Pinnacle West Capital Corporation - Water 2018

W0. Introduction

W0.1

(W0.1) Give a general description of and introduction to your organization.

Pinnacle West Capital Corporation is an energy holding company based in Phoenix, AZ with a focus on the business of its primary subsidiary, the Arizona Public Service Company (APS). APS is an investor-owned, vertically integrated power company that generates and delivers reliable electric power and related services to approximately 1.2 million customers located in Arizona. To meet the energy demand of our customers, APS owns and operates a fleet of generation resources, including nuclear, coal, natural gas, and renewable (solar and wind) generation. Additionally, APS owns and operates a transmission and distribution system that is necessary to deliver the power to our customers.

Water is vital for APS to meet its core business objectives. As a result, APS has a Water Resource Management department whose sole purpose is to ensure a sufficient quality and quantity of water is available to meet the current and future needs of our generating stations. The vision of the Water Resource Management department is to secure and maintain a sustainable and cost-effective supply of water to enable reliable energy production for APS customers. The Department's mission is to develop and implement a strategic water resource management program that will provide APS timely and reliable information to manage APS's water resources portfolio in support of the safe and efficient generation of electricity for the long term. This is accomplished through the acquisition of water supplies, alternative supplies, and conservation by the efficient use of water, development of water metrics and water conserving initiatives, participation in state and regional water management organizations, engagement in developing water legislation, research and technology, groundwater models, a well and pumping equipment reliability program, water supply contingency initiatives and development and use of well field management plans.

W-EU0.1a

(W-EU0.1a) Which activities in the electric utilities sector does your organization engage in?

Electricity generation
Transmission
Distribution

W-EU0.1b

(W-EU0.1b) For your electricity generation activities, provide details of your nameplate capacity and the generation for each power source.

	Nameplate capacity (MW)	% of total nameplate capacity	Gross generation (MWh)
Coal – hard	2747	25	10140883
Lignite	0	0	0
Oil	0	0	0
Gas	3276	30	8078866
Biomass	0	0	0
Waste (non-biomass)	0	0	0
Nuclear	4200	38	32340137
Geothermal	0	0	0
Hydroelectric	0	0	0
Wind	289	2	745000
Solar	562	5	2282000
Other renewable	0	0	0
Other non-renewable	0	0	0
Total	11074	100	53586886

W0.2

(W0.2) State the start and end date of the year for which you are reporting data.

	Start date	End date
Reporting year	January 1 2017	December 31 2017

W0.3

(W0.3) Select the countries/regions for which you will be supplying data.

United States of America

W0.4

(W0.4) Select the currency used for all financial information disclosed throughout your response.

USD

W0.5

(W0.5) Select the option that best describes the reporting boundary for companies, entities, or groups for which water impacts on your business are being reported.

Companies, entities or groups over which operational control is exercised

W0.6

(W0.6) Within this boundary, are there any geographies, facilities, water aspects, or other exclusions from your disclosure?

Yes

W0.6a

(W0.6a) Please report the exclusions.

Exclusion	Please explain
Commercial Office buildings and facilities not associated with power generation	The facilities are excluded because the amount of water used in office buildings is immaterial in comparison to the amount of water used in power generation and the water is provided from sources that are not at risk of shortages. However, APS does monitor and track water usage in these facilities.

W1. Current state

W1.1

(W1.1) Rate the importance (current and future) of water quality and water quantity to the success of your business.

	Direct use importance rating	Indirect use importance rating	Please explain
Sufficient amounts of good quality freshwater available for use	Vital	Neutral	Without sufficient good quality water, generating the power required to meet customer's energy demands would not be possible. Large amounts of water are needed for cooling water and boiler make-up, boiler and domestic uses. Sufficient amounts of quality fresh water are important because fresh water is the primary water supply at seven out of nine APS power plants representing 4,582 MW of generating capacity. Future freshwater use will decrease about 9% by 2032. This will be accomplished by retiring water intensive units, increasing renewable energy and through water conservation measures. Importance is "neutral" because our value chain has access to freshwater where applicable and top spend suppliers have low risk of water impacts. Freshwater is used in our value chain for potable water, manufacturing processes and other operational uses. Future water dependency in our value chain is not anticipated to change based on our continuous engagement with our water suppliers.
Sufficient amounts of recycled, brackish and/or produced water available for use	Vital	Neutral	Recycled water is vital to the operation of the Palo Verde Generating Station and to the Redhawk Power Plant. Since APS generation resources are located in a desert, recycled water, a renewable and relatively drought-proof supply is a critical resource to meet production needs. Without sufficient amounts of adequate quality reclaimed water, a significant portion of our power generation would not be possible unless a different source of water was available. The importance of recycled water will likely increase in the future due to increased competition for scarce water resources in the arid Southwest. This water is currently contracted through 2050. Importance is "neutral" because our value chain has access to sufficient amounts of recycled, ocean, brackish and/or freshwater where applicable. This type of water is used in our value chain for cooling and chemical treatment purposes. Future water dependency in our value chain is not anticipated to change based on continuous engagement.

W1.2

(W1.2) Across all your operations, what proportion of the following water aspects are regularly measured and monitored?

	% of sites/facilities/operations	Please explain

	% of sites/facilities/operations	Please explain
Water withdrawals – total volumes	100%	APS measures and monitors 100 percent of our water withdrawals. Power plant water use is measured by direct metering and monthly reports are compiled and evaluated. In some cases this is performed daily or as needed to support operational and/or regulatory requirements. This information is provided to management in monthly progress reports and metric target reports. Other water needs, such as in office buildings, service centers, etc. are met by a municipal provider. Because water use is vital for power production, it is important to track actual water usage as a baseline for water goal setting and water conservation purposes.
Water withdrawals – volumes from water stressed areas	Not relevant	APS Power plants are not located in water stressed areas.
Water withdrawals – volumes by source	100%	APS measures and monitors 100 percent of water withdrawals and identifies the water withdrawals by source. Fleet wide, the plants use a combination of recycled water, groundwater and surface water, all of which are measured by direct metering. In some cases measurement is performed daily or as needed to support operational and/or regulatory requirements. This information is provided to management in monthly progress and metric target reports. This information is also is reported on annual basis to the appropriate agencies for compliance purposes. It is important to understand the source of the water withdrawal to identify potential watershed impacts and as a baseline for goal setting.
Produced water associated with your metals & mining sector activities - total volumes	<Not Applicable>	<Not Applicable>
Produced water associated with your oil & gas sector activities - total volumes	<Not Applicable>	<Not Applicable>
Water withdrawals quality	100%	APS measures and monitors water quality to ensure the correct water chemistry is being used for power generation and performed daily, or as needed, to support operational and/or regulatory requirements.
Water discharges – total volumes	100%	APS measures and monitors 100 percent of water discharge volumes. A portion of the blowdown water is treated then recycled and reused at the plants. The remainder is discharged to a sanitary sewer, discharged to a river or is discharged into evaporation ponds. Measurement is performed as needed to support operational and/or regulatory requirements. This information is provided to management in monthly progress and metric target reports. This information is also is reported on an annual basis to the appropriate agencies for compliance purposes. Accurate measurement of discharge data is required to calculate water consumption.

	% of sites/facilities/operations	Please explain
Water discharges – volumes by destination	100%	APS measures and monitors 100 percent of water discharge volumes by destination. A portion of the blowdown water is treated then recycled and reused at the plants. The remainder is discharged to a sanitary sewer, discharged to a river or is discharged into evaporation ponds. This information is provided to management in monthly progress and metric target reports. This information is also is reported on an annual basis to the appropriate agencies for compliance purposes. Tracking the volume discharged by destination provides data regarding potential impacts on watersheds.
Water discharges – volumes by treatment method	100%	APS measures and monitors 100 percent of our water discharge volumes by treatment method. A portion of our blowdown water is treated then recycled and reused at the plants. The remainder is discharged to a sanitary sewer, discharged to a river or is discharged into evaporation ponds. Measurement is performed daily or as needed. This information is provided to management in monthly progress and metric target reports. This information is also is reported on annual basis to the appropriate agencies for compliance purposes. APS treatment methods are identified in procedures at each power plant in order to optimize and encourage recycling when possible. Discharge volume, water quality, discharge locations, and impacts to the watershed are accurately recorded.
Water discharge quality – by standard effluent parameters	100%	APS measures and monitors 100 percent of our water discharge quality data to ensure effluent quality standards are met. A portion of our blowdown water is treated then recycled and reused at the plant, is discharged to a sanitary sewer, discharged to a river or is discharged into evaporation ponds. In some cases measurement is done daily. This information is provided to management and used throughout the company and is reported to the appropriate agencies. This information is measured and monitored to ensure consistent water quality parameters for power production. Water discharge quality consistent with each type of discharge is closely monitored to ensure environmental commitments are met.
Water discharge quality – temperature	1-25	Water Temperature data is collected at APS's Four Corners power plant to comply with environmental and National Pollutant Discharge Elimination System (NPDES) regulatory commitments.
Water consumption – total volume	100%	APS measures and monitors 100 percent of our water consumption. Power plant uses are all measured by direct metering and monthly reports are compiled and evaluated. This information is provided to management in monthly progress and metric target reports. This information is also is reported on annual basis to the appropriate agencies for compliance purposes. Other water uses, such as in office buildings, service centers, etc. are served by a municipal provider. APS Facilities Department monitors water consumption in office buildings and service centers.

	% of sites/facilities/operations	Please explain
Water recycled/reused	76-99	Water use is measured and monitored at APS's West Phoenix and Redhawk power plants which utilize a zero liquid discharge (ZLD) system. The ZLD blowdown recovery system is a very important and effective water management tool for the plant, enabling them to keep water use low and cycles of concentration (CoC) as high as possible. CoC is a measure of the degree to which cooling water is recycled, and is a significant factor in ensuring efficient water use. Redhawk recycles 100% of water used and West Phoenix recycles 95-100% of water used. Palo Verde is a ZLD facility, recycling 95% of water used by increasing COC in cooling towers up to 25 times; the blowdown is discharged to evaporation ponds. Cholla is a ZLD facility that uses a cooling lake and cooling towers; 95% of water is recycled and 5% is sent to ash ponds. Four Corners uses a cooling lake, returns 20% of water used to the source, and recycles the remaining 80%. CoC is monitored on a daily basis.
The provision of fully-functioning, safely managed WASH services to all workers	100%	APS measures and monitors 100 percent of water withdrawals and provided facilities with fully functioning WASH services for all workers. APS drinking water systems are permitted, operated by licensed operators, and receive annual inspections from regulators. Annual reports are sent to regulators that document compliance with Safe Drinking Water Act provisions.

W1.2b

(W1.2b) What are the total volumes of water withdrawn, discharged, and consumed across all your operations, and how do these volumes compare to the previous reporting year?

	Volume (megaliters/year)	Comparison with previous reporting year	Please explain
Total withdrawals	137917	About the same	The total withdrawals for 2017 (137,917 megaliters/year) was about the same as in 2016 (132,196 megaliters/year) due to generation being about the same. Year-to-year changes less than 5% were considered "about the same." Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower". Future withdrawals in the next five years are projected to stay about the same based on generation
Total discharges	4719	About the same	The total discharge is about the same in 2017 (4,719 megaliters/year) as in 2016 (4,457 megaliters/year). The discharges were very consistent from last year for the plants that have a discharge component due to consistent generation from each of those plants compared to last year. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower". Future discharges in the next five years are projected to stay about the same based on generation.

