Exhibit A

Rocky Mountain Power

Investment Justification for

Smart Inverter Project

Sustainable Transportation and Energy Plan

Utah Innovative Technologies Team

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1 Executive Summary

As part of the Sustainable Transportation Energy Plan, a Utah statute, Rocky Mountain Power (the Company) should authorize $450,000 to collaborate with Utah State University (USU), Electric Power Research Institute (EPRI) to investigate the capabilities of smart inverters and their impact and benefit for the company's electric distribution system. The project will also review of the company's distributed energy resource (DER) interconnection policy to identify the necessary modifications required for enabling adoption of smart inverters in the Company's service territory. Further, this project will provide appropriate guidance to the Company to help align the company's interconnection policy with the new interconnection standards being proposed by the Institute of Electrical and Electronics Engineers (IEEE) 1547.

2 Scope

The project includes but is not necessarily limited to the following:

- ***Lab Testing of Smart Inverters*** to understand the capabilities of the advanced functionalities and the quality of current manufacturers' implementations.
- ***Modeling and simulation*** of multiple distribution circuits to study the impact and potential benefits of smart inverters on distribution circuit hosting capacity and distribution feeder equipment.
- ***Detailed interpretation of the modified IEEE 1547 interconnection standards*** and its implications to the Company's distribution system operations and recommend revisions to the Company's interconnection policies. The project will investigate suitable settings for distribution-focused distributed energy resource inverter controls including but not limited to power factor, volt-var, voltage/frequency ride-through, etc.
- ***Develop a guideline document*** highlighting examples of the recommended smart inverter settings for varying penetration levels of distributed energy resources and the interconnection policy changes needed to accommodate smart inverter implementation.

3 Purpose and Necessity

This project will inform the Company, regulators and other stakeholders by providing insights and addressing current gaps in performance measurement factors and best practices for deploying and operating smart inverters on the distribution system. This includes understanding the opportunities and challenges of mandating revised interconnection standards. A few topics that need to be explored for the benefit of the Company and its customers are:

- Review smart inverter standards and identify existing gaps in implementation of core functionality.

- Determine the ability of smart inverters to respond to rapid changes on the utility's electric grid.
- Investigate the ability to leverage smart inverters to increase the hosting capacity of distribution circuits and accommodate more distributed energy resources without reducing safety or grid reliability.
- Study the effectiveness of smart inverter configurations in "set and forget" settings under varying levels of distributed energy resource penetration and its impact at the customer point of interconnect, service transformer and distribution system level.
- Understanding the importance of requiring distributed energy resources to utilize advanced communication protocols and subsequent benefits/challenges of remotely modifying configuration settings of smart inverters.
- Develop technical modifications to the Company's interconnection policy to reflect smart inverter standards for distribution systems.
- Develop guidelines for the management of smart inverter capabilities in coordination with distribution line and substation assets.
- Provide guidance on modeling smart inverters in the Company's distribution planning software and further performing advanced distribution planning studies.

4 Background

Growth of Renewables in the State of Utah

The Company has recently experienced a significant growth in interconnection of distributed energy resources on its distribution system. As illustrated in Figure 1, the company has in the past - and continues to - received a large number of requests for interconnecting net-energy metering projects, primarily being rooftop solar installations. The Company currently does not anticipate this growth to decline in the immediate future.

