Rocky Mountain Power
Docket No. 16-035-36
Witness: K. Ian Andrews

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF UTAH

ROCKY MOUNTAIN POWER

Direct Testimony of K. Ian Andrews in Support of the Clean Coal Technology Program

September 2016

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

A. My name is K. Ian Andrews. My business address is 1407 West North Temple, Suite 310, Salt Lake City, UT 84116. I am the Director of Resource Development in the Resource Development and Construction department.

QUALIFICATIONS

Q. Briefly describe your educational and professional background.

A. I have a Bachelor of Science degree in chemical engineering from the University of Utah and a Masters degree in Business Administration from Brigham Young University. Since joining the Company in September 1978, I have had multiple responsibilities including power plant training, project management, customer technical services, resource planning, managing due diligence of resource acquisitions, power plant performance improvement, emissions controls strategy development and implementation, electric power generation resource development and most recently, director of the resource development group since October 2013. I am a registered professional engineer in the state of Utah. I also represent the Company on a number of issues related to energy.

Q. What are your responsibilities as Director of Resource Development?

A. My primary responsibilities include developing Company-owned generation resource options that the Company could potentially implement, if those resources are determined to be least cost on a risk-adjusted basis. The group is responsible for developing and providing performance and cost information related to future resource options used in the Company's integrated resource planning process and

maintains data on existing resource capacities and performance. The resource development group also provides cost and performance information on current and emerging environmental regulations that may affect the operation of the Company's thermal generating assets.

PURPOSE OF TESTIMONY

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

A. My testimony supports the Company's proposed Clean Coal Technology Program described in the Application, and included as Exhibit B thereto. The Company's filing respectfully requests the Commission approve the Clean Coal Technology Program projects pursuant to U.C.A. § 54-20-104; these proposed projects have been selected to meet the objectives of the Sustainable Transportation and Energy Plan Act ("STEP") "to investigate, analyze, and research clean coal technology" (U.C.A. § Section 54-20-104).

CLEAN COAL TECHNOLOGY PROGRAM

Q. Please describe the Company's proposed Clean Coal Technology Program.

A. Pursuant to the STEP legislation, the Company is requesting authorization to spend up to $5.0 million in STEP funding over the five-year pilot period to investigate, analyze, and research clean coal technology. The program consists of the following proposed projects:

1) A co-firing test of processed woody-waste (biomass) materials at the Company's Hunter Unit 3.
2) Co-funding of a long term availability test of Sustainable Energy Solutions' Cryogenic Carbon Capture^{TM} technology on one of the units at either the

Hunter or Huntington Plants.

3) Co-funding of the University of Utah Phase 1 effort to perform a pre-feasibility study for commercial carbon dioxide ("CO_2") sequestration sites with co-funding by the United States Department of Energy.

4) A study to evaluate the potential for using CO_2 to be used for regional enhanced coal bed methane recovery with sequestration.

5) A study to evaluate the performance and cost effectiveness of integrating solar thermal capture technologies at Hunter 3.

6) The application of an advanced neural network control system at Huntington Unit 2 for the reduction of nitrogen oxides ("NO_X") emissions.

7) Implementation of a utility scale demonstration of one or more alternative technologies that may result in decreases in NO_X emissions without the use of Selective Catalytic Reduction ("SCR").

A full description of the program is provided in the Clean Coal Technology Program document included as Exhibit B to the Application.

For implementation of this program, the Company has assembled a Clean Coal Research team to guide selection and implementation of the initiatives. In addition to Company personnel, the team includes professors from the chemical engineering and mechanical engineering departments at the University of Utah, Brigham Young University, and Utah State University, and personnel from the Utah Office of Energy Development, the University of Utah Geosciences Institute, the Utah Science and Technology Research Initiative, Reaction Engineering, and Sustainable Energy Solutions.

Q. What kind of benefits will the program provide?

A. The respective components of the Clean Coal Technology program will provide the following benefits:

1) Opportunity to assess the feasibility of potential periodic removal of Utah's woody waste that will help the Utah forest health and potentially decrease wild fires and their associated particulate emissions. This testing would be performed on woody waste materials that have processed using technologies developed by two Utah based companies, Amaron Energy and AEG Coalswitch.

2) Provide for a long term availability test of Sustainable Energy Solutions' Cryogenic Carbon Capture^{TM} technology on one of the units at the Hunter or Huntington Plants. This test is viewed as a next step to facilitate United States Department of Energy ("USDOE") funding to design, construct, install and test pilot scale (5-10 MWe) facility. This technology is considered to be an emerging technology with lower costs and auxiliary loads than currently available commercial carbon capture technologies. Sustainable Energy Solutions is a Utah-based company.

3) Opportunity to conduct a pre-feasibility study for a commercial scale CO_2 geological storage complex in Emery County while leveraging $1.2m of USDOE funding. Other participants include a number of Utah state agencies including Utah Science Technology and Research initiative, Utah Division of Environmental Quality, the Office of Energy Development, the Utah Division of Oil, Gas and Mining, the Utah Geological Survey and the State Institutional

Land Administration.

4) Investigate the potential ability to use captured CO_2 from Emery County coal-fueled power plants for use in enhanced coal bed methane recovery.

5) Evaluate the potential to install solar thermal augmentation to produce steam or hot water at a Utah coal plant location thereby reducing emissions associated with coal fueled power generation.

6) Facilitate the implementation of a neural net software application using the direct involvement of a Utah university to reduce NOx emissions at Huntington Unit 2.

7) Facilitate future potential targeted NO_X emissions reductions solutions that may be more economical than installing selective catalytic reduction system.

CONCLUSION

Q. Please summarize the proposal for Clean Coal Technology Program contained in this Application.

A. The Company has identified seven clean coal research studies and projects with associated budgets. These projects and studies were reviewed and prioritized by the Clean Coal Research team during the development and research identification phase. These selected projects meet the definition of Clean Coal technology in STEP and its objective "to investigate, analyze, and research clean coal technology" (U.C.A. § Section 54-20-104). The benefits of each project are identified in the individual project descriptions in Exhibit B, Clean Coal Technology Program. The selected projects are intended to meet multiple objectives, and include:

1) Demonstration projects that will result in measurable reduced emissions,

2) Investment in promising technologies and applications that may advance technologies that when fully developed and applied in utility scale that will allow for coal-fired generation resources to operate with reduced carbon emissions,

3) Providing opportunities for industry-targeted areas of research that can be performed by Utah's universities, and

4) Promotion of Utah's clean energy technology companies.

Q. In your opinion, is the Company's proposal consistent with STEP and in the interest of Rocky Mountain Power's customers?

A. Yes.

Q. Does this conclude your direct testimony?

A. Yes.