	Volume (megaliters/year)	Comparison with previous reporting year	Please explain
Total consumption	133198	About the same	The total consumption for 2017 (133,198 megaliters/year) was about the same as in 2016 (127,739 megaliters/year) due to generation being about the same. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower". Future consumption in the next five years are projected to stay about the same based on generation

W1.2h

(W1.2h) Provide total water withdrawal data by source.

	Relevance	Volume (megaliters/year)	Comparison with previous reporting year	Please explain
Fresh surface water, including rainwater, water from wetlands, rivers, and lakes	Relevant	22366	About the same	The total fresh surface water for 2017 (22,366 megaliters/year) was about the same as in 2016 (22,236 megaliters/year) due to generation being about the same for plants that rely on surface water. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".
Brackish surface water/seawater	Not relevant	<Not Applicable>	<Not Applicable>	None of APS's operations withdrew water from brackish surface water/seawater sources. The total withdrawal made from this source is thus not applicable.
Groundwater – renewable	Not relevant	<Not Applicable>	<Not Applicable>	There are no renewable groundwater sources available for use at APS power plants, therefore no withdrawals were made. This was the case for the previous year as well, thus it is not applicable.
Groundwater – non-renewable	Relevant	20386	Higher	About the same amount of power was generated in 2017 (20,386 megaliters/year) compared to 2016 (16,972 megaliters/year) overall, however increased generation at more groundwater intensive plants caused higher groundwater use as compared to 2016. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".
Produced water	Not relevant	<Not Applicable>	<Not Applicable>	None of APS's operations withdrew water from produced/process water sources.This is the case for the previous year as well, thus it is not applicable.

	Relevance	Volume (megaliters/year)	Comparison with previous reporting year	Please explain
Third party sources	Relevant	95165	About the same	For purposes of this report, reclaimed water use is reported under third party sources. In 2017 (95,165 megaliters/year), reclaimed water use was about the same slightly higher asthan in 2016 (92,988 megaliters)., however Ggeneration totals were about the same for plants that utilize reclaimed water. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

W1.2i

(W1.2i) Provide total water discharge data by destination.

	Relevance	Volume (megaliters/year)	Comparison with previous reporting year	Please explain
Fresh surface water	Relevant	4259	About the same	About the same amount of water was returned back to the environment in 2017(4,259 Megaliters/year) compared to 2016 (4,222 megaliters/year). Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".
Brackish surface water/seawater	Not relevant	<Not Applicable>	<Not Applicable>	There were no discharges to brackish surface water/seawater.
Groundwater	Not relevant	<Not Applicable>	<Not Applicable>	There were no discharges to groundwater.
Third-party destinations	Relevant	460	Higher	More water was discharged to the city sewer at West Phoenix in 2017 (460 megaliters) than in 2016 (234 megaliters/year) due to equipment failure and an extended outage of the Zero Liquid Discharge system. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

W1.2j

(W1.2j) What proportion of your total water use do you recycle or reuse?

	% recycled and reused	Comparison with previous reporting year	Please explain
Row 1	76-99%	About the same	The Zero Liquid Discharge blowdown recovery system at our Redhawk and West Phoenix power plants is a very important and effective water management tool for the plant, enabling them to keep water use low and cycles of concentration (CoC) as high as possible. CoC is a measure of the degree to which cooling water is recycled, and is a significant factor in ensuring efficient water use. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

W-EU1.3

(W-EU1.3) Do you calculate water intensity for your electricity generation activities?

Yes

W-EU1.3a

(W-EU1.3a) Provide the following intensity information associated with your electricity generation activities.

Water intensity value	Numerator: water aspect	Denominator: unit of production	Comparison with previous reporting year	Please explain
693	Total water consumption	MWh	Higher	The water intensity value is the average of all 9 plants in 2017. Generation from 2016 (50,221,737 MWH) to 2017 (53,586,886 MWH) was about the same which reflects water intensity was about the same from 2016 (661 Gallons/MWH) to 2017 (693 gallons/MWH). Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

W1.4

(W1.4) Do you engage with your value chain on water-related issues?

Yes, our suppliers

W1.4a

(W1.4a) What proportion of suppliers do you request to report on their water use, risks and/or management information and what proportion of your procurement spend does this represent?

Row 1

% of suppliers by number

1-25%

% of total procurement spend

26-50

Rationale for this coverage

Annually, APS engages our top tier suppliers in a sustainability survey, with questions on how they are managing environmental impacts in their operations, including greenhouse gas emissions, energy and water usage, waste, and materials management. 2) Strategy for prioritizing engagements i) Suppliers: Within APS' supply chain, we prioritize our top tier suppliers, our most critical and strategic suppliers and those with whom we spend significant dollars. APS evaluates these suppliers using key performance indicators such as safety, quality and operations, and supplier diversity.

Impact of the engagement and measures of success

Measures of success - APS defines success in two ways: a year over year increase in supplier response rate to the survey, and a year over year improvement in performance across the key performance indicators. 4) How this information is used i) Information gathered during annual Electric Utility Industry Sustainable Supply Chain Alliance (EUISSCA) survey is shared with Supply Chain Leadership to develop awareness of our supplier's performance. In the future, information will be used to drive Supplier Relationship Management quarterly discussions. 5) How suppliers are incentivized to report i) We incentivize suppliers to share their water performance through our Supplier of the Year Awards.

Comment

W1.4b

(W1.4b) Provide details of any other water-related supplier engagement activity.

Type of engagement
Innovation & collaboration

Details of engagement
Other, please specify (Incentivize innovation and solutions)

% of suppliers by number
1-25

% of total procurement spend
26-50

Rationale for the coverage of your engagement
APS's supplier relationship management program is utilized to effectively manage supplier engagements including performance management and relationship building. APS manages company suppliers with the purpose of establishing relationships that drive towards open collaboration, continuous improvement, innovation, and sustainability. APS conducts a rigorous supplier segmentation which evaluates criticality, spend, risk, viability, and sustainability as welll as alignment to APS core values.

Impact of the engagement and measures of success
Measures of success: APS defines success in two ways: a year over year increase in supplier response rate to our EUISSCA survey, and a year over year improvement in performance across the key performance indicators. In addition, success stories are celebrated through our supplier of the year nomination process for an environmental stewardship award that is presented each year. For 2017 performance, 3 suppliers were nominated specifically for the environmental stewardship award. In addition, each nominee is evaluated in five critical areas, environmental stewardship as one of the established criteria that the supplier must exceed before they are considered for an award. We incentivize suppliers to share their water/environmental, risk reduction performance through our Supplier of the Year Awards.

Comment

W2. Business impacts

W2.1

(W2.1) Has your organization experienced any detrimental water-related impacts?

No

W2.2

(W2.2) In the reporting year, was your organization subject to any fines, enforcement orders, and/or other penalties for water-related regulatory violations?

No

W3. Procedures

W-EU3.1

(W-EU3.1) How does your organization identify and classify potential water pollutants associated with your business activities in the electric utilities sector that could have a detrimental impact on water ecosystems or human health?

Five APS power plants are Zero Liquid Discharge plants, including Palo Verde, Redhawk, Cholla, Saguaro, and Sundance, therefore no pollutants are discharged that may be detrimental to water systems or human health. Four APS plants have permitted discharges and are discussed as follows.The West Phoenix Power Plant has a permitted discharge to the City of Phoenix sanitary sewer and discharges are regulated under their Industrial Pretreatment Program. Samples of the discharge are taken by APS and reported to demonstrate compliance with permit limits. Additional compliance samples are taken by the City of Phoenix to confirm compliance.The Ocotillo Power Plant has a permitted discharge to the City of Tempe sanitary sewer and discharges are regulated under their Industrial Pretreatment Program. Samples of the discharge are taken by APS and reported to demonstrate compliance with permit limits. Additional compliance samples are taken by the City of Tempe to confirm compliance. The

Four Corners Power Plant has an NPDES permit that places limits on discharges from Morgan Lake to Chaco Wash. Annual inspections are conducted by the Navajo EPA and compliance samples are collected. APS also collects compliance samples and reports results to confirm compliance. The Yucca Power Plant has a discharge to the USBR Mode Canal that has water quality limits. Samples are collected and reported by APS to confirm compliance.

W-EU3.1a

(W-EU3.1a) Describe how your organization minimizes the adverse impacts of potential water pollutants associated with your activities in the electric utilities sector on water ecosystems or human health.

Potential water pollutant	Description of water pollutant and potential impacts	Management procedures	Please explain
Other, please specify (Four APS plants have permitted discharg)	The West Phoenix and Ocotillo power plants have permitted discharges to sanitary sewer systems. Violations of discharge limits could adversely impact a wastewater treatment plant or pass through the wastewater treatment plant, resulting in environmental harm. The Four Corners Power Plant has a NPDES permit to discharge to Chaco Wash, and ultimately to the San Juan River in New Mexico. Violations of the permit could result in adverse impacts in the San Juan River, habitat of two endangered fishes. The Yucca Power Plant has a permitted discharge to the Mode Canal that ultimately discharges to the Cienega Santa Clara in Mexico. Violations of this permit could result in adverse impacts to a sensitive ecosystem.	Compliance with effluent quality standards Measures to prevent spillage, leaching, and leakages Community/stakeholder engagement Emergency preparedness	All four plants that have discharge permits have limits on discharges that protect from environmental or human harm and compliance is documented. Spill Prevention Control and Countermeasures plans are implemented at all APS power plants, primarily to prevent oil spills and minimize possible environmental impacts. These SPCC plans are recorded with local emergency management agencies and are exercised on regular frequencies to confirm effectiveness. Community stakeholder engagement is performed with communities surrounding APS power plants. An example if the Palo Verde Community Advisory Panel. This group meets at regular intervals to discuss actions taken by Palo Verde to protect local water resources from damage by plant operations. Emergency preparedness is another activity undertaken by APS plants. This includes coordination with local environmental, police, and regulatory agencies on issues such as spill response or any public safety issue. An example is that APS has many regulated dams that provide containment for evaporation ponds, water storage reservoirs, and ash ponds. These regulated dam are regularly inspected to confirm compliance with safety standards.

W3.3

(W3.3) Does your organization undertake a water-related risk assessment?

Yes, water-related risks are assessed

W3.3a

(W3.3a) Select the options that best describe your procedures for identifying and assessing water-related risks.

Direct operations

Coverage
Full

Risk assessment procedure
Water risks are assessed as part of an enterprise risk management framework

Frequency of assessment
Six-monthly or more frequently

How far into the future are risks considered?
>10 years

Type of tools and methods used
Enterprise Risk Management
International methodologies
Databases

Tools and methods used
Environmental Impact Assessment
IPCC Climate Change Projections
Other, please specify (ISO 14001 Compliance at all Power Plants)

Comment
EIS actions are conducted at some plants to renew the operating licenses. The Four Corners Power Plant EIS established Biological and Reasonable and Prudent Measures to be identified, implemented, and reported annually. APS worked with the USBR, Sandia National Lab, LANL, and NREL to evaluate the potential impacts of climate change on power plant water availability in the Western US and received a final report in December, 2017. ISO 14001 EMS was implemented at all APS power plants.

Supply chain

Coverage
Full

Risk assessment procedure
Water risks are assessed as part of an enterprise risk management framework

Frequency of assessment
Annually

How far into the future are risks considered?
2 to 5 years

Type of tools and methods used
Tools on the market

International methodologies
Other

Tools and methods used

Life Cycle Assessment
Internal company methods
Other, please specify (Risk Viability & Procurement IQ)

Comment

Suppliers are vetted and segmented in proper categories and supplier risk analysis consists of evaluation by financial, terms and conditions, regional/Natural disaster, environmental, health, safety, corporate responsibility, business resilience, quality, and service capacity. In addition, as part of sourcing process, risk analysis is done for each considered supplier so that APS can understand the risk that it is assuming and potential impacts.

