Rocky Mountain Power
Docket No. 16-035-36
Witness: Jake Barker

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF UTAH

ROCKY MOUNTAIN POWER

Direct Testimony of Jake Barker

August 2017

Q. Please state your name, business address, and present position with PacifiCorp dba Rocky Mountain Power ("the Company").

A. My name is Jake Barker and my business address is 1407 West North Temple, Suite 270, Salt Lake City, Utah 84116. I am currently employed as the Manager of Engineering Technical Services and Smart Grid for Rocky Mountain Power.

QUALIFICATIONS

Q. Briefly describe your educational and professional background.

A. I have a Bachelor of Science in Electrical Engineering from Utah State University and a Master's in Business Administration from the University of Utah. During my 15 years of working in the utility industry, I have held responsibilities in field engineering, area transmission planning, asset management and since 2015, as Manager of Engineering Technical Services and Smart Grid.

Q. What are your responsibilities as Manager of Engineering Technical Services and Smart Grid?

A. My primary responsibilities include the development and implementation of distributed energy resource interconnection policy, grid modernization strategy, and power quality assessments.

PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony in this proceeding?

A. My testimony supports: (1) the Company's proposed Smart Inverter Program described in the Application, and included as Exhibit A thereto; and (2) the Company's proposed Microgrid Program described in the Application, and attached as Exhibit B thereto ("Programs"). The Company asserts that the Programs are innovative utility programs

pursuant to U.C. A. § 54-20-105(1)(h), and that the Programs provide investigation and analysis in the interest of the Company's utility customers. The Company, therefore, respectfully requests the Commission approve the Programs pursuant to U.C.A § 54-20-105.

SMART INVERTER PROGRAM

Q. What is a Smart Inverter?

A. All inverters used in grid-connected distributed generation and energy storage programs convert electricity from a direct-current source to alternating current output that matches the voltage, frequency, and phase of the interconnected utility grid to ensure safety and reliability. An inverter is the gateway between the distributed generation and energy storage systems and the utility's grid. Inverters must disconnect the generation from the grid if frequency and voltage fall outside of parameters defined in current electrical codes and standards. In addition, current interconnection standards do not allow distributed energy resources to actively regulate grid voltage without coordination from the interconnecting utility.

The difference between a "smart" inverter and traditional inverters is software that creates advanced functionality. Smart inverters perform all of the functions of traditional inverters, and also actively support the electric grid through reactive power production and absorption, voltage/frequency ride through, and real-time communications. Smart inverters are a stepping stone to customer "smart grid" offerings that leverage real-time connectivity and dispatch of decentralized distribution resources.

Q. Please describe the Company's proposed Smart Inverter Program.

A. The Smart Inverter Program, if authorized, will enable the Company to partner with Utah State University and the Electric Power Research Institute to investigate the capabilities of smart inverters and their impact and benefit to the Company's electric distribution system. The program will also review the Company's distributed energy resource interconnection policy to identify the necessary modifications required for wider adoption of smart inverters by the Company's customers. Finally, the program will help align the Company's interconnection policy with the new interconnection standards being proposed by the Institute of Electrical and Electronics Engineers ("IEEE"). The Company is requesting authorization of $450,000 for the program. A full description of the proposed Smart Inverter Program is included as Exhibit A to the Application. Smart inverter technology is commercially available today and expanded functionality and communications are being developed. The development of usable implementation strategies for utilities has, however, lagged behind. There is very little publicly available information on smart inverter settings and their impact on voltage levels, variability and distribution assets under actual operational conditions.

Q. What customer benefits will the program provide?

A. The program will benefit customers by safeguarding distribution facilities and address gaps in performance measurement factors and best practices for deploying and operating smart inverters on the distribution system. The program will accomplish this by: (1) lab testing smart inverters to understand capabilities and functionality; (2) modeling and simulating multiple distribution circuits to study the impact of smart inverters on hosting capacity and distribution feeder equipment; (3) evaluating the new

IEEE interconnection standards and their implications, along with suggested revisions; and (4) developing guidelines for recommended smart inverter settings for various penetration levels of distributed energy resources ("DERs") and corresponding policy changes needed to accommodate smart inverters.

