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ARIZONA CORPORATION COMMISSION
PUBLIC UTILITY CONTROL

Arizona Corporation Commission

DOCKETED

AUG 30 2010

August 30, 2010

Kristin K. Mayes, Chairman
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007-2996

DOCKETED BY

**Re: Battery Storage Research and Development for Use in Conjunction
With Energy Efficiency and Renewable Energy Technology; 2011 Energy
Efficiency Implementation Plan (Docket Nos. E-01345A-10-0219)**

Dear Chairman Mayes:

This letter responds to your July 30 and August 24, 2010 inquiries regarding Arizona Public Service Company's ("APS" or "Company") current and planned battery storage research and development ("R&D") for use in conjunction with energy efficiency and renewable energy.

The interest in opportunities for both developing and implementing energy storage technologies is increasing as distributed and utility-scale solar energy projects are deployed in Arizona and the roll-out of electric vehicles is anticipated in the foreseeable future. Energy storage technologies are evolving and hold great promise. R&D efforts related to both electrochemical batteries and lithium-ion battery technology present more opportunities for both large-scale utility applications and plug-in hybrid electric vehicles. The impact of widespread implementation of these technologies is yet to be determined.

Energy storage has the potential to improve asset utilization by deferring distribution asset upgrades; to enhance reliability by providing peak reduction; to support a higher penetration of renewable generation by smoothing the variability and intermittency of these resources; and to increase the value provided by distributed renewable energy projects. Given the dynamic nature of the analysis and technologies related to energy storage, APS has taken an active role in studying and deploying demonstration projects. Additionally, the Company is actively monitoring related efforts by other utilities and developers to identify the most viable, efficient, and cost-effective technologies emerging from national research and development efforts. These actions will enable APS to understand the actual cost and benefits of these

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emerging technologies, including the effects on peak demand and the manner and location of deployment of battery storage for maximum benefit. The following sections illustrate the Company's historical, current and planned efforts at combining energy storage with renewable energy and demand response applications.

Energy Storage and Renewable Energy

i. RES Research & Development Project. As part of the Company's 2011 Renewable Energy Standard Implementation Plan,¹ APS intends to undertake an energy storage demonstration project. APS's technical staff is currently planning and developing a distributed energy storage project, with the primary purpose to better understand the impacts of operating and controlling an energy storage system that is connected to the electric grid. This includes the potential to reduce the effect of short-term variability issues of solar photovoltaic generation by providing a means of regulation; the ability to store and shift energy delivery to facilitate a more constant load profile; and the cost, control and deferral opportunities provided by energy storage. APS plans on deploying the demonstration project as part of the Community Power Project – Flagstaff Pilot.² On August 6, 2010, APS issued a Request for Proposal for this demonstration project, and the Company anticipates storage facility installation in mid-2011.³

ii. Distributed Energy Impact Study. In 2009, APS commissioned R.W. Beck, Inc. to study the value and impacts of solar distributed technologies on the APS system and resource planning. Although this study did not directly address energy storage, it did determine that the value of solar distributed energy would increase if cost-effective energy storage technology existed.⁴

iii. STAR Facility Projects. APS's Solar Test and Research ("STAR") facility has an extended history with energy storage, having tested and operated batteries at both the STAR location in Tempe and in the field. The STAR and Technology Development groups have developed several operating hybrid solar sites. These installations included battery storage to provide off-grid energy support. An early generation flow battery was tested at STAR in the last five years to assess its potential for energy storage for grid support. While there were challenges with the early technology, some of the issues appear to have been resolved, and APS expects to continue evaluating this technology.

iv. Studies in Conjunction with Arizona Universities. APS is currently working with Arizona's three universities on several energy storage and distribution solutions. Arizona State University is one of APS's partners in the Department of Energy ("DOE") study of the effects of

¹ This is addressed in the Renewable Research, Development, Commercialization and Integration section of the Implementation Plan filed in Docket No. E-01345A-10-0262.

² See Docket No. E-01345A-09-0227 for more details regarding the Community Power Project – Flagstaff Pilot.

³ Responses to the RFP are due by September 7, 2010, and APS plans to execute a purchase contract for the utility-scale system in the fourth quarter of 2010.

⁴ The *Distributed Renewable Energy Operating Impacts and Valuation Study* (January 2009) was filed in Docket Nos. E-01345A-05-0816, E-01345A-05-0826, and E-01345A-05-0827 (Jan. 29, 2009).

high penetrations of distributed generation on the electrical grid. Although battery storage is not a defined objective in that study, the Company expects to learn much about the value of batteries and energy storage as a complimenting technology to distributed solar generation. APS has also teamed with the University of Arizona to analyze compressed air energy storage, battery storage and photovoltaic technologies for system peak shaving. In addition, Northern Arizona University is providing data support and analysis on a solar variability study that is being conducted at APS's Prescott solar facility. APS will continue to look for university partnerships in support of future energy storage study and integration.

v. Commercial Energy Storage Project. APS is currently developing the scope of a commercial energy storage project that the Company intends to deploy in the future. The primary purpose of the prospective system will be to provide APS a better understanding of the effects of operating a commercial-scale energy storage system connected to a customer's facilities. APS intends to study the capability of energy storage systems to improve the power quality delivered to the customer, as well as to store and shift energy output to provide a time-of-use benefit to the customer. The development timeline and proposed sites have not yet been determined.

vi. Utility Scale Thermal Energy Storage. APS continues to support the study and integration of large scale utility thermal storage. The planned Solana Generating Station will be constructed with a molten salt storage system that will allow for the extension of the generation for up to six hours. APS recognizes the need for this type of storage to meet Arizona's peak energy demand and will continue to collaborate with developers to support opportunities to deploy solar thermal applications. For example, in 2008, APS partnered with US Solar Holdings in support and development of a DOE grant proposal to analyze novel thermal storage technologies. US Solar was awarded a DOE grant in September 2008 to address two specific technologies: single tank thermocline storage, and a sand shifter – a two silo thermal mass storage system. This project is currently in the Phase 2 prototyping stage.