Other stages of the value chain

Coverage

Full

Risk assessment procedure

Water risks are assessed as part of an enterprise risk management framework

Frequency of assessment

Six-monthly or more frequently

How far into the future are risks considered?

>10 years

Type of tools and methods used

Enterprise Risk Management
Databases
Other

Tools and methods used

Other, please specify (Internal Expertise)

Comment

Each Business Area executive is responsible for identifying significant risks and planned mitigations in his/her business plan. Each executive is also responsible for supporting the Company's Enterprise Risk Management process by assigning a Risk Coordinator to surface and report Business Area risks which have the potential to impact achieving Company objectives. Risks (including water risk) are reported to shareholders, the public, and other stakeholders through company SEC filing.

W3.3b

(W3.3b) Which of the following contextual issues are considered in your organization's water-related risk assessments?

	Relevance & inclusion	Please explain
Water availability at a basin/catchment level	Relevant, always included	APS has numerous agreements and contracts with local communities regarding current and future water supplies. Examples of such agreements are the San Juan River Shortage Sharing Agreement that ensures that all water users would share proportionally in drought-related cuts to water supply. Another example is the Joseph City Severance and Transfer agreement that provides a contingent supply of surface water to the Cholla Power Plant in the event that sufficient groundwater was not available. APS is committed to work with these entities to ensure continued efficient water use and has made plans for shortages that will ensure a reliable supply of water is available.
Water quality at a basin/catchment level	Relevant, always included	Water quality issues are addressed at all APS, plants, with particular focus on the four plants that have discharge permits. APS actively manages plant activities such as effluent monitoring, reporting, and spill response, and ensuring that operators are properly trained and certified to ensure permit compliance.
Stakeholder conflicts concerning water resources at a basin/catchment level	Relevant, always included	APS participates in a number of groups throughout Arizona and New Mexico that are working to resolve water resource conflicts and issues. Examples include the Governor's Water Augmentation Council, the Groundwater Users Advisory Council, the Kyl Center for Water Policy, and the San Juan River Basin Recovery Implementation Program. APS also participates in a critical watershed project at the Four Corners power plant with four national laboratories and the U.S. Bureau of Reclamation to evaluate possible climate change impacts on water supplies used for power generation. The study's title is "Climate Change Impact and Decision Support for Energy Development Planning Under Changing Water Supply Conditions." While planning for future water supply acquisition, APS looks at potential stakeholder conflicts and examines different scenarios to determine if those conflicts can be resolved while ensuring that sufficient water is available to meet each stakeholder's needs. APS evaluates alternative water supplies for the future such as poor quality groundwater that is currently underutilized in Arizona and is being considered for development by multiple entities. Scenarios have been developed to either independently pursue such water supplies or to work with one or more parties to jointly develop it.
Implications of water on your key commodities/raw materials	Relevant, always included	In 2017, APS asked its 50 top tier suppliers to report their water management through the Electric Utility Industry Sustainable Supply Chain Alliance (EUISSCA) Sustainability Survey. These suppliers represent about 31% of total spend. APS suppliers invited to respond were selected based on prioritizing top tier suppliers, the most critical and strategic suppliers and those with whom APS spends significant dollars. Responding suppliers may state whether their company operates in a region that is currently or projected to be a water-scarce region and if their company's production/service/generation process rely on water availability. Water shortages are not anticipated to have an impact on key commodities/raw materials needed to support electric generation.
Water-related regulatory frameworks	Relevant, always included	One important aspect of risk assessment at APS is complying with local, state and federal regulatory requirements. APS works with the Arizona Department of Water Resources on state regulations of groundwater and surface water, the Arizona Department of Environmental Quality on water quality regulations, and the New Mexico State Engineers Office on water supplies in New Mexico. Regulatory issues such as developing legislation, rules, or guidance documents are tracked and reported quarterly or more frequently if needed. Plans are in place to proactively participate in the regulatory process, to provide comments, and address each developing issue to ensure there is no adverse impact to the water supplies needed to support generation.

	Relevance & inclusion	Please explain
Status of ecosystems and habitats	Relevant, always included	APS participates on the Biology Committee and Coordinating Committee of the San Juan River Basin Recovery Implementation Program to assist in recovery efforts associated with the endangered Colorado Pikeminnow and Razorback Sucker. APS provides about $500,000 a year for stocking programs, non-native fish removal, protecting and augmenting fish habitat, monitoring endangered fish populations, prohibiting expansion of non-native fish species (fish traps), constructing an in-stream fish passage and evaluating temperature modification studies. APS also participates in the Coconino Plateau Water Advisory Committee, modeling Coconino Aquifer withdrawals and protecting the critical habitat of the Little Colorado Spinedace. APS works with water users and environmental stakeholders to evaluate potential impacts/mitigation of groundwater pumping on spring flows that provide critical habitat for threatened fish populations.
Access to fully-functioning, safely managed WASH services for all employees	Relevant, always included	All APS workers have full access to fully functioning WASH services at all APS facilities. APS drinking water treatment systems are permitted and monitored for compliance by ADEQ and APS operators are trained and licensed by the State to ensure proper operation and protection of public health.
Other contextual issues, please specify	Not relevant, explanation provided	There are no other water issues for risk assessment

W3.3c

(W3.3c) Which of the following stakeholders are considered in your organization’s water-related risk assessments?

	Relevance & inclusion	Please explain
Customers	Relevant, always included	Water risk assessments are performed to minimize risk to APS's ability to generate power in the interest of our customers. APS discusses water risk with suppliers of water such as those that produce the effluent that is purchased for use at power plants. Those suppliers are also APS customers, therefore it is mutually beneficial to jointly assess water risks that may impact us. A good example of water risk management where we interface with other stakeholders is at Four Corners, where the possibility of a water shortage on the San Juan is never more than three years away due to the small watershed associated with Navajo Reservoir. The San Juan Shortage Sharing Agreement is intended to make a shortage less of a burden on one member of the group, as shortages are equally shared. Further, the quarterly Navajo Reservoir meetings provide an opportunity to remain aware of current watershed conditions and outlook, plus all of the SSA members are present to discuss how to prepare if a shortage is imminent. Other stakeholders also attend these meetings, including the USBR, NGOs, and local business owners that benefit from the discussions.

	Relevance & inclusion	Please explain
Employees	Relevant, always included	At APS, employees are continually educated concerning water risks to the company. This is done by providing presentations to executive management, Directors, and employees that are interested in how APS manages water. Water Resource Management works directly with plant operators and chemical control specialists at the plants that operate water treatment and disposal systems. Water Resource staff meet monthly with plant managers, Directors, General Managers and Vice-Presidents to discuss the status of water conservation initiatives and suggest actions that the plants can take to minimize water use. Water Resource Management conducts water use surveys of each plant and provides specific recommendations to reduce water consumption. As new employees are hired, WRM makes an effort to be sure they become integrated in water issues and are cross-trained to the extent practicable as they learn new job duties.
Investors	Relevant, always included	APS discusses water risks with partners at all participant owned plants – Palo Verde, Cholla, Yucca and Four Corners. Decisions that reduce risk often involve cost, therefore, must be discussed with co-owner/investors. APS also reports to investors through SEC filings (10-K and 10-Q), the Pinnacle West Corporate Responsibility Report and CDP Water questionnaire. APS risk assessments identify and eliminate risks that may interfere with plant operations and help APS to become a better steward of water resources.
Local communities	Relevant, always included	APS participates with local communities throughout Arizona and in New Mexico to seek local solutions to water resource issues. APS participates in Community Advisory Panel meetings that occur near the Palo Verde to ensure that the local community is aware of activities at Palo Verde, and to answer any questions that may develop. APS works on the San Juan Recovery Implementation Program in New Mexico, participating in quarterly meetings to discuss local watershed issues and make the public aware of activities at the Four Corners Power Plant.
NGOs	Relevant, always included	APS engages with Non-Governmental Organizations (NGOs) concerning water risks associated with potential adverse environmental impacts at the Four Corners Power Plant and the Cholla Power Plant. Some NGO's include the Sierra Club, National Parks and Conservation Association, Environmental Defense Fund, and the Nature Conservancy. Interaction with NGO's has proven beneficial, particularly at Four Corners, where the process of working together on endangered fish issues has made it clear that our interests are aligned.
Other water users at a basin/catchment level	Relevant, always included	APS engages with local water users in planning meetings such as the Groundwater Users Advisory Council, Governors Water Augmentation Council, and the Kyl Center for Water Policy. APS also interacts with local users on the San Juan River to maintain a shortage sharing agreement to be implemented following severe drought conditions. Quarterly Navajo Reservoir meetings are also a good opportunity to interact with local business interests, such as fishing guides and motel/cabin owners that are impacted by water conditions on the San Juan River.
Regulators	Relevant, always included	APS engages with the Arizona Department of Water Resources concerning risk to water supplies in state-wide planning meetings such as the Groundwater Users Advisory Council. APS also engages with the New Mexico State Engineers concerning water supply conditions on the San Juan River, Navajo Reservoir, and shortage sharing. As potential shortages on the Colorado River remain possible in the next few years, APS has engaged with local regulators and other stakeholders to develop and support the Lower Colorado River Drought Contingency Plan, designed to keep more water in Lake Mead and reduce the possibility of future shortages.
River basin management authorities	Relevant, always included	APS works with the U.S. Bureau of Reclamation concerning management of the water supply in Navajo Reservoir. APS participates in on-going environmental flows workshops designed to balance the needs between commercial, agricultural and environmental interest in the San Juan River Basin in New Mexico.

	Relevance & inclusion	Please explain
Statutory special interest groups at a local level	Relevant, always included	APS works with statutory special interest groups as they are identified and, based on evaluation, may directly engage with the groups when appropriate. APS meets regularly with a variety of groups such as the Governors Water Augmentation Council, the Groundwater Users Advisory Council, the Kyl Center for Water Policy, and the San Juan River River Implementation Program (RIP).
Suppliers	Relevant, always included	We have worked with our suppliers to better understand our value-chain footprint. In 2017, APS asked its 50 top tier suppliers to report on their water management through the Electric Utility Industry Sustainable Supply Chain Alliance Sustainability Survey. Suppliers are selected based upon their ability to meet the needs of APS power plants while ensuring their products are not at risk of delivery due to water related issues. Responding suppliers may state whether their company operates in a region that is currently or projected to be a water-scarce region and if their company's production/service/generation process rely on water availability. We engage our suppliers through a variety of channels and communications. At a corporate level this includes the Corporate Responsibility section of our corporate website, our annual Corporate Responsibility Report and through multi-stakeholder roundtables. We also hold annual Supplier of the Year awards and hold an annual Key Supplier Forum. In addition, APS performs assessments of supplier risk (includes water treatment chemicals). Risk is evaluated by financial, terms and conditions, regional/natural disaster, environmental, health, safety, corporate responsibility, business resilience, quality, and service and capacity.
Water utilities at a local level	Relevant, always included	Communication with local water utilities is essential to ensure that a sustainable water supply is available for use at the Palo Verde Generating Station and the Redhawk Power Plant. APS meets regularly with representatives of the five municipalities that supply water to the 91st Avenue Waste Water Treatment Plant (Phoenix, Scottsdale, Glendale, Mesa, and Tempe, Arizona), and ultimately is delivered to Palo Verde and Redhawk. APS also meets with representatives of Tolleson and Goodyear, as needed, to ensure that their discharges to the Palo Verde pipeline remain reliable and meet water quality goals.
Other stakeholder, please specify	Relevant, always included	APS meets with other electric utilities in Arizona to pool data that demonstrates to the public, the efficient use of water by the electric power industry in Arizona. Statewide efficiency of power plants, by type, is developed, water consumption is tracked over time, water intensity (efficiency) is trended, and this data is shared with state agencies, municipalities, and Non-Governmental Organizations (NGOs) in a variety of local and statewide public meetings. In 2017, less than 2% of Arizona's statewide water budget was consumed by the electric industry.