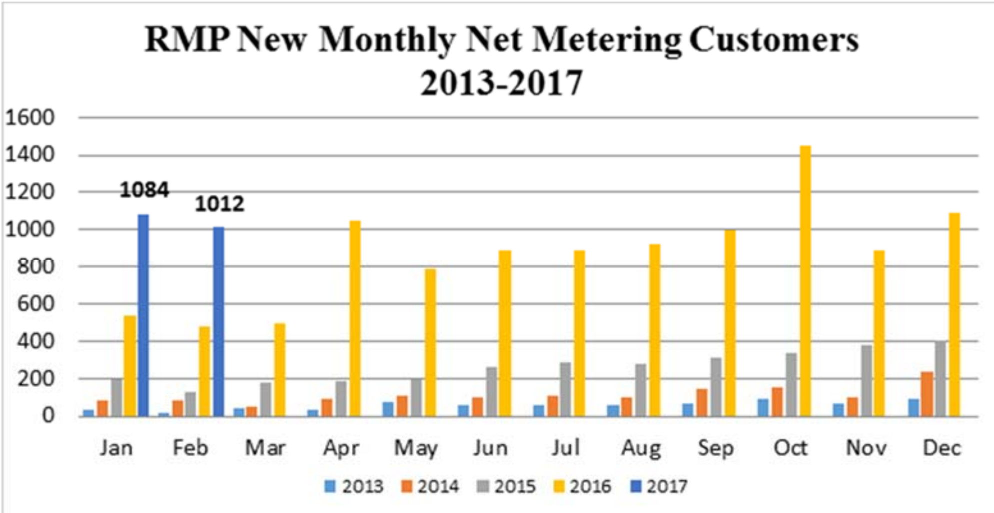

Figure 1: NEM Growth in the state of Utah

With increasing levels of distributed energy resources being installed on the distribution system, there is an opportunity to more effectively integrate this resource with the electric power system. To ensure the Company can continue to integrate increasing levels of renewables on its distribution system in a safe, reliable and effective way, it is vital to utilize the advanced functionality of modern inverters. This is based on the principle that distributed and central energy resources contribute to the quality and reliability of grid electricity at the lowest possible cost for consumers.

Definition of "Smart Inverter"

All inverters used in grid-connected distributed generation and energy storage systems convert electricity from a direct-current (DC) source to alternating-current (AC) output that matches the voltage, frequency, and phase of the interconnected utility grid to ensure safety and reliability. They essentially act as gateways between the distributed generation and energy storage systems and the utility's electric grid. Under current electrical codes and standards, inverters must disconnect the generation from the electric grid if frequency and voltage fall outside of set parameters. In addition, current interconnection standards do not allow distributed energy resources to actively regulate the grid voltage without coordination with the local electric utility.

The key difference between a "smart" inverter and traditional inverters is the software that governs the advanced functionality. Smart inverters not only convert DC power to AC power but also actively support the electric grid through reactive power production and absorption, voltage/frequency ride-through, and real time communications. These functions can be enabled by the inverter manufacturer by merely updating the firmware that will be modified to adhere to grid codes such as IEEE 1547 and UL 1741. Smart inverters are a stepping stone to customer ‘smart grid’ offerings that leverage real-time connectivity and dispatch of decentralized generation resources.

Smart inverter technology is commercially available today and expanded functionality and communications is expected soon. However, the development of useable implementation strategies for utilities has lagged behind. There is very little public information on smart inverter settings and their subsequent impact on voltage levels, variability, and distribution assets under myriad operational conditions at various utilities in the country.

Interconnection Standards and Policies

The Company’s interconnection standards and policies are based on the following standards, as well as other national, state, and local jurisdictional guidelines:

- IEEE 1547 – *Standard for Interconnecting Distributed Resources with Electric Power Systems*
- UL 1741 – *Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources*

Background of IEEE 1547

The IEEE 1547 (2003) Standard for Interconnecting Distributed Resources with Electric Power Systems is a family of standards for distributed energy resource interconnection that address the technical and test requirements for generators less than 10 megawatts. The standard provides requirements relevant to the performance, operation, testing, safety, and maintenance of interconnected equipment. These requirements are needed for the interconnection of multiple types of distributed energy resources, including synchronous machines, induction machines, and power inverters/converters.

Adherence to an IEEE standard is considered an industry best practice and individual states have the ability to enforce such industry standards. In the state of Utah, R746-312-4 (Installation, Operation, Maintenance, Testing and Modification of Generating and Interconnection Facilities) states “*Except for generating facilities in operation or approved for operation prior to the effective date of this rule, an interconnection customer of a public utility must install, operate and maintain its generating and interconnection facilities in compliance with the IEEE standards, as applicable, and the requirements of the interconnection agreement or other agreements executed between the parties during the interconnection review and approval process*.” For this reason, the Company will continue to adhere to IEEE 1547 as currently written along with all future revisions of the standard.