With increasing levels of DERs being installed on the Company's Utah distribution system, it is vital for the integrity of the distribution system to study how the Company can continue to integrate additional renewables into the system in a safe, reliable, and effective way, and the advanced functionality of smart inverters will play a major role in this process.

MICROGRID PROGRAM

Q. What is a microgrid?

A. The U.S. Department of Energy defines a microgrid as "a group of interconnected loads and distributed generation resources, within clearly defined electrical boundaries, which acts as a single controllable entity with respect to the grid and can connect and disconnect from the grid to enable it to operate in either grid-connected or islanded mode." A microgrid differs from a simple backup power system due to its unique ability to automatically integrate and coordinate generation, energy storage, controllable loads, and the grid intertie equipment within the microgrid and interact with the utility's grid as an aggregated single system. The microgrid controller manages itself, operating autonomously or grid connected, and seamlessly connects or disconnects based on demand and supply requirements. Each dynamic piece of a microgrid system is individually monitored and controlled to optimize performance and operational cost of the system.

Q. Please describe the Company's proposed Microgrid Program.

A. The Company's proposed program will deploy a microgrid demonstration project at the Utah State University Electric Vehicle Roadway research facility and test track. The project is a collaborative effort between Rocky Mountain Power, Utah State University Sustainable Electrified Transportation Center, and Hill Air Force Base to demonstrate the ability to integrate generation, energy storage, and controls to create a microgrid. A full description of the proposed Microgrid Program is attached as Exhibit B to the Application. The proposed microgrid program will: (1) demonstrate the feasibility of operating a microgrid on the Company's system and its effectiveness in automatically transitioning from grid-connected to islanded mode; (2) assess the gap between microgrid system costs and existing infrastructure; (3) inform interconnection policy and standards and understanding of impacts on the Company's distribution system; and (4) determine the feasibility of microgrids providing ancillary services and inform recommendations for a microgrid service program in the future. The Company is requesting authorization of $250,000 for the Microgrid Program.

Q. What customer benefits will the Microgrid Program provide?

A. The benefits will focus on gaining a better understanding of microgrid technology and DERs, developing control algorithms for microgrid component interaction, and determining opportunities for microgrid and DER systems. The program will also allow the Company to: (1) evaluate the viability of operating a microgrid on the Company's distribution system along with any reliability improvements; (2) understand the intricacies of microgrid system operation, including the ability to impact reliability, load shaping, and power quality; (3) create a quantified list of distribution system

impacts resulting from the interconnection of microgrids; (4) enable the creation of policy and standards for potential future microgrid system development; and (5) enable the potential development of a future microgrid service program. As on-site generation and battery storage costs continue to decline, the Company expects net metering customers in the next 5-10 years to consider leveraging on-site generation into microgrid systems. If other states or the federal government follow the lead of Maryland, which has introduced legislation to provide tax incentives for battery storage systems, adoption rates will be faster in the future. The program will enable the Company to take proactive steps to assess microgrid projects, and create policies and standards based on real experience. These policies and standards will help to shorten the microgrid interconnection reviews in the future.

CONCLUSION

Q. Please summarize the proposal for the Smart Inverter Program.

A. As more Rocky Mountain Power customers adopt distributed generation resources, particularly renewables, smart inverters will be needed to manage operation of those resources and to safeguard the distribution system. The Smart Inverter Program will provide information necessary for the integration of smart inverters, and help develop a more progressive electric grid that can manage and respond to the unique needs of customers served by a system with distributed generation resources.

Q. Please summarize the proposal for the Microgrid Program.

A. Deploying a microgrid demonstration project at the Utah State University Electric Vehicle Roadway research facility and test track will benefit customers by allowing the

Company to develop tools to assist in evaluating and optimizing microgrid systems before they are adopted widely across the Company's distribution system.

Q. In your opinion, are the Programs consistent with the Sustainable Transportation and Energy Plan Act and in the interest of Rocky Mountain Power's customers?

A. Yes.

Q. Does this conclude your direct testimony?

A. Yes.