W3.3d

(W3.3d) Describe your organization's process for identifying, assessing, and responding to water-related risks within your direct operations and other stages of your value chain.

The Chief Financial Officer is responsible for enterprise risk management (ERM) and chairs the Executive Risk Committee (ERC). The ERC is responsible for ensuring the Board receives timely information concerning Company material risks and risk management processes. The ERC provides the Board with a list of the Company's top risks on an annual basis. Risks encompass a broad range of topics such as water resource availability and cost and exposures in the

supply chain. Each executive is responsible for identifying significant risks and planned mitigation in their business plan. Each executive is also responsible for supporting the ERM process by assigning a Risk Coordinator to report risks which have the potential to impact achieving Company objectives. Risks (including water risk) are reported to shareholders and other stakeholders through Pinnacle West's Form 10-K and Sustainability Report, and to regulators via annual reporting. In addition, a corporate water quantity policy was established with risk criteria, including shortages due to drought, infrastructure issues, regulatory/legal limits and costs of water. Risk is assessed quarterly and reported to executives on the strategic options roadmap. APS also files Integrated Resource Plans every 2-3 years with the Arizona Corporation Commission that address water risks for the next 15 years. Risk assessments are performed annually by the USBR and partners, including APS, at Navajo Reservoir and in the San Juan River. These assessments identify potential for drought-related shortages and involve models developed by the Colorado Basin River Forecast Center. Suppliers are vetted and segmented in proper categories and supplier risk analysis includes evaluation by regional/natural disaster, business resilience, and service capacity. In addition, as part of the sourcing process, risk analysis is conducted for each considered supplier so that APS can understand the risk it is assuming and potential impacts.

W4. Risks and opportunities

W4.1

(W4.1) Have you identified any inherent water-related risks with the potential to have a substantive financial or strategic impact on your business?

Yes, only within our direct operations

W4.1a

(W4.1a) How does your organization define substantive financial or strategic impact on your business?

APS defines substantive change to our business related to water risk in three ways. First, a physical disruption of a water supply constitutes a substantive and disruptive change. If a vital piece of infrastructure is damaged or becomes inoperable, output could be impacted or generation could be curtailed entirely. Second, noncompliance with a permit or regulatory requirement could impact production and/or result in notices of violations and penalties. Finally, allocation cuts related to water shortages would impact production.

W4.1b

(W4.1b) What is the total number of facilities exposed to water risks with the potential to have a substantive financial or strategic impact on your business, and what proportion of your company-wide facilities does this represent?

	Total number of facilities exposed to water risk	% company-wide facilities this represents	Comment
Row 1	9	100	Includes Palo Verde Generating Station, Redhawk Power Plant, West Phoenix Power Plant, Ocotillo Power Plant, Sundance Power Plant, Saguaro Power Plant, Cholla Power Plant, Four Corners Power Plant, and Yucca Power Plant

W4.1c

(W4.1c) By river basin, what is the number and proportion of facilities exposed to water risks that could have a substantive impact on your business, and what is the potential business impact associated with those facilities?

Country/Region
United States of America

River basin
Other, please specify (Phoenix Active Management Area (AMA))

Number of facilities exposed to water risk
4

% company-wide facilities this represents
26-50

Production value for the metals & mining activities associated with these facilities
<Not Applicable>

% company's annual electricity generation that could be affected by these facilities
76-99

% company's global oil & gas production volume that could be affected by these facilities
<Not Applicable>

% company's total global revenue that could be affected
76-99

Comment

Includes Palo Verde Generating Station, Redhawk Power Plant, West Phoenix Power Plant and Ocotillo Power Plant

---

Country/Region

United States of America

River basin

Other, please specify (Pinal Active Management Area (AMA))

Number of facilities exposed to water risk

1

% company-wide facilities this represents

Less than 1%

Production value for the metals & mining activities associated with these facilities

<Not Applicable>

% company's annual electricity generation that could be affected by these facilities

Less than 1%

% company's global oil & gas production volume that could be affected by these facilities

<Not Applicable>

% company's total global revenue that could be affected

Less than 1%

Comment

Sundance Power Plant

Country/Region

United States of America

River basin

Other, please specify (Tucson Active Management Area (AMA))

Number of facilities exposed to water risk

1

% company-wide facilities this represents

Less than 1%

Production value for the metals & mining activities associated with these facilities

<Not Applicable>

% company's annual electricity generation that could be affected by these facilities

Less than 1%

% company's global oil & gas production volume that could be affected by these facilities

<Not Applicable>

% company's total global revenue that could be affected
Less than 1%

Comment
Saguaro Power Plant

Country/Region
United States of America

River basin
Other, please specify (Joseph City Irrig. Non-Expansion Area)

Number of facilities exposed to water risk
1

% company-wide facilities this represents
1-25

Production value for the metals & mining activities associated with these facilities
<Not Applicable>

% company's annual electricity generation that could be affected by these facilities
1-25

% company's global oil & gas production volume that could be affected by these facilities
<Not Applicable>

% company's total global revenue that could be affected
1-25

Comment
Cholla Power Plant

Country/Region
United States of America

River basin
Other, please specify (San Juan River Basin)

Number of facilities exposed to water risk
1

% company-wide facilities this represents
1-25

Production value for the metals & mining activities associated with these facilities
<Not Applicable>

% company's annual electricity generation that could be affected by these facilities
1-25

% company's global oil & gas production volume that could be affected by these facilities
<Not Applicable>

% company's total global revenue that could be affected
1-25

Comment
Four Corners Power Plant

Country/Region
United States of America

River basin
Other, please specify (Colorado River Basin)

Number of facilities exposed to water risk
1

% company-wide facilities this represents
Less than 1%

Production value for the metals & mining activities associated with these facilities
<Not Applicable>

% company's annual electricity generation that could be affected by these facilities
Less than 1%

% company's global oil & gas production volume that could be affected by these facilities
<Not Applicable>

% company's total global revenue that could be affected
Less than 1%

Comment
Yucca Power Plant

W4.2

(W4.2) Provide details of identified risks in your direct operations with the potential to have a substantive financial or strategic impact on your business, and your response to those risks.

Country/Region
United States of America

River basin

Other, please specify (AMA, Colorado River and San Juan Basin)

Type of risk

Physical

Primary risk driver

Other, please specify (Physical Disruption of water supply)

Primary potential impact

Reduction or disruption in production capacity

Company-specific description

Well failure is a risk that could generate a substantive change in our business. To mitigate this risk, we established a Well and Pumping Equipment Reliability Program in 2015. The program includes monitoring and testing of groundwater wells, pump testing, and well infrastructure inspection (including pumps and motors, meters and lubrication systems.) In the past APS essentially had a "run-to-failure" program which caused more equipment damage and longer down time. Now APS, under the new program, takes a proactive approach which provides shorter down time and less expensive equipment replacement.

Timeframe

Current up to 1 year

Magnitude of potential impact

Low

Likelihood

Unlikely

Potential financial impact

4000000

Explanation of financial impact

The well and pumping equipment reliability program includes annual O&M expenditures for rehabilitation ($635,000 based on operational experience) and capital well replacements ($3-6 million/year which is historically what it cost to drill/replace 1 to 2 wells per year). The enhanced rehabilitation program has reduced unplanned well failures from 5/year in 2015 to two per year in 2017. Wells that fail typically double the cost of repair over a well that was repaired prior to failure.

Primary response to risk

Other, please specify (Well and Pumping Equipment Reliability)

Description of response

Potential well failures have been identified in previous years, therefore, APS implemented a well and pumping equipment reliability program, consisting of well closure/replacement capital projects (typically for wells greater than 50 years old), enhanced well efficiency testing (increased frequency from once per year to once per month), rehabilitation of existing

wells, and adding new equipment that increases efficiency and reliability, such as variable frequency drives and automated oilers.

Cost of response
60000

Explanation of cost of response
A typical planned well rehabilitation costs approximately $50,000-75,000 (based on operational experience), depending on the complexity of the repair. If a well fails catastrophically, the cost of repairs is twice that amount, or more due to the ancillary damage done to down-hole equipment (drive shafts, bearings, column pipe).

Country/Region
United States of America

River basin
Other, please specify (AMA, Colorado River and San Juan Basin)

Type of risk
Regulatory

Primary risk driver
Other, please specify (Exceedance of Permit Requirements)

Primary potential impact
Reduction or disruption in production capacity

Company-specific description
If a permit requirement is exceeded a notice of violation could be issued that may include monetary fines and changes in our business practices that could generate a substantive change in our business. To avoid this risk APS implemented an initiative to focus on building a comprehensive, controlled and structured body of the company's policies, processes and procedures. This action is used to ensure APS has documented its regulatory requirements in a manner that allows for regulatory compliance.

Timeframe
Current up to 1 year

Magnitude of potential impact
Low

Likelihood
Unlikely

Potential financial impact
5000

Explanation of financial impact
Fines range from $1000 to $10,000 depending on the nature of permit exceedance. APS understands that penalties vary depending on the nature of the violation. We have a great

relationship with our regulators and engaged with them for years to know that these fines can vary. Penalties for water quality exceedances are rare because APS manages discharges with a clear understanding of permit limits, and a more likely penalty would be a permit violation, such as failure to submit a report on time.

Primary response to risk

Other, please specify (Process, procedures, and policies)

Description of response

APS understands permit limits and conditions and tracks regulatory commitments in the Enviance database. This ensures that such commitments are understood and completed, as required.

Cost of response

0

Explanation of cost of response

Commitment-tracking databases are part of the routine cost of doing business, no added expense involved.

Country/Region

United States of America

River basin

Other, please specify (AMA, Colorado River and San Juan Basin)

Type of risk

Regulatory

Primary risk driver

Statutory water withdrawal limits/changes to water allocation

Primary potential impact

Reduction or disruption in production capacity

Company-specific description

Another significant risk is the potential declaration of water shortages in the southwest. Risk is mitigated by participating in the San Juan Shortage Sharing Agreement. APS also developed a severance and transfer agreement with the Joseph City Irrigation Company and the Cholla Power Plant to develop a surface water supply contingency to the groundwater supply. APS mitigates the risk of water shortages by investigating storing water and acquiring groundwater rights for use in shortage circumstances. APS has investigated the possibility of acquiring land for storing water in underground storage facilities for use when other supplies are threatened by drought. APS engages with Electric Power Research Institute under their P-185 water management program. It includes cooling technologies, water treatment technologies and specific power generation effluent treatment technologies. APS works with State and local government agencies as well as water providers in Arizona and other states to manage these risks. Surface water supplies are the most at risk water supply, which we manage very closely. Reclaimed water is the most drought proof supply we

have, which provides 74% of all of our supply. Groundwater is the most reliable source; however we manage this supply very closely as well.

Timeframe
4 - 6 years

Magnitude of potential impact
Low

Likelihood
Unlikely

Potential financial impact
0

Explanation of financial impact
There are no added costs for management of shortage-related risks. Understanding this risk and developing risk responses are routine duties of existing Water Resource Management staff.

