncertainties in these areas can be highly impactful and require ongoing monitoring and evaluation of their potential effect on the portfolios.

Portfolios / Scenarios

Portfolios are distinct sets of resources designed to meet customer power needs over the Planning Period. Although all the portfolios incorporate much of the existing fleet, each portfolio focuses on different technology combinations that could become part of APS's energy mix in various proportions. In the 2017 IRP, portfolios other than those listed below may be considered as APS evaluates different combinations of key technologies.

As APS and other parts of the West provide a platform to integrate a higher penetration of variable resources in the energy mix, as well as advanced technologies and distributed energy resources, the need for conventional baseload resources will decline over time.

Coal Strategy

Evaluates early retirement of Cholla Units 1 and 3 and NGS, executes Four Corners strategy

- Reduces future upgrades
- Manages aging fleet concerns
- Expands opportunities for other technologies
- Reduces environmental impacts

Carbon Reduction

Evaluates carbon reduction beyond potential CPP requirements

- Provides for new technologies, including SMRs and energy storage
- Expands use of renewable energy
- Reduces environmental impacts

Battery Energy Storage Systems

Incorporates greater penetration of BESS to further integrate renewables and help manage peak demand

- Captures energy for later use
- Mitigates variability of renewable energy resources
- Provides local voltage management
- Provides ancillary services (non-energy components required for system operation)

Small Modular Reactors

Incorporates new nuclear technology of small modular reactors to reduce carbon footprint and provide baseload power

- Offers modular and scalable architecture
- Factory-fabricated units mitigate risks of schedule overruns
- Reduces environmental impacts

Expanded Renewables

Increases renewable energy portfolio contribution beyond requirements of the RES (to include both distributed and grid-scale renewable energy resources)

- Positions the portfolio in the event of further environmental regulation
- Optimizes use of Arizona's natural resource: the sun
- Reduces environmental impacts

Expanded Demand Side Management

Increases contribution of distributed energy resource solutions such as energy efficiency, demand response, battery storage and smart inverters

- Enhances customer engagement
- Increases penetration of advanced system technologies
- Improves tools for customer energy management
- Reduces environmental impacts

Loads & Resources

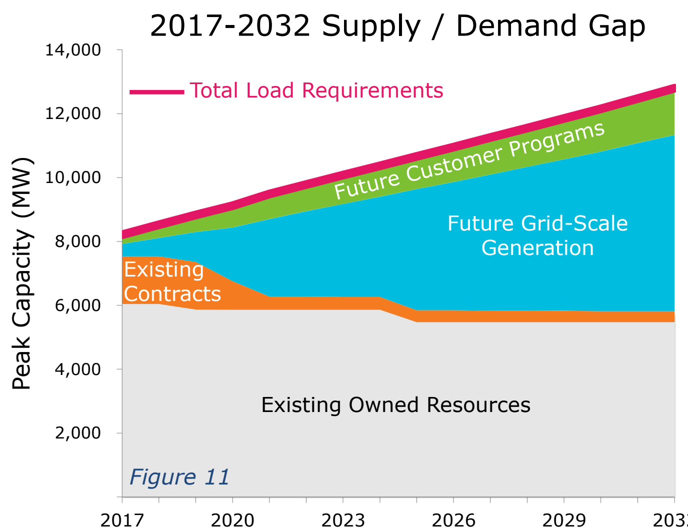


Figure 11

The supply-demand gap, depicted in the blue and green areas in Figure 11, refers to the difference between the resources APS has and the resources it needs to meet expected load growth.

For the 2017-2032 Planning Period, increases in customer load and the expiration of several contracts bring about an immediate need for resources – projected at 675 MW for 2017. By 2022, the need is forecast to be in excess of 3,500 MW and five years after that over 5,400 MW. APS plans to utilize short-term markets to fill remaining near-term needs. For longer-term needs (2020 and beyond), APS will begin procuring resources through the March 2016 All Source RFP and continue its evaluation of resource needs throughout the Planning Period.

TABLE 1 – PRELIMINARY 2017 IRP (Values in MW at Peak)				
	2017	**2022**	**2027**	**2032**
PROJECTED LOAD REQUIREMENTS (NEEDS)	8,210	9,748	11,252	12,797
EXISTING RESOURCES AS OF JANUARY 2016				
APS-Owned Generation	6,045	5,864	5,475	5,474
Long-Term Contracts	1,489	412	355	342
Total Existing Resources as of January 2016	7,534	6,277	5,830	5,816
FUTURE PROJECTED DISTRIBUTED RESOURCES				
Energy Efficiency (1), (2)	225	629	749	857
Distributed Energy (1), (2)	30	98	175	250
Demand Response (3) & Microgrid (4)	32	107	232	357
Total Future Projected Distributed Resources	287	835	1,156	1,464
FUTURE PROJECTED UTILITY RESOURCES				
Natural Gas	363	2,611	4,084	5,229
Renewable Energy & Energy Storage	25	62	182	288
Total Future Projected Utility Resources	388	2,672	4,266	5,517
TOTAL FUTURE PROJECTED RESOURCE ADDITIONS	675	3,507	5,422	6,981
TOTAL RESOURCES	8,210	9,784	11,252	12,797

(1) Incremental to current levels.