Revision of IEEE 1547 standards

The Company is an active member of the IEEE 1547 standards working group and continues to support the standard's revision process. Currently, the working group is in the process of completely revising the standard to enable distributed energy resources to provide significantly more contribution to the electric power system.

Several sections of IEEE 1547 are undergoing significant changes including voltage regulation, response to abnormal voltage and frequency conditions, islanding, power quality and interoperability. The main intent of these changes is to clearly define and understand the challenges of integrating smart inverters into the suite of interconnection standards. The final draft of IEEE 1547 is expected to be voted on in late 2017 and published in 2018. The standards committee of IEEE is also working expeditiously towards revising IEEE 1547.1, which will provide testing requirements for the new IEEE 1547 standard.

In September 2016, the UL 1741 working group published UL 1741 Supplement A. This supplement defines the evaluation criteria for utility interactive inverters with grid support functionalities. The requirements provided in the revised standard are intended to validate compliance with grid interactive functions that are not covered in IEEE 1547-2003. These grid support functions may include voltage and frequency ride-through and active and reactive power control. A few inverter manufacturers have begun testing and certifying inverters to the new UL 1741 standard. Coordination between the UL 1741 Supplement A testing and certification requirements and the new IEEE 1547.1 testing requirements is currently in process.

The Company intends to implement the advanced inverter functionality recommendations to be defined in the IEEE 1547 standard. However, the company will await publication of the revised IEEE 1547 standard to update internal interconnection standards and policies.

5 Project Tasks and Descriptions

This project, through laboratory testing and computer simulation, intends to provide the Company with further understanding of the implications of smart inverters on the distribution system. This includes an investigation of the current maturity level of smart inverters through laboratory testing, the potential for hosting capacity improvement across a planning area, as well as guidance on inverter settings for different levels of distributed energy resource penetration levels, loading, and solar resource availability.

Some of the key research areas that will be studied for the benefit of the Company and its customers are listed below:

Smart Inverter Standards and Policy Updates	• Detailed summary of the revised IEEE 1547 interconnection standards • Overview of interconnection standards development in states that are in the process of mandating smart inverters e.g. California and Hawaii
Smart inverter selection and laboratory testing	• Select smart inverters and energy storage for laboratory testing • Demonstrate and test the advanced functionalities of smart inverters with and without energy storage • Evaluate smart inverter interaction with the utility's electric grid and its response to varying grid conditions
Hosting capacity analysis with and without smart inverters	• Overview of hosting capacity concept and the need for hosting capacity analysis at utilities • Assessment of baseline distribution feeder hosting capacity with traditional inverters • Evaluate impact of various smart inverter settings on hosting capacity
Determining smart inverter settings	• Modeling and simulation of pre-selected distribution feeders in the state of Utah • Assess the impact of various smart inverter settings for over-voltage and under-voltage issues • Determine appropriate smart inverter settings under varying penetration levels of distributed energy resource
Sharing of industry best practices on smart inverter deployment	• Detailed information on current and future utility plans to enable deployment of smart inverters • Overview of communication protocols, bandwidth and data transfer requirements in addition to utility strategies to monitor and control smart inverters • Sharing of utility plans and high-level summary of smart inverter response to abnormal grid conditions
Review Distributed Energy Resource interconnection standard (Policy 138)	• Review the Company's interconnection policy and provide feedback with recommended edits to the technical and commissioning requirements in the policy
Publish final report	• Publish report that details project tasks, results, overall costs and recommendations

A. Smart Inverter Standards and Policy Updates

The Company requires interconnection customers to adhere to IEEE 1547 standards for distributed energy resources connected to the Company's distribution system. As mentioned earlier, IEEE 1547 working group is currently involved in revising interconnection standards to allow the use of inverters with advanced functionalities.

EPRI is one of the pioneering organizations in developing smart inverter technology, specifications, modeling/simulation, testing (laboratory and field), analytics, and standards. In addition EPRI is highly instrumental in the IEEE 1547 standard development process as well as state and utility specific interconnection standards development in different parts of the country.