Primary response to risk
Develop drought emergency plans

Description of response
Shortage sharing agreements (Four Corners), participation in regional strategic planning activities (Drought Contingency Plan), provision of primary and secondary water supplies at power plants, and creation of severance and transfer agreements (Cholla) reduces the probability of an adverse result from drought conditions.

Cost of response
0

Explanation of cost of response
All drought response activities are part of routine business planning and performed by existing staff or with normal budgeted consultant assistance.

W4.2c

(W4.2c) Why does your organization not consider itself exposed to water risks in its value chain (beyond direct operations) with the potential to have a substantive financial or strategic impact?

	Primary reason	Please explain

	Primary reason	Please explain
Row 1	Risks exist, but no substantive impact anticipated	Per our Electric Utility Industry Sustainable Supply Chain Alliance (EUISSCA) survey, suppliers have indicated risks but none that are anticipated to have a substantive impact on their operations. On a quarterly basis, we engage with our suppliers to discuss current performance including risks identified and mitigation plans. Our key suppliers have instituted sustainability programs including quality of water, water risk, and water consumption.

W4.3

(W4.3) Have you identified any water-related opportunities with the potential to have a substantive financial or strategic impact on your business?

Yes, we have identified opportunities, and some/all are being realized

W4.3a

(W4.3a) Provide details of opportunities currently being realized that could have a substantive financial or strategic impact on your business.

Type of opportunity
Efficiency

Primary water-related opportunity
Improved water efficiency in operations

Company-specific description & strategy to realize opportunity

Natural gas and solar generation are more water efficient than coal generation, accordingly APS's closure of coal units at Cholla and Four Corners (820 megawatts retired since 2013) has resulted in the reduction of water consumption by approximately 20%. APS plans to retire an additional 767 megawatts of coal by 2025, which is projected to further reduce water consumption at the Cholla Power Plant to less than 10% of current consumption. Shift in load from coal to natural gas will result in significant water savings as the water intensity (gallons/megawatt hour) at gas plants is less than half of the coal plant water intensity.

Continued development of renewable energy such as PV solar and wind will reduce fleet wide water intensity. When combined with reduction in coal generation plus the retirement of steam units at Ocotillo (replaced with more efficient combustion turbines), APS expects fleet wide water intensity reductions of 20% by 2025.

Estimated timeframe for realization
>6 years

Magnitude of potential financial impact

Low-medium

Potential financial impact
5000000

Explanation of financial impact
Reduced water consumption will reduce need for well and pumping equipment maintenance and capital replacements proportional to reductions in water consumption. Savings of $1,000,000 - $2,000,000/year would be reasonable. APS evaluates the need for new infrastructure and includes such projects in the long range forecast. Then, based upon reduced need for water due to more efficient plants, or retirement of older plants, certain of the capital projects can be eliminated. As plant retirements are planned, certain capital improvement projects can be eliminated without risk, such as need for new wells and/or pipeline replacements, assuming existing infrastructure is maintained properly. A single new well could cost $2-3 million and pipeline replacement projects can easily exceed $1 million.

Type of opportunity
Resilience

Primary water-related opportunity
Other, please specify (Resilience to costs and supply challenge)

Company-specific description & strategy to realize opportunity
Investments to meet future generation needs: APS investment in water for the future includes purchase of effluent under contracts through 2050 for Palo Verde and Redhawk, to be extended if needed. It also includes purchase of long term storage credits from the Gila River Indian Community to supply high priority water to the Sundance Power Plant. These long-duration contracts provide assured water at a known price.

Estimated timeframe for realization
>6 years

Magnitude of potential financial impact
Medium-high

Potential financial impact
12500000

Explanation of financial impact
Assured water supplies for a predictable price allows long-term budgeting with a high probability of confidence. The regional cost of water is currently increasing at twice the rate of inflation or more, therefore, from 2025 - 2050, it is likely that current contracts could save $500,000/year, or more.This is based upon knowledge of the existing water market, supplemented by bi-annual audits of water sales in the area. Recent audits have revealed that the inflation rate has been less than 2%, however, local water costs are inflating at 4-8%. Having a contract with a maximum escalation rate of 3%/year between 2025 and 2050 in a water market that exceeds a 3%/year escalation rate will result in substantial savings. For

example, if the cost of water in 2025 is $20,000,000/year, escalating at a maximum of 3%/year, but the water market is escalating at 6%/year, the savings would be $600,000/year.

Type of opportunity
Efficiency

Primary water-related opportunity
Improved water efficiency in operations

Company-specific description & strategy to realize opportunity
Alternative cooling technologies: Retirement of steam units at Ocotillo and replacement with more efficient combustion turbines, cooled by hybrid cooling will reduce water consumption significantly. Water intensity will improve from 1000 g/mwh to 140 g/mwh. Additional efficiencies will be achieved by retiring older water intensive steam Units at Cholla by 2025 and replacing them with gas-fired Units, with reductions from 1000 g/mwh to an average of 300 g/mwh. APS water efficiency strategies include development of commercial scale solar and wind generation, energy efficiency improvements, and distributed generation (rooftop solar) that will reduce overall water consumption for power delivered to APS customers. We project a reduction in water intensity of 20% by 2025. This reduction in water consumption will reduce the need for water pumping and treatment infrastructure.

Estimated timeframe for realization
>6 years

Magnitude of potential financial impact
Low-medium

Potential financial impact
4000000

Explanation of financial impact
Reduced water pumping, delivery and treatment costs between 2017 and 2025 at $500,000/year. Reduced water pumping, delivery and treatment costs between 2017 and 2025 at $500,000/year. As the quantity of water needed to support generation is decreases, the costs of delivering water (acquisition, electricity, maintenance, equipment replacement) is decreasing. In addition, APS has successfully upgraded the quality of wells and pumping equipment for several years to the point that the need for on-going major maintenance/replacement is decreasing. A single planned major maintenance of a well can cost $50 – 100,000. We currently have 44 wells and plan major maintenance at least every 5 years, but may extend the maintenance period to 6 years, or more, depending on how many hours the wells are run.

Type of opportunity
Efficiency

Primary water-related opportunity
Improved water efficiency in operations

Company-specific description & strategy to realize opportunity

Infrastructure maintenance and repair: APS established a Well and Pumping Equipment Reliability Program in 2015 that encompasses critical components of the water supply, including groundwater wells, well testing and inspection, pump testing, well infrastructure inspection (including pumps and motors, meters and lubrication systems). Expected improvements in reliability of 2%/year are being tracked. Prior to 2015 APS experienced 5 well failures in one year. With the implementation of the Well and Pumping Equipment Reliability Program, we see approximately 1-2 per year, expected to be no more than one/year after 2019. We also perform well testing on all of our mission critical wells every year to gain information on their efficiency and reliability.

Estimated timeframe for realization

1 to 3 years

Magnitude of potential financial impact

Low

Potential financial impact

150000

Explanation of financial impact

This program is expected to reduce unplanned failures to one per year, or less, down from two per year in 2017, at a savings over 3 years of $150,000. A single planned well rehabilitation can cost $50-100,000, however, an unplanned failure can cost twice that amount.

Type of opportunity

Efficiency

Primary water-related opportunity

Improved water efficiency in operations

Company-specific description & strategy to realize opportunity

Management of pumping is important to ensure that the highest quality water possible is delivered to the plant at all times, and used as efficiently as possible before water needs to be discharged for disposal. It also prevents or minimizes degradation of water quality in the well field area over time. Use of higher quality water reduces treatment and equipment operation and maintenance costs. Currently there are three (3) well field operation plans that have been developed. They include Cholla, West Phoenix and Redhawk. The plans lay out a well ranking system to prioritize which wells should run for certain times of the day. These plans are based on reviews of information such as gallons per minute, Total Dissolved Solids, location, historical pumpage, evaluation schedules and years in service. The recommendations are based on normal conditions and plant operations.

Estimated timeframe for realization

Current - up to 1 year

Magnitude of potential financial impact

Low

Potential financial impact
100000

Explanation of financial impact
Improved efficiency at the three identified plants could reduce water consumption by 5%/year. The cost of water at these plants is limited to the cost of pumping and treatment. Savings are achieved in reduced power costs and reduced need for major maintenance as wells and pumping equipment are lasting longer, due to shorter run times.

W5. Facility-level water accounting

W5.1

(W5.1) For each facility referenced in W4.1c, provide coordinates, total water accounting data and comparisons with the previous reporting year.

Facility reference number
Facility 1

Facility name (optional)
Palo Verde Generating Station

Country/Region
United States of America

River basin
Other, please specify (Phoenix Active Management Areas)

Latitude
33.395277

Longitude
-112.858333

Primary power generation source for your electricity generation at this facility
Nuclear

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
93184

Comparison of withdrawals with previous reporting year
About the same

Total water discharges at this facility (megaliters/year)
0

Comparison of discharges with previous reporting year
About the same

Total water consumption at this facility (megaliters/year)
93184

Comparison of consumption with previous reporting year
About the same

Please explain

About the same amount of power was generated at the Palo Verde Generating Station in 2017, and about the same amount of reclaimed water was used. Palo Verde continued to be the single largest producer of electricity in the US in 2017. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

Facility reference number
Facility 2

Facility name (optional)
Red Hawk Power Plant

Country/Region
United States of America

River basin
Other, please specify (Phoenix Active Management Area)

Latitude
33.336229

Longitude
-112.840533

Primary power generation source for your electricity generation at this facility
Gas

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
5092

Comparison of withdrawals with previous reporting year
Lower

Total water discharges at this facility (megaliters/year)
0

Comparison of discharges with previous reporting year
About the same

Total water consumption at this facility (megaliters/year)
5092

Comparison of consumption with previous reporting year
Lower

Please explain

Less power was generated at the Redhawk Power Plant in 2017 resulting in less reclaimed water and groundwater use. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

Facility reference number
Facility 3

Facility name (optional)
West Phoenix Power Plant

Country/Region
United States of America

River basin
Other, please specify (Phoenix Active Management Area)

Latitude
33.440277

Longitude
-112.162777

Primary power generation source for your electricity generation at this facility
Gas

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
4025

Comparison of withdrawals with previous reporting year
Higher

Total water discharges at this facility (megaliters/year)
345

Comparison of discharges with previous reporting year
Much higher

Total water consumption at this facility (megaliters/year)
3680

Comparison of consumption with previous reporting year
Higher

Please explain

Water use was higher in 2017 due to increased generation at the West Phoenix Power Plant associated with reduction in natural gas prices. There was an increase of water discharged in 2017 due to an extended outage of the ZLD system. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

Facility reference number
Facility 4

Facility name (optional)
Ocotillo Power Plant

Country/Region
United States of America

River basin
Other, please specify (Phoenix Active Management Area)

Latitude
33.428888

Longitude
-111.910277

Primary power generation source for your electricity generation at this facility
Gas

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
741

Comparison of withdrawals with previous reporting year
Much higher

Total water discharges at this facility (megaliters/year)
115

Comparison of discharges with previous reporting year
Much higher

Total water consumption at this facility (megaliters/year)
626

Comparison of consumption with previous reporting year
Much higher

Please explain

Water use was much higher in 2017 due to increased generation at the Ocotillo Power Plant, associated with reduction in natural gas prices. Also, increased water use occurred due to the construction of 5 new combustion turbines to be deployed in 2019. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

Facility reference number
Facility 5

Facility name (optional)
Sundance Power Plant

Country/Region
United States of America

River basin
Other, please specify (Pinal Active Management Area)

Latitude
32.927941

Longitude
-111.588993

Primary power generation source for your electricity generation at this facility
Gas

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
297

Comparison of withdrawals with previous reporting year
Much higher

Total water discharges at this facility (megaliters/year)
0

Comparison of discharges with previous reporting year
About the same

Total water consumption at this facility (megaliters/year)
297

Comparison of consumption with previous reporting year
Much higher

Please explain

More power was generated at the Sundance Power Plant in 2017, associated with reduction in natural gas prices, resulting in more water used. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

Facility reference number
Facility 6

Facility name (optional)
Saguaro Power Plant

Country/Region
Other, please specify (Tucson Active Management Area)

River basin
Other, please specify (Tucson Active Management Areas)

Latitude
32.553903

Longitude
-111.299829

Primary power generation source for your electricity generation at this facility
Gas

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
19

Comparison of withdrawals with previous reporting year
Much lower

Total water discharges at this facility (megaliters/year)

0

Comparison of discharges with previous reporting year
About the same

Total water consumption at this facility (megaliters/year)
19

Comparison of consumption with previous reporting year
Much lower

Please explain

Power production at the Saguaro Power Plant was much less in 2017 resulting in decreased water use. Decommissioning of old steam Units at Saguaro was completed in 2017 and improvements to well infrastructure will ensure a reliable water supply remains available to support current and future generation. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower".