(2) Projections based on technologies expected to be available to customers during the Planning Period and the effect of those technologies on peak load. Energy Efficiency – Post-2020 levels assume EE continues at 22% of retail sales. Distributed Energy – forecast is at time of peak.

(3) Projections based on factors such as comfort impact, usability of technology, load reduction (kW) per household and levels of customer participation during the Planning Period.

(4) Projections based on available technology and customer participation during the Planning Period.

Technologies Evaluated

Due to contract expirations and unit retirements, existing resources and projected customer resources will meet only a portion of future resource needs. The remainder will need to be met with additional resources. These added resources are expected to come from a combination of (a) technologies currently deployed in APS's portfolio, such as natural gas-fired generation, renewable energy resources and demand side management resources, and (b) newer technologies that can play a significant role in meeting customer demand, reducing APS's carbon footprint, further facilitating operational flexibility and addressing aging fleet issues.

Microgrids comprise one area under which many new technologies are emerging as frontrunners. Microgrids are loads that can served by on-site generation and be operated in parallel with (supporting) the electric system or in island mode (stand-alone).

Microgrid Benefits

- Meets customer need for backup power supply
- Highly flexible resource shared with host utility that can respond rapidly to system needs
- Provides peak management, planning reserves and frequency response
- Facilitates future capabilities
  - Renewable energy
  - Smart inverter technology
  - Battery storage

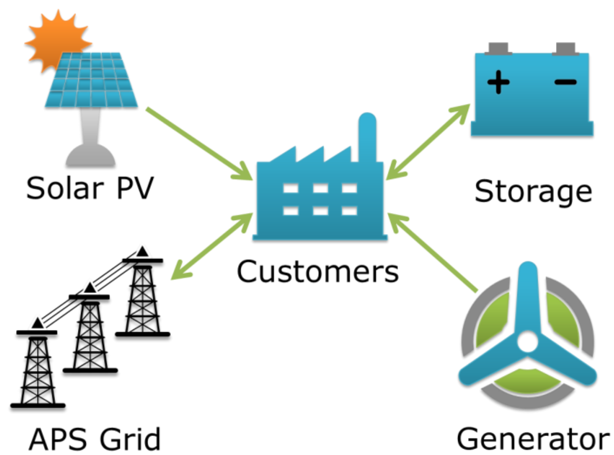


Figure 12

Another new technology APS will incorporate into the 2017 IRP will be battery energy storage systems (BESS) which have modular and scalable architectures.

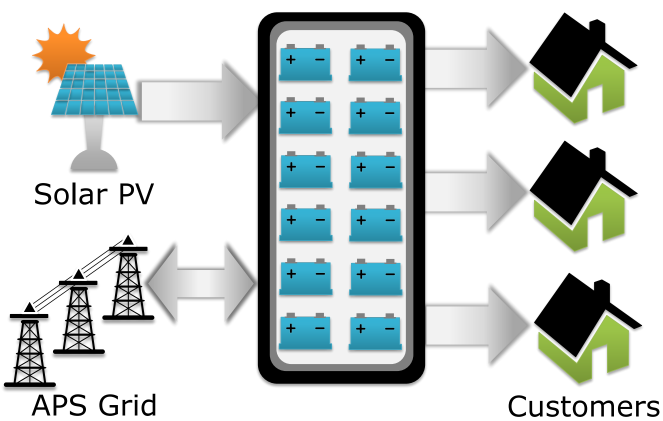


Figure 13

BESS Benefits

- Stores energy at midday and provides power at peak
- Local voltage management
- Distribution upgrade deferment
- Frequency response and other ancillary services
- May reduce environmental impacts

Other Technologies Evaluated

In preparing the 2017 IRP, APS technology evaluations may also include but will not be limited to the following:

DISTRIBUTED ENERGY RESOURCES (DERs)

As energy planners and operators increasingly focus on decentralized resource solutions, greater customer engagement is being achieved through the use of rooftop solar, smart inverters, DSM, battery storage, home energy management systems and smart appliances.

COMBINED CYCLE

Combined cycle natural gas-fired power plants deliver higher fuel efficiency by using residual heat in the gas turbine's exhaust stream. While less flexible than other resources, this technology is suitable for managing summertime peak demand and overall energy needs.

COMBUSTION TURBINE

Combustion turbine natural gas-fired power plants are comprised of a compressor, combustion system (fuel injectors) and turbine. This flexible technology is well-suited for managing peak demand and fast-ramping requirements.

ENERGY STORAGE

In addition to BESS configurations, APS may evaluate the following energy storage technologies:

- Flywheel technologies – used primarily for dynamic system support
- Above- and below-ground compressed air energy storage (CAES) – these technologies store air when energy is available

SMALL MODULAR REACTORS (SMR)

SMRs are smaller in size than traditional nuclear units and can be built in modular arrangements in a manufacturing plant, then shipped to the plant site. Besides providing carbon free electricity, this technology is scalable and standardized, thereby reducing manufacturing and other risks.