To help support this research, EPRI intends to draw upon its significant background in this area including creating common smart inverter functions, developing laboratory test protocols, mapping functions to several standard communication protocols, and supporting standards and grid code requirements for IEEE and in California, and Hawaii. As part of this project, EPRI will provide a detailed synopsis of the technological and standard development as well as utility deployment plans for smart inverters.

B. Smart Inverter Selection and Laboratory Testing

The Company will work with Utah State University to assess the technical readiness of commercially available smart inverters in terms of function and communications according to open standards and protocols. EPRI's previous work has highlighted that manufacturers still needed significant development in this area.

A wide range of laboratory tests will be performed to understand the capabilities of the advanced functionalities of smart inverters and their subsequent impact on the utility grid. Smart inverters from several manufacturers will be selected with ranges from 6 kilowatts single-phase to 10 kilowatts three-phase. Inverters will be configured and evaluated as solar only, battery only, and solar plus battery, including an evaluation of a Tesla Powerwall. Testing will be performed at the USU Electric Vehicle and Roadway (EVR) test facility, in accordance with IEEE 1547, and will evaluate inverter performance during various grid disturbances.

Utah State University will lead the technical evaluation process of smart inverters, with feedback from EPRI. Specifically, EPRI intends to provide engineering support, test setup verification, and review and assessment of inverter testing results at Utah State University and the Company, on an as-needed basis.

C. Hosting Capacity Analysis with and without Smart Inverters

The hosting capacity of a feeder defines the amount of distributed energy resources that can be accommodated before adversely impacting reliability or power quality. Hosting capacity is dependent on distribution feeder characteristics, customer loads, deployment of distributed energy resources, and specific utility thresholds that must be met. The purpose of this task is to evaluate the potential impact of smart inverters on distribution system hosting capacity for distributed energy resources on a system-wide basis with primarily photovoltaic systems. This project intends to encompass several distribution feeders, allowing the Company to later review hosting capacity across a large portion of the system. Further the results from this project would help provide a more comprehensive picture of hosting capacity and the impact of smart inverters, reducing the potential for induced error in the analysis that may be due to a small sample size.

To perform hosting capacity analysis, the team will complete the following sub-tasks:

- A subset of the Company's distribution system will be selected for preliminary analysis. The Company and EPRI will identify one or more distribution planning areas with the intent for the area(s) to cover up to three distribution substations and 15 circuits. Additional data such as distribution line equipment and relevant settings will be collected to perform power flow/fault analysis on the distribution feeders.
- Once the necessary system data is collected, EPRI will use its Distributed Resource Integration and Value Estimation (DRIVE) tool to analyze the hosting capacity limits for each of the selected distribution circuits. The tool will assume that added inverters are operated in unity power factor mode consistent with the Company's interconnection policy.
- The results generated from the analysis will be used as a baseline for a relative comparison with the tasks proposed under section D.

D. Determining Smart Inverter Settings

To help determine suitable smart inverter settings for interconnection of distributed energy resources on distribution feeders at the Company, EPRI will repeat the computer simulation study for the selected planning area under the assumption that the added distributed energy resources will be smart inverter based systems. The net change in hosting capacity will be studied for this scenario. The result of the study will provide the Company with an in-depth understanding of the range of available hosting capacity realized through the use of smart inverters.

To determine suitable smart inverter settings through analysis, EPRI will analyze a variety of settings for key smart inverter functions including volt-var, droop control and fixed power factor. The impact of the smart inverters on distribution system performance will be evaluated including:

- Levelized voltage profiles across the distribution circuit
- Voltage variability
- Number of regulator operations or capacitor bank switching events
- Different smart inverter functions and the range of settings that need to be considered

E. Sharing of Current Utility Practices

The Company will learn more about two other vital functionalities of smart inverters namely voltage and frequency ride-through and inverter communication protocols. EPRI is well positioned to provide an in-depth overview of these functionalities considering it has previously performed multiple studies to evaluate the efficacy of various smart inverter functionalities including voltage and frequency ride-through.