Facility reference number
Facility 7

Facility name (optional)
Cholla Power Plant

Country/Region
United States of America

River basin
Other, please specify (Joseph City Irrigation Non-expansion Are)

Latitude
34.940654

Longitude
-110.299623

Primary power generation source for your electricity generation at this facility
Coal - hard

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
12104

Comparison of withdrawals with previous reporting year
Much higher

Total water discharges at this facility (megaliters/year)

0

Comparison of discharges with previous reporting year
About the same

Total water consumption at this facility (megaliters/year)
12104

Comparison of consumption with previous reporting year
Much higher

Please explain

Power production at Cholla was significantly more in 2017 resulting in a significant increase in water consumption. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered

---

Facility reference number
Facility 8

Facility name (optional)
Four Corners Power Plant

Country/Region
United States of America

River basin
Other, please specify (San Juan)

Latitude
36.685009

Longitude
-108.479176

Primary power generation source for your electricity generation at this facility
Coal - hard

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
21844

Comparison of withdrawals with previous reporting year
About the same

Total water discharges at this facility (megaliters/year)
4259

Comparison of discharges with previous reporting year
About the same

Total water consumption at this facility (megaliters/year)
17584

Comparison of consumption with previous reporting year
About the same

Please explain
Water use at the Four Corners Power Plant was about the same in 2017 due to about the same generation from 2016. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

Facility reference number
Facility 9

Facility name (optional)
Yucca Power Plant

Country/Region
United States of America

River basin
Other, please specify (Colorado River)

Latitude
32.719722

Longitude
-114.713333

Primary power generation source for your electricity generation at this facility
Gas

Oil & gas sector business division
<Not Applicable>

Total water withdrawals at this facility (megaliters/year)
612

Comparison of withdrawals with previous reporting year
Lower

Total water discharges at this facility (megaliters/year)
0

Comparison of discharges with previous reporting year
About the same

Total water consumption at this facility (megaliters/year)
612

Comparison of consumption with previous reporting year
Lower

Please explain
Power generation was lower at Yucca due to decreased operation of the water-intensive steam Unit resulting in lower water use. Year-to-year changes of less than 5% were considered "about the same". Year-to-year changes between 5% and 15% were considered "higher"/"lower". Year-to-year changes over 15% were considered "much higher"/'much lower".

W5.1a

(W5.1a) For each facility referenced in W5.1, provide withdrawal data by water source.

Facility reference number
Facility 1

Facility name
Palo Verde Generating Station

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
47

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
2455

Produced water
0

Third party sources
90682

Comment
Third party sources for purposes of this report is reclaimed water

---

Facility reference number
Facility 2

Facility name
Red Hawk Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes

0

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
609

Produced water
0

Third party sources
4483

Comment
Third party sources for purposes of this report is reclaimed water

---

Facility reference number
Facility 3

Facility name
West Phoenix Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
0

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
4025

Produced water
0

Third party sources
0

Comment

Facility reference number
Facility 4

Facility name

Ocotillo Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
0

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
741

Produced water
0

Third party sources
0

Comment

Facility reference number
Facility 5

Facility name
Sundance Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
297

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
0

Produced water
0

Third party sources
0

Comment

Facility reference number
Facility 6

Facility name
Saguaro Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
0

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
19

Produced water
0

Third party sources
0

Comment

Facility reference number
Facility 7

Facility name
Cholla Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
148

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
11956

Produced water
0

Third party sources
0

Comment

Facility reference number

Facility 8

Facility name
Four Corners Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
21844

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
0

Produced water
0

Third party sources
0

Comment

Facility reference number
Facility 9

Facility name
Yucca Power Plant

Fresh surface water, including rainwater, water from wetlands, rivers and lakes
31

Brackish surface water/seawater
0

Groundwater - renewable
0

Groundwater - non-renewable
581

Produced water
0

Third party sources
0

Comment

W5.1b

(W5.1b) For each facility referenced in W5.1, provide discharge data by destination.

Facility reference number
Facility 1

Facility name
Palo Verde Generating Station

Fresh surface water
0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
0

Comment
Zero liquid discharge facility

Facility reference number
Facility 2

Facility name
Red Hawk Power Plant

Fresh surface water
0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
0

Comment
Zero liquid discharge facility

Facility reference number

Facility 3

Facility name
West Phoenix Power Plant

Fresh surface water
0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
345

Comment
More water was discharged to the city sewer at West Phoenix in 2017 due to failure and an extended outage with the ZLD system.

Facility reference number
Facility 4

Facility name
Ocotillo Power Plant

Fresh surface water
0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
115

Comment
More water was discharged in 2017 than in 2016 at Ocotillo due to higher generation and construction use.

Facility reference number
Facility 5

Facility name
Sundance Power Plant

Fresh surface water

0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
0

Comment
Zero liquid discharge facility

Facility reference number
Facility 6

Facility name
Saguaro Power Plant

Fresh surface water
0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
0

Comment
Zero liquid discharge facility

Facility reference number
Facility 7

Facility name
Cholla Power Plant

Fresh surface water
0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
0

Comment
Zero liquid discharge facility

Facility reference number
Facility 8

Facility name
Four Corners Power Plant

Fresh surface water
4259

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
0

Comment
In 2017, about the same amount of water was returned back into the environment than in 2016.

Facility reference number
Facility 9

Facility name
Yucca Power Plant

Fresh surface water
0

Brackish surface water/Seawater
0

Groundwater
0

Third party destinations
0

Comment
In 2017, about the same amount of water was returned back into the environment than in 2016.

W5.1c

(W5.1c) For each facility referenced in W5.1, provide the proportion of your total water use that is recycled or reused, and give the comparison with the previous reporting year.

Facility reference number
Facility 1

Facility name
Palo Verde Generating Station

% recycled or reused
76-99%

Comparison with previous reporting year
About the same

Please explain
Palo Verde is a ZLD facility, recycling 95% of water used by increasing COC in cooling towers up to 25 times; the blowdown is discharged to evaporation ponds.

Facility reference number
Facility 2

Facility name
Red Hawk Power Plant

% recycled or reused
76-99%

Comparison with previous reporting year
About the same

Please explain
Red Hawk is also a zero liquid discharge (ZLD) site, meaning that all water is continually reclaimed and reused. No water is released to the environment and blowdown water is distilled to remove impurities and is continually reused in the system. Water loss at the plant is primarily through evaporation in the cooling towers.

Facility reference number
Facility 3

Facility name
West Phoenix Power Plant

% recycled or reused

76-99%

Comparison with previous reporting year
About the same

Please explain
West Phoenix is also a zero liquid discharge (ZLD) site, meaning that all water is continually reclaimed and reused. No water is released to the environment and blowdown water is distilled to remove impurities and is continually reused in the system. Water loss at the plant is primarily through evaporation in the cooling towers.

Facility reference number
Facility 4

Facility name
Ocotillo Power Plant

% recycled or reused
76-99%

Comparison with previous reporting year
About the same

Please explain
Ocotillo recycles 90% of water used by increasing the cycles of concentration in cooling towers up to 7 times; the blowdown is discharged to the Sewer.

Facility reference number
Facility 5

Facility name
Sundance Power Plant

% recycled or reused
None

Comparison with previous reporting year
About the same

Please explain
None of the water at Sundance is recycled.

Facility reference number
Facility 6

Facility name
Saguaro Power Plant

% recycled or reused

None

Comparison with previous reporting year
About the same

Please explain
None of the water at Saguaro is recycled

Facility reference number
Facility 7

Facility name
Cholla Power Plant

% recycled or reused
76-99%

Comparison with previous reporting year
About the same

Please explain
Cholla is a ZLD facility that uses a cooling lake and cooling towers; 95% of water is recycled and 5% is sent to ash ponds.

Facility reference number
Facility 8

Facility name
Four Corners Power Plant

% recycled or reused
76-99%

Comparison with previous reporting year
About the same

Please explain
Four Corners uses a cooling lake, returns 20% of water used to the source, and recycles the remaining 80%.

Facility reference number
Facility 9

Facility name
Yucca Power Plant

% recycled or reused
76-99%

Comparison with previous reporting year
About the same

Please explain
Yucca recycles 85% of water used by increasing cycles of concentration in cooling towers up to 5 times; the blowdown is discharged to a reclamation canal.

W5.1d

(W5.1d) For the facilities referenced in W5.1, what proportion of water accounting data has been externally verified?

Water withdrawals – total volumes

% verified
76-100

What standard and methodology was used?
APS's water withdrawal data was verified in accordance with the guidelines set forth in the International Standard on Assurance Engagements (ISAE) 3000. The 3rd party verification report is attached at W-FI in Section 11.

Water withdrawals – volume by source

% verified
76-100

What standard and methodology was used?
APS's water withdrawal data was verified in accordance with the guidelines set forth in the International Standard on Assurance Engagements (ISAE) 3000. The 3rd party verification report is attached at W-FI in Section 11.

Water withdrawals – quality

% verified
Not verified

What standard and methodology was used?
Water quality was not verified.

Water discharges – total volumes

% verified
76-100

What standard and methodology was used?

APS's water discharge data was verified in accordance with the guidelines set forth in the International Standard on Assurance Engagements (ISAE) 3000. The 3rd party verification report is attached at W-FI in Section 11.

Water discharges – volume by destination

% verified
76-100

What standard and methodology was used?
APS's water discharge data was verified in accordance with the guidelines set forth in the International Standard on Assurance Engagements (ISAE) 3000. The 3rd party verification report is attached at W-FI in Section 11.

Water discharges – volume by treatment method

% verified
76-100

What standard and methodology was used?
APS's water discharge data was verified in accordance with the guidelines set forth in the International Standard on Assurance Engagements (ISAE) 3000. The 3rd party verification report is attached at W-FI in Section 11.

Water discharge quality – quality by standard effluent parameters

% verified
Not verified

What standard and methodology was used?
Water discharge quality by standard eluent parameters was not verified.

Water discharge quality – temperature

% verified
Not verified

What standard and methodology was used?
Water discharge quality - temperature was not verified.

Water consumption – total volume

% verified
76-100

What standard and methodology was used?
APS's water discharge data was verified in accordance with the guidelines set forth in the International Standard on Assurance Engagements (ISAE) 3000. The 3rd party verification report is attached at W-FI in Section 11.

Water recycled/reused

% verified
76-100

What standard and methodology was used?