SOLAR

Solar configurations will be evaluated for the 2017 IRP based on economics and regulatory requirements. These may include solar PV fixed and single axis tracking and solar thermal-trough technologies.

WIND

Wind systems convert the wind's energy into electricity by using rotating blades to collect the wind's kinetic energy. While wind generation in Arizona is challenging, improvements in technology have increased the viability of this resource within the WECC region.

Action Plan: 2017-2021

The 2017-2021 Action Plan provides specific events anticipated to occur in the near-term that support APS's goal for greater operational flexibility, increased market participation and enhanced customer engagement. Actual events during the 2017-2021 Action Plan Period will be based on conditions prevalent at the time of their undertaking and may differ from what is delineated below. APS will file updates to its Action Plan whenever substantive changes occur, in compliance with Commission Decision No. 75068.

Future Resource Procurement / Development

APS plans to

- Conduct an all-source RFP in March 2016 for 400-600 MW of capacity resources for delivery beginning 2020.
- Begin initial site planning for resource needs beyond 2020.

Solar Innovation Study

APS plans to conduct

- A 75-home research and development study on advanced technologies and innovative rate designs.
- A 125-home study that assists third-party solar PV and DER market to design customer-owned technology packages around existing APS demand rates.

Solar Partners Project

APS-owned rooftop solar research and development program aimed at learning how to efficiently enable the integration of rooftop solar and battery storage with our grid.

Customer Solar Project

APS plans to construct a 40 MW SAT solar PV project at the Saguaro Power Plant in response to customers who want a reduced environmental impact to help meet their long-term energy goals.

EIM

APS expects to begin participation in the CAISO EIM in October 2016. During the Action Plan Period, APS will further enhance internal processes related to EIM participation.

Microgrid

APS has partnered with customers to develop backup generation resources on their business sites. These resources benefit all APS customers, providing flexible resources to help meet peak demand.

Aging Fleet Strategy

Ocotillo Modernization Project

The project, consisting of replacing 1960s-era steam generators with modern quick-start natural gas CT units with capacities of 102 MW each, is planned to be in service by summer 2019.

Coal Fleet

Cholla Unit 2 was retired on October 1, 2015, and APS plans to no longer burn coal in units 1&3 beyond 2025. APS will continue to evaluate the economics of operating Cholla units 1&3, as well as its participation in the Navajo Generating Station.

All-Source RFP

To help meet load requirements for the 2017 IRP Planning Period, APS plans to issue an All Source RFP in March 2016. The RFP will seek competitive proposals for capacity resources totaling approximately 400-600 MW.

Key parameters for the RFP include:

- Technologies Considered
  - Thermal Generation
  - Energy Storage
  - Renewable Energy
  - Non-Supply Side Technologies (EE and DR)
  - Other

- Contract Structures
  - Tolling Power Purchase Agreements for Thermal Technologies
  - Asset Purchase Agreements for existing Thermal Technologies
  - Energy Storage Tolling Agreements
  - Renewable Energy Power Purchase Agreements
  - Load Management Agreements

- Size
  - For supply-side technologies, each proposed facility must be a minimum of 25 MW in size, located on a single site.
  - For non-supply-side technologies, the minimum requirement is 25 MW in size for the aggregated program.

- Delivery
  - No earlier than January 1, 2020, and no later than June 1, 2020.
  - In the case of a proposed asset sale for an existing facility, APS recognizes that pre-sale activities may need to occur prior to June 1, 2020.

- Review
  - The entire RFP process will be monitored and reviewed by a third-party, ACC-approved independent monitor.

- Interconnection
  - Any proposed facility must interconnect directly to the APS system, or in the alternative, the bidder must demonstrate that it has secured firm transmission for delivery from the facility to the APS system.
  - Each proposed facility must be constructed and interconnected to meet the June 1, 2020 deadline.

- Selection Criteria
  - Selection criteria will emphasize meeting peak resource needs and will be discussed in more detail at upcoming Bidder's Webinar.

Sources of Assumptions

Inputs	Sources of Assumptions
Load Forecast:	Bureau of Labor Statistics; U.S. Census Bureau; Bureau of Economic Analysis; National Weather Service
Environmental Regulations:	Environmental Protection Agency; Arizona Department of Environmental Quality
Energy Efficiency Programs:	Energy Efficiency Standard; Navigant Consulting (program evaluation contractor)
Renewable Energy:	Renewable Energy Standard; market data
Resource Costs:	Major equipment vendors; market data acquired through RFP and/or RFI solicitations; industry organizations; customer data from field implementations
Integration Costs:	Solar Photovoltaic Integration Cost Study
Fuel Forecast:	Market, fuel contracts
CO_2:	Market

[1] GTM US Solar Market Insight Q3 2015 Full Report (page 38)
[2] http://www.eenews.net/interactive/clean_power_plan#updated_total_reduction_percentage
[3] Clean Power Plan Implementation – What States Need to Know, National Conference of State Legislatures, January 12, 2016
[4] http://www.epa.gov/cleanpowerplan/fact-sheet-overview-clean-power-plan
[5] http://www.eenews.net/interactive/clean_power_plan/states/arizona
Icons: Sourced from PresentationLoad