The team will develop a better understanding of the additional communication features of smart inverters. This may include information related to communication protocols, latency, bandwidth, data transfer and the logical approach for utilities to leverage existing and/or new communication strategies to interconnect distributed energy resources in a more effective way. The report will provide any available information pertinent to typical use cases being considered by utilities to leverage smart inverter communication protocols to deploy distributed energy resource management systems.

F. Review of Existing Interconnection Policy

The Company currently requires customers to adhere to Policy 138. This interconnection policy explains the technical requirements for interconnecting inverter and non-inverter based distributed energy resource facilities to the Company's electric distribution system. The Company policy is based on applicable rules and tariffs crafted by the Federal Energy Regulatory Commission (FERC), IEEE 1547 and jurisdictional state regulatory agencies.

With the upcoming changes to IEEE 1547, these rules may need to be amended to fully leverage the new capabilities of inverter-based distributed energy resources. As part of this project, EPRI will review the Company's existing interconnection rules and provide a detailed feedback on how the revised IEEE 1547 standards may affect the Company's standards and subsequently provide recommendations to adjust the interconnection standard to leverage potential benefits of smart inverters where applicable.

G. Publish Final Report

The Company, EPRI and Utah State University will publish a final report summarizing the overall study objectives, work performed, findings and results, lessons learned and recommendations for future action. This report will be prepared and submitted to the Utah Public Service Commission by January 31, 2019.

6 Benefits and Public Interest Justification

- This program will enable a greater understanding of these innovative solutions as the Company continues to make the grid more progressive
- Provides the Company, Utah Public Service Commission, and other stakeholders with information regarding the capabilities of advanced inverters and changes to interconnection standards.
- The findings from this project will assist the company in updating *PacifiCorp Policy 138: Distributed energy resource interconnection policy.*
- Enables the company to gain knowledge on smart inverter operation for solar and battery combined projects.
- Enables the Company to become familiar with and utilize innovative technologies to provide customers with solutions to power quality issues.
- Opportunity to provide guidance to the company's distribution engineers to enhance the company's distribution planning process.
- The Company continues to experience rapid growth in interconnection requests and considers innovative technologies such as smart inverters a valuable tool to improve service to customers.
- Provides a better understanding of smart inverter settings will potentially assist in improved utilization of grid assets leading to cost savings for customers.
- This project aligns with the goals of the program to support the greater use of renewable energy. Through this project, the Company is taking steps to prepare for an enhanced deployment of clean energy sources for its customers.

7 Legislative Compliance with SB115

The smart inverter program meets the legislative intent of SB115 54-20-105-1(h) that pertains to "any other technology program" in the best interest of the customers in the state of Utah. This project falls under the STEP's discretionary allotment of funds as part of the Utah Innovative Technology category.

8 Alternatives Considered

The IEEE 1547 standards working group plans to release the revised interconnection standard in early 2018. In the absence of any background research and testing as proposed in this project, the Company may be forced to adopt implementation of 'default' inverter settings prescribed in the revised interconnection standard. It must be noted that while the application of smart inverters can be very beneficial for accommodating increased levels of distributed energy resource penetration, previous research from EPRI indicates that the practice is not without its risks. Incorrect settings could produce a sizeable negative impact on voltage levels, variability, and regulating equipment operations.

9 Purpose and Necessity – Risk Analysis

Company impacts without this project/solution:

- In the absence of the proposed project, the deployment of smart inverter standards might get delayed considering the complexity of evaluating the impact of the new standard on Rocky Mountain Power's transmission and distribution system.

Customer impact without this project/solution:

- A higher cost solution with non-innovative technology will impede any efforts to learn from implementing progressive grid technologies.

9.1 Project Delivery Risk Factors

The project will be managed to mitigate typical project risks (design, material deliveries, etc.) as it applies to scope, schedule, and budget. Appropriate documentation will be created, tracked and communicated to properly manage the project. The appropriate risk mitigation measures will be identified and resolved in the project development phase.