APS's water discharge data was verified in accordance with the guidelines set forth in the International Standard on Assurance Engagements (ISAE) 3000. The 3rd party verification report is attached at W-FI in Section 11.

W6. Governance

W6.1

(W6.1) Does your organization have a water policy?

Yes, we have a documented water policy that is publicly available

W6.1a

(W6.1a) Select the options that best describe the scope and content of your water policy.

	Scope	Content	Please explain

	Scope	Content	Please explain
Row 1	Company-wide	Description of business dependency on water Description of water-related performance standards for direct operations Company water targets and goals Commitment to align with public policy initiatives, such as the SDGs Commitments beyond regulatory compliance Commitment to water-related innovation Commitment to stakeholder awareness and education Commitment to water stewardship and/or collective action Acknowledgement of the human right to water and sanitation Recognition of environmental linkages, for example, due to climate change	The water policy guiding APS is the company's strategic water plan. This plan describes initiatives that have been developed to ensure APS secures and maintains a sustainable and cost-effective supply of water to enable reliable energy production for our customers. The plan is company-wide to address water impacts from all operations. It is made available to all employees to demonstrate APS commitment to water stewardship, raise awareness about water issues, and maintain transparency in internal communications. The plan details the main components of the water resource management program which encompass the acquisition of water supplies, alternative supplies, conservation by the efficient use of water, research and technology, groundwater models, well and pumping reliability program, water supply contingency initiative and well field management plans.

W6.2

(W6.2) Is there board level oversight of water-related issues within your organization?

Yes

W6.2a

(W6.2a) Identify the position(s) of the individual(s) on the board with responsibility for water-related issues.

Position of individual	Please explain
Chief Executive Officer (CEO)	The Chairman of the Board, President and Chief Executive Officer of Pinnacle West and Arizona Public Service Company, has the highest level of direct responsibility for water within our organization. The Chief Executive Officer reviews material water issues twice per year via the SEC reporting process and Board of Director's Top Risk Report.

W6.2b

(W6.2b) Provide further details on the board's oversight of water-related issues.

	Frequency that water-related issues are a scheduled agenda item	Governance mechanisms into which water-related issues are integrated	Please explain

	Frequency that water-related issues are a scheduled agenda item	Governance mechanisms into which water-related issues are integrated	Please explain
Row 1	Scheduled - some meetings	Monitoring implementation and performance Overseeing acquisitions and divestiture Overseeing major capital expenditures Reviewing and guiding annual budgets Reviewing and guiding major plans of action Reviewing and guiding risk management policies Reviewing and guiding strategy Reviewing innovation/R&D priorities Setting performance objectives	The Board oversees the Company's business strategy. In addition, the Board's oversees the Company's risk management function to provide assurance that the Company's risk management processes are well adapted to and consistent with the Company's business and strategy. Each Board Committee receives periodic presentations from management about its assigned risk areas. The Executive Risk Committee is responsible for ensuring the Board receives timely information concerning the Company's material risks and risk management processes. Management also assists the Human Resources Committee in recommending: salary levels; annual incentive plan structure and design, including earnings and business unit performance targets or goals. The Finance Committee reviews and discusses with management the Company's process for allocating and managing capital and reviews the Company's annual operations and maintenance budget. The Human Resource Committee annually reviews the goals and performance of the officers of the Pinnacle West and APS and approves corporate goals and objectives relevant to the compensation of the CEO. The Nuclear and Operating Committee receives regular reports from management and monitors the overall performance of Palo Verde; the principal non-nuclear business functions of the Company and APS, including fossil energy generation, energy transmission and delivery, customer service, and receives reports on the Company's sustainability initiatives and strategy.

W6.3

(W6.3) Below board level, provide the highest-level management position(s) or committee(s) with responsibility for water-related issues.

Name of the position(s) and/or committee(s)
Chief Executive Officer (CEO)

Responsibility
Other, please specify (Reviewing water risks and opportunities)

Frequency of reporting to the board on water-related issues
Half-yearly

Please explain

The Chairman of the Board, President and Chief Executive Officer of Pinnacle West and Arizona Public Service Company, has the highest level of direct responsibility for water within our organization. The Chief Executive Officer reviews material water issues twice per year via the SEC reporting process and Board of Director's Top Risk Report.

W-FB6.4/W-CH6.4/W-EU6.4/W-OG6.4/W-MM6.4

(W-FB6.4/W-CH6.4/W-EU6.4/W-OG6.4/W-MM6.4) Do you provide incentives to C-suite employees or board members for the management of water-related issues?

Yes

W-FB6.4a/W-CH6.4a/W-EU6.4a/W-OG6.4a/W-MM6.4a

(W-FB6.4a/W-CH6.4a/W-EU6.4a/W-OG6.4a/W-MM6.4a) What incentives are provided to C-suite employees or board members for the management of water-related issues?

	Who is entitled to benefit from these incentives?	Indicator for incentivized performance	Please explain
Monetary reward	Chief Sustainability Officer (CSO) Other C-suite Officer (VP of Fossil Generation)	Reduction in consumptive volumes	Our executive compensation programs focus on transparency with an emphasis on incentivizing performance. APS's compensation philosophy incorporates multiple business performance metrics to assess executive performance. The business unit metrics component of our annual incentive plan ensures that our compensation program appropriately focuses our employees on core measures of overall Company health and performance. Our use of business unit metrics in executive incentive plans promotes our performance. Our use of business unit metrics in our executive incentive plans promotes our continued success as a safe, sustainable, and overall well-run vertically integrated and regulated electric utility. In 2015, APS created a new Tier 1 water metric designed to reduce the quantity of non-renewable groundwater consumed. The goal to reduce consumption of non-renewable water by 8 percent in 2016 as compared to a 2014 baseline year.

	Who is entitled to benefit from these incentives?	Indicator for incentivized performance	Please explain
Recognition (non-monetary)	Chief Sustainability Officer (CSO) Other C-suite Officer (VP of Fossil Generation)	Reduction in consumptive volumes	Our executive compensation programs focus on transparency with an emphasis on incentivizing performance. APS's compensation philosophy incorporates multiple business performance metrics to assess executive performance. The business unit metrics component of our annual incentive plan ensures that our compensation program appropriately focuses our employees on core measures of overall Company health and performance. Our use of business unit metrics in our executive's incentive plans promotes our performance. Our use of business unit metrics in our executive's incentive plans promotes our continued success as a safe, sustainable, and overall well-run vertically integrated and regulated electric utility. In 2015, APS created a new Tier 1 water metric designed to reduce the quantity of non-renewable groundwater consumed. The goal to reduce consumption of non-renewable water by 8 percent in 2016 as compared to a 2014 baseline year.
Other non-monetary reward	Chief Sustainability Officer (CSO) Other C-suite Officer (VP of Fossil Generation)	Reduction in consumptive volumes	Our executive compensation programs focus on transparency with an emphasis on incentivizing performance. APS's compensation philosophy incorporates multiple business performance metrics to assess executive performance. The business unit metrics component of our annual incentive plan ensures that our compensation program appropriately focuses our employees on core measures of overall Company health and performance. Our use of business unit metrics in our executive incentive plans promotes our performance. Our use of business unit metrics in our executive incentive plans promotes our continued success as a safe, sustainable, and overall well-run vertically integrated and regulated electric utility. In 2015, APS created a new Tier 1 water metric designed to reduce the quantity of non-renewable groundwater consumed. The goal to reduce consumption of non-renewable water by 8 percent in 2016 as compared to a 2014 baseline year.

W6.5

(W6.5) Do you engage in activities that could either directly or indirectly influence public policy on water through any of the following?

Yes, direct engagement with policy makers
Yes, trade associations
Yes, funding research organizations

W6.5a

(W6.5a) What processes do you have in place to ensure that all of your direct and indirect activities seeking to influence policy are consistent with your water policy/water commitments?

During the first quarter of each calendar year management reviews with the Corporate Governance Committee of the Board of Directors its anticipated governmental affairs strategies for the year, including the priorities for the Company's political expenditure and lobbying activities. During the year, management periodically reports to the Corporate Governance Committee on the progress of the Company's strategy, including any significant activities not encompassed within the initial strategy discussion. Following each of its meetings, the Corporate Governance Committee provides a summary to the Board of the matters involving political activities, which were discussed at the meeting. At least annually, the Corporate Governance Committee reviews our Political Participation Policy and recommends to the Board any revisions it deems necessary. Some of the entities we engage with/ participate in include the following: Arizona Department of Water Resources, Groundwater Users Advisory Council, New Mexico State Engineers, statutory special interest groups, EPRI Water Research Center, the Governors Water Augmentation Council and the Kyl Center for Water Policy. If an entity's stated water security position is not consistent with our policy, we discuss internally and engage our internal policy group. Following this, we develop an internal policy position and develop a plan to support, stay neutral, or oppose the entity's stance and communicate that position to the entity.

W7. Business strategy

W7.1

(W7.1) Are water-related issues integrated into any aspects of your long-term strategic business plan, and if so how?

	Are water-related issues integrated?	Long-term time horizon (years)	Please explain
Long-term business objectives	Yes, water-related issues are integrated	11-15	Secure and maintain a reliable and cost-effective supply of water to APS power plants while developing comprehensive strategies that promote water sustainability in APS customer service areas. APS develops a biannual Resource Plan and submits this plan to the Public Utility Commission (the Arizona Corporation Commission) for review and approval. Water strategies and plans associated with APS power plants and strategies to increase renewable energy and energy efficiency are identified for the next 15 years. APS forecasts out 15 years due to market changes and generation needs. This timeframe allows APS to make the appropriate decisions based on reasonable forecasts.

	Are water-related issues integrated?	Long-term time horizon (years)	Please explain
Strategy for achieving long-term objectives	Yes, water-related issues are integrated	11-15	Develop and implement a strategic water resource management program, including initiatives that meet the needs of current APS customers and the evolving needs of the utility of the future . These strategies include Water Investment, Research and Technology, Water Metrics/Initiatives, Well and Pumping Equipment Reliability Program, Water Supply Contingency Initiative, Water Intensity, Wellfield Operations Management Plans, and Data Collection. APS forecasts out 15 years due to market changes and generation needs. This timeframe allows APS to make the appropriate decisions based on reasonable forecasts.
Financial planning	Yes, water-related issues are integrated	11-15	The largest single water related expenditure for APS is the contract for treated effluent for use at Palo Verde and Redhawk. This contract extends through 2050, and APS has first right of refusal to renegotiate and extend the contract, if needed. This contract has fixed costs through 2025 and limits on cost increases for the remaining 25 years. Water supplies are guaranteed through 2050 at a know price. Capital costs for water improvements are identified in the Long Range Forecast. Well capital replacements are identified for 10 years. APS forecasts out 15 years due to market changes and generation needs. This timeframe allows APS to make the appropriate decisions based on reasonable forecasts.

W7.2

(W7.2) What is the trend in your organization's water-related capital expenditure (CAPEX) and operating expenditure (OPEX) for the reporting year, and the anticipated trend for the next reporting year?

	Water-related CAPEX change)	Anticipated forward trend for CAPEX (+/- % change)	Water-related OPEX (+/- % change)	Anticipated forward trend for OPEX (+/- % change)	Please explain
Row 1	0	0	0	0	Capital expenditures for new wells and well abandonments are expected to be approximately $4,000,000/year in future years. Operating expenses for well maintenance are expected to be $545,000/year in future years. Reductions in cost in future years due to less need for water will be offset by inflation.

W7.3

(W7.3) Does your organization use climate-related scenario analysis to inform its business strategy?