Energy Storage and Demand Response

i. Demand Response Study. In 2008, as part of the Company's review of potential Demand Response programs and technologies, APS examined the potential for battery storage to be deployed at customer sites specifically for Demand Response purposes.⁵ While acknowledging that the technology had merit and warranted continued monitoring, APS determined that battery storage at that time was not mature enough from a Demand Response perspective.

ii. Electric Vehicle Study. In preparation for the deployment of electric vehicles in Arizona, in 2010 APS commissioned a valuation study of the impacts of electric vehicles, which also examined current battery technology developments for transportation application.⁶ A key

⁵ The *Demand Response & Load Management Program Study* (June 2008) was filed in Docket Nos. E-01345A-05-0816, E-01345A-05-0826, and E-01345A-05-0827 (June 27, 2008).

⁶ The *PHEV/EV and V2G Impacts and Valuation Study* (March 20, 2010) prepared by Navigant Consulting, Inc. was filed in Docket No. E-01345A-10-0123.

finding from that study was that the current battery technology is limited and expensive, although a number of promising battery technologies are being developed. The study indicated that for electric vehicles to become an attractive option for car buyers, battery cost must decline and its performance must improve significantly from current levels.

iii. Electric Vehicle Demonstration Program. As part of the Company's Electric Vehicle Readiness Development Program,⁷ APS will be filing for Commission approval of an electric vehicle demonstration project in September 2010. As part of that filing, APS intends to propose a plan for the testing and monitoring of an APS vehicle with respect to battery charging performance, storage capabilities, and the possibilities of future vehicle-to-building and vehicle-to-grid applications.

iv. Thermal Energy Research. APS is continuing to research a range of potential thermal energy storage ("TES") systems. TES programs typically assist customers in acquiring and installing ice or chilled water storage systems that are used to shift air conditioning load to off-peak hours. The Company's research includes the technical viability of TES in Arizona's climate, market potential based on APS's customer base, project economics, customer incentives, and accompanying rate designs. The Company will develop a new TES time-of-use rate that will be filed as a part its next general rate case.

Monitoring of Other Demonstration Projects

i. SDG&E Battery Storage Projects. APS is monitoring the San Diego Gas & Electric's ("SDG&E") battery redeployment project.⁸ The purpose of this multiphase test project is to redeploy previously used batteries from the electric vehicle auto industry and transform them into a home energy storage appliance. This multi-year project, which is in its initial phase, will analyze the technical and economic feasibility of using this technology as a cost-effective energy storage resource in residential applications. SDG&E is also working on a battery storage project at the distribution feeder level, which is similar to APS's project in Flagstaff.

ii. SMUD Battery Storage Projects. APS is also monitoring Sacramento Municipal Utility District's ("SMUD") distributed energy storage pilot, where SMUD will study the impact of distributed energy storage devices in 15 homes in its service territory.⁹ This pilot will analyze the technical and economic feasibility of integrating localized energy storage, and study how such utilization may enhance the overall value of distributed photovoltaic resources for both the utility and its customers (*e.g.*, reducing peak loads, firming intermittent resources, maximizing system efficiencies). Based on the outcome of this multi-year pilot, a utility may be able to replicate the technology throughout its service territory.

⁷ An outline of this program is provided in APS's Notice of Filing (April 1, 2010), filed in Docket No. E-01345A-10-0123.

⁸ SDG&E's collaborative effort involves the Center for Sustainable Energy California, National Renewable Energy Laboratory, Aerovironment, and Flux Power.

⁹ SMUD's pilot project involves collaboration with Silent Power, GridPoint, National Renewable Energy Laboratory, Navigant Consulting, SunPower, and Saft.

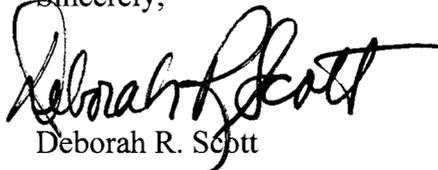
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APS intends to collaborate with SDG&E, SMUD, and other industry participants to evaluate technologies, designs and strategies addressing the use of battery storage technologies. APS is committed to continuing its efforts in identifying energy storage technologies for both utility and customer scale applications. Whether it is through industry collaboration or the implementation of demonstration projects, APS intends to provide customers with cost-effective options for managing their energy needs and costs. The Company is currently focused on the effects of energy storage on the utility grid, as well as the application of new technologies on commercial-scale storage on a customer's facilities, utilizing cost-effective and established technologies. APS may expand its approach as energy storage technologies for residential customer applications are proven to be feasible and cost-effective.

As APS gains more experience with these resources, including the study of their impact on electrical system operation and customer consumption, the Company will make recommendations for the deployment of energy storage technologies as part of future Renewable Energy Standard Implementation Plans and Demand Side Management Implementation Plans.

If you are interested in discussing energy storage issues further, APS representatives are available to do so.

Sincerely,



Deborah R. Scott

DRS/jlj

cc: Commissioner Gary Pierce
Commissioner Sandra Kennedy
Commissioner Paul Newman
Commissioner Bob Stump
Ernest Johnson
Steve Olea
Janice Alward
Lyn Farmer
Rebecca Wilder