10 Planned Budgeted Costs

The table below identifies the proposed annual expenditures for each of the project participants. Some minor adjustments in spending over the period of twelve months may occur. Although not anticipated, any excess funds that become available because actual costs are lower than current forecasts, the funds may be used to purchase tools, solutions and research reports that will help the Company with a smoother transition into implementing smart inverter standards.

Entity	**2018**	**Total**
Rocky Mountain Power	$100,000	$100,000
Electric Power Research Institute	$250,000	$250,000
Utah State University	$100,000	$100,000
	$450,000	**$450,000**

11 Project Delivery Strategy

This project is fundamentally an educational project in which the proposed plan is to work directly with universities and research organizations such as Utah State University and Electric Power Research Institute. As such, this directed program is not conducive to using typical competitive bidding practices. It is expected that the work for this project will be clearly defined and costs for that work negotiated with the entity that will perform the work. It is proposed to award the work to the entity (or entities) stated in this document. Typical Rocky Mountain Power contractual commercial terms and conditions will be applied to the extent possible.

12 Accounting Issues or Regulatory Recovery Issues

All expenses towards this project will be recovered through the accounting workflow setup for the Utah Innovative Technologies under the Sustainable Transportation and Energy Plan. For detailed information, refer the overarching Utah STEP Accounting document. All project costs including but not limited to internal Rocky Mountain Power labor costs and expenses paid to partners will be monitored and tracked.

12.1 Program Closure

In January 2019, the Company will report back to the Utah Public Service Commission regarding the actual expenditures made for the project and provide a report summarizing the overall study objectives, work performed, findings and results, lessons learned, recommendations as well as tools and research reports purchased. If it is necessary to report more often to comply with the STEP statute or other reporting requirement, the Company will comply with those requirements.

13 Appendices

- Appendix A – Project Partners

APPENDIX A – Project Partners

Electric Power Research Institute

The Electric Power Research Institute (EPRI), as a research and development organization, is the industry's premier developer of leading-edge technology, and the industry's premier service provider, delivering bottom line value to clients via the application and implementation of EPRI's state-of-the-art technologies and industry best practices. U.S. electric utilities established EPRI in 1973 as a nonprofit technology research and development organization for the benefit of electric utility members, their customers, and society at large. EPRI provides a wide range of innovative products and services to more than 1000 energy-related organizations in 40 countries.

EPRI has been one of the pioneering organizations in developing smart inverter technology, specifications, modeling/simulation, testing (laboratory and field), analytics, and standards. Key accomplishments include:

- Development of the original Common Functions for Smart Inverters report (in 2009) which has been included in the IEC 61850 information model and is the reference for most smart inverter implementations to-date.
- Award-winning smart inverter demonstration projects as part of the DOE Sunshot Initiative and with Arizona Public Service on their Solar Partner Program. Additional demonstrations are ongoing with other utilities, including Salt River Project and National Grid.
- Innovative power system analysis and planning with smart inverters, with the EPRI-developed Distribution Resource Integration and Value Estimation (DRIVE) being incorporated into most major distribution planning tools.
- Leadership in the IEEE 1547 standards update, as well as state processes in California and Hawaii.

Utah State University

Utah State University has extensive experience in integration of distributed energy resources on the grid, including optimization of renewable energy sources and use of energy storage as a resource on the grid. Utah State is the lead university for the multi-campus industry sponsored Center for Sustainable Electrified Transportation (SELECT), with over 20 members representing public utilities, tier 1 suppliers, battery manufacturers, automotive companies, and national laboratories. Facilities include the Electric Vehicle and Roadway (EVR) research facility and the Power Electronics Laboratory, representing over 10,000 sqft of laboratory and high bay space. The EVR was custom designed for hardware evaluation and testing of DC and AC micro-grids with active control of distributed energy resources, loads, and the grid connection. The facility is equipped with a reconfigurable 400 A bus bar system for interconnecting sources and loads on micro-grids, 20 kW of solar power (under construction summer 2017), single and three-phase programmable AC sources, an 80 kWh modular battery pack, and bidirectional electronic test equipment for cycling and emulating battery packs and solar arrays up to 600 VDC and 120 kW.

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