	Use of climate-related scenario analysis	Comment
Row 1	No, but we anticipate doing so within the next two years	APS is currently assessing the possibility of establishing a science-based target that supports the 2°C climate change scenario and assessing the use of climate-related scenario analysis.

W7.4

(W7.4) Does your company use an internal price on water?

Row 1

Does your company use an internal price on water?

Yes

Please explain

As water supplies reduce and demand continues to rise, the cost of acquisition of new water supplies or extension of existing agreements will escalate faster than the standard rate of inflation. A recent market analysis performed for the Company's Water Resource Management group indicated that the cost of many water supplies is increasing at a rate of 8% to 10% per year. Additionally, operation of the Water Reclamation Facility at Palo Verde and Redhawk Power Station adds more than $1 and $0.60 per MWh, respectively, to each plant's O&M cost. These costs are expected to increase to over $2.50 per MWh by 2050, due to increasing costs of effluent, chemicals, and labor. Increased O&M costs and the resultant impact to electricity costs may challenge operational cost-effectiveness of these plants.

W8. Targets

W8.1

(W8.1) Describe your approach to setting and monitoring water-related targets and/or goals.

	Levels for targets and/or goals	Monitoring at corporate level	Approach to setting and monitoring targets and/or goals

	Levels for targets and/or goals	Monitoring at corporate level	Approach to setting and monitoring targets and/or goals
Row 1	Company-wide targets and goals Business level specific targets and/or goals Site/facility specific targets and/or goals	Targets are monitored at the corporate level Goals are monitored at the corporate level	In 2015, APS created a Tier 1 (our highest company metrics) water metric designed to reduce the quantity of non-renewable groundwater consumed. The goal to reduce consumption of non-renewable water by 8 percent in 2016 as compared to a 2014 baseline year. The 2017 goal is a 10 percent reduction and the 2018 goal is a 12 percent reduction. APS established these targets because 16 percent of the fleet's water demand is supplied from groundwater. Initiatives are underway to conserve groundwater, including early retirement of additional coal units, implementation of well field operations plans, and further development of implementation of Renewable Energy, Distributed Generation and Energy Efficiency programs. These initiatives were presented to APS upper management which includes Managers, Directors and Vice Presidents. Their feedback is essential to the development and implementation of these initiatives.

W8.1a

(W8.1a) Provide details of your water targets that are monitored at the corporate level, and the progress made.

Target reference number
Target 1

Category of target
Other, please specify (Absolute reduction of water withdrawals)

Level
Company-wide

Primary motivation
Water stewardship

Description of target
APS created a Tier 1 (the highest level company metric) water metric designed to reduce the quantity of non-renewable groundwater consumed. APS set this metric because 16 percent of the fleet's water demand is supplied from groundwater. Beginning in 2016 the target for this metric is an 2% reduction per year from the 2014 baseline groundwater consumption. For 2017 the goal was a 10 percent reduction from the 2014 baseline year. APS uses three types of water; groundwater, surface water, and treated effluent. Both surface water and treated effluent are renewable, however, groundwater is not considered renewable because it can be withdrawn from the ground much faster than it is replenished, therefore we chose conservation of the non-renewable supply as our highest level water metric.

Quantitative metric

Other, please specify (% reduction of water sourced from GW)

Baseline year
2014

Start year
2016

Target year
2017

% achieved
100

Please explain
APS exceeded the 2017 goal of 10 percent by achieving a 14 percent reduction from the baseline year. This achievement places the company on solid ground to achieve a longer-term goal of reducing non-renewable water consumption by 60% by 2026.

Target reference number
Target 2

Category of target
Other, please specify (Increase Pumping Equipment Reliability)

Level
Company-wide

Primary motivation
Risk mitigation

Description of target
APS owns and operates 44 production wells that provide cooling water and supplemental water to support generation at eight of nine power plants. Unplanned well and pumping equipment failures can occur as a result of pumping equipment failure, electrical/mechanical issues, well casing problems, or human performance errors. These failures disrupt scheduled maintenance plans, result in unplanned/unbudgeted costs, and could result in loss of water necessary to support generation. The reliability rate in 2015 was 90%, equating to 5 unplanned failures. Water Resource Management (WRM) established a goal to increase the reliability rate by 2%/year through 2019, resulting in a 98% reliability rate in 2019, equating to one unplanned failure per year.

Quantitative metric
Other, please specify (Well and Pumping Equipment Reliability)

Baseline year
2015

Start year
2016

Target year
2019

% achieved
100

Please explain
The 2016 result was 98% reliability, exceeding the goal of 92% reliability. The 2017 result was 96% reliability, exceeding the goal of 94% reliability.

W8.1b

(W8.1b) Provide details of your water goal(s) that are monitored at the corporate level and the progress made.

Goal
Reduce environmental impact of product in use phase

Level
Company-wide

Motivation
Water stewardship

Description of goal
In 2015, APS created a new Tier 1 water metric designed to reduce the quantity of non-renewable groundwater consumed. The goal to reduce consumption of non-renewable water by 8 percent in 2016 as compared to a 2014 baseline year. The 2017 goal is a 10 percent reduction and the 2018 goal is a 12 percent reduction. APS established these targets because 16 percent of the fleet's water demand is supplied from groundwater. Initiatives are underway to conserve groundwater, including early retirement of additional coal units, implementation of well field operations plans, and further development of implementation of Renewable Energy, Distributed Generation and Energy Efficiency programs. At Cholla, APS modelled water use, developed a well field operation plan and provided water conservation recommendations. APS also developed a plant operations plan that included evaluation of water quality at each well.

Baseline year
2014

Start year
2015

End year
2018

Progress

Plant well field staff have incorporated recommendations into Daily Operations Reports and are using the highest quality water available. Plant water use is more in 2017 than in 2016, however, it is primarily due to increased generation a our less water efficient plants. The model has enabled monitoring of the impacts of reduced groundwater pumping associated with reduced generation, showing that groundwater levels are rising across the wellfield and that water quality improvements have been measured, due to decreased pumping from lower levels in the aquifer.

Goal

Reduce environmental impact of product in use phase

Level

Company-wide

Motivation

Other, please specify (Reduce Water Intensity Use in Operations)

Description of goal

APS plans to reduce fleet wide water intensity by 20 percent by 2025. This will be accomplished by retiring older water intensive units and replacing them with more efficient units, increasing use of solar photo-voltaic and wind, energy efficiency and implementing water conservation plans at all power plants.

Baseline year

2014

Start year

2015

End year

2025

Progress

Reductions in fleet water intensity from 2014 through 2017 were 6.3%

W9. Linkages and trade-offs

W9.1

(W9.1) Has your organization identified any linkages or tradeoffs between water and other environmental issues in its direct operations and/or other parts of its value chain?

Yes

W9.1a

(W9.1a) Describe the linkages or tradeoffs and the related management policy or action.

Linkage or tradeoff
Linkage

Type of linkage/tradeoff
Other, please specify (Coal Combustion Residual)

Description of linkage/tradeoff
The Coal Combustion Residual (CCR) rules require closure of unlined ponds three years after operations cease. APS estimates that its share of incremental costs to comply with the CCR rule for Four Corners is approximately $22 million and its share of incremental costs to comply with the CCR rule for Cholla is approximately $20 million. The Navajo Plant currently disposes of CCR in a dry landfill storage area. APS estimates that its share of incremental costs to comply with the CCR rule for the Navajo Plant is approximately $1 million.

Policy or action
APS is working to minimize the quantity of water sent to the impoundments to meet the coal combustion residual rules, allowing closure within three years of ceasing operations. Groundwater models have been developed that distinguish between wells with variable water quality (TDS). Modeling demonstrated that by using the lower TDS well water for plant cooling water, the cooling towers are able to achieve higher cycles of concentration, reducing water consumption and reducing the quantity of wastewater sent to the fly ash pond. This will reduce the quantity of water that must be evaporated to allow pond closure. This helps APS meet its business strategy by achieving conservation by the efficient use of water and to develop and implement a strategic water resource management program that will provide APS timely and reliable information to manage APS's water resources portfolio in support of the safe and efficient generation of electricity for the long term.

Linkage or tradeoff
Linkage

Type of linkage/tradeoff
Other, please specify (PM-10)

Description of linkage/tradeoff
Palo Verde Generating Station and Redhawk Power Plant are located in Maricopa County, Arizona; a non-attainment area for PM-10. Therefore, cooling tower emissions are limited. At the same time, the Arizona Department of Water Resources cooling tower water efficiency requirements require cycling up cooling tower circulation water 15 times prior to blowdown. This helps APS meet its business strategy by achieving conservation by the efficient use of

water and to develop and implement a strategic water resource management program that will provide APS timely and reliable information to manage APS's water resources portfolio in support of the safe and efficient generation of electricity for the long term.

Policy or action

APS more than meets the ADWR water conservation requirements of 15 cycles of concentration (currently 25 cycles achieved) and also meets the PM-10 requirements of the non-attainment area.

Linkage or tradeoff

Linkage

Type of linkage/tradeoff

Other, please specify (Water-Energy Nexus)

Description of linkage/tradeoff

APS has been keenly aware of what the nation has come to know as the ‘water-energy nexus’ for many years i.e., that it takes water to generate power and it takes power to treat and deliver water. This is a well understood concept in the Arizona desert. Whether for creating steam to drive the turbines in coal-, natural gas- or nuclear-powered generating units or for cooling the equipment in combustion turbine units, all electric steam-generating plants use water. Since water is such a precious commodity in the desert Southwest, it is imperative that APS uses it as efficiently as possible.

Policy or action

At the Ocotillo Power Plant, APS elected to replace two old steam units that are highly water intensive, with new combustion turbines that incorporate hybrid cooling, a technology that will result in an 80% decrease in water consumption. APS will continue to decrease water intensity as the renewable portfolio is expanded. To date, APS has a diverse portfolio of existing renewable resources totaling 2239 MW, including solar, wind, geothermal, biomass and biogas. APS’s strategy to achieve its RES requirements includes executing purchased power contracts for new facilities, ongoing development of distributed energy resources and procurement of new facilities to be owned by APS. Finally, APS’s energy efficiency programs reduce the energy needed by our customers, and reduce the need to supply water-intensive generation. This helps APS meet its business strategy by achieving conservation by the efficient use of water and to develop and implement a strategic water resource management program that will provide APS timely and reliable information to manage APS's water resources portfolio in support of the safe and efficient generation of electricity for the long term.

W10. Verification

W10.1

(W10.1) Do you verify any other water information reported in your CDP disclosure (not already covered by W5.1d)?

No, but we are actively considering verifying within the next two years

CDP Verification Statement APS CY2017 vTR 6.14.2018.pdf

W11. Sign off

W-FI

(W-FI) Use this field to provide any additional information or context that you feel is relevant to your organization's response. Please note that this field is optional and is not scored.

Water verification data provided on page 3 of the attached report.

CDP Verification Statement APS CY2017 vTR 6.14.2018.pdf

W11.1

(W11.1) Provide details for the person that has signed off (approved) your CDP water response.

	Job title	Corresponding job category
Row 1	Executive Vice President and Chief Operating Officer	Chief Operating Officer (COO)

W11.2

(W11.2) Please indicate whether your organization agrees for CDP to transfer your publicly disclosed data on your impact and risk response strategies to the CEO Water Mandate's Water Action Hub [applies only to W2.1a (response to impacts), W4.2 and W4.2a (response to risks)].

Yes

Submit your response

In which language are you submitting your response?

English

Please confirm how your response should be handled by CDP

	Public or Non-Public Submission	I am submitting to
I am submitting my response	Public	Investors

Please confirm below

I have read and accept the applicable Terms