

# **Renewable Energy for Taos and Vicinity, New Mexico**

**2015 Status Report**



**Prepared by**

**Renewable Taos, Inc.**

**November 2015 Update**

## **About This Report**

This report is based on the results of visioning exercises on renewable energy futures for North Central New Mexico. Local, state and regional governments, public utility companies, non-government organizations (NGOs) and others routinely conduct such exercises in assessing alternative energy development scenarios. During the past decade or more, Tri-State Generation and Transmission Association, Inc. (Tri-State), Public Service Company of New Mexico (PNM), the State of New Mexico, the Town and County of Taos, Kit Carson Electric Cooperative, Inc. (KCEC), the Rocky Mountain Institute (RMI), Renewable Taos, Inc. (RT) and others have developed substantial information for creating and assessing these scenarios. RT championed a team of energy stakeholders to participate in RMI's eLab Accelerator 2015 in order to explore potential business models that could enable a transition to 100% renewable energy in North Central New Mexico. This report summarizes the context for, and initial outcomes and next steps resulting from that engagement.

## **Disclaimers**

The Rocky Mountain Institute Electricity Innovation Lab Accelerator (eLab) is a joint collaboration, convened by Rocky Mountain Institute, with participation from stakeholders across the electricity industry. eLab is not a consensus organization, and the views expressed in this document do not necessarily represent those of any individual eLab member or supporting organizations.

"Land of Enchantment Renewables (LER)," as used in this report is a temporary, informal name adopted by Renewable Taos, Inc. as a placeholder for a potential new distributed renewables services entity concept. As such, "LER" offers a convenient way to report, plan and discuss options, and does not meet any legal or other requirements for a formal business name.

This report is preliminary and subject to revision. The most current version is dated **November 2015** and supersedes all versions with an earlier date.

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**Cover: Blue Sky Mesa 1.5-Megawatt Solar Photovoltaic Tracking Array, Taos, NM**  
William M. Brown – April 5, 2013



## **Local Energy and a Strong Economy**

### **100% Clean Energy for our Community by 2030**

**Renewable Taos, Inc. is dedicated to promoting and facilitating a full transition to renewable energy and energy efficiency in Taos County and our surrounding region.**

**We advocate for local generation of renewable energy with an emphasis on local ownership. We build community partnerships to facilitate the transition to renewables, and propose and support projects. We recognize that energy efficiency is integral to the transition to renewable energy. We also work with other organizations to change the political climate in the state and country to facilitate the transition to renewable energy and energy efficiency.**

**<http://renewabletaos.org>**

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## Executive Summary

A renewable energy transition driven by new technology, favorable economics, and policy changes on emissions of fossil fuel combustion is now taking place across the global landscape. North Central New Mexico is well positioned to take its place in this transition in the interests of a better economic future for its citizens, and anticipating upcoming regulation of fossil fuels emissions. Renewable Taos, Inc. (RT), with support and input from Rocky Mountain Institute (RMI) Electricity Innovation Lab (eLab), initiated The Renewable Taos Project in early 2015. The project is designed to find solutions to a rapid transition to renewable energy for the Kit Carson Electric Cooperative (KCEC) service area in North Central New Mexico.

In its introduction to eLab, [RMI makes the following statements](#):

Issues such as the growing need for reinvestment in electricity infrastructure, climate change and other environmental concerns, an increasing focus on grid resilience, and the rapid development of new business solutions to leverage the changing cost of technologies that produce, deliver, and use electricity are fundamentally changing the electricity landscape in the U.S.

As a result, rapid innovation—as well as change, cooperation, and conflict—are occurring at the ‘seams’ in the electricity sector where no single stakeholder or industry group can control the outcome. The most important new sources of competitive advantage in today’s rapidly changing electricity sector are not technology or market position; they are the ability of innovators to work efficiently and effectively in complex multi-stakeholder environments. Shifting the electricity sector will require engagement and innovation across traditional institutional boundaries.

RT is using these and similar guiding principles for envisioning new business models, new customer solutions, new projects, and evaluating new regulatory developments to accelerate distributed energy resource (DER) solutions in the KCEC Service Area.

RT is evaluating the implications of a Federal Energy Regulatory Commission (FERC) Order of June 18, 2015. The ruling would permit Delta-Montrose Electric Association (DMEA), a Colorado Rural Electric Cooperative (REC), to purchase locally generated renewable energy from a Qualifying Facility (QF). QFs are renewable energy generation facilities defined under the Public Utilities Regulatory Policies Act of 1978 (PURPA). Further, the ruling states that DMEA’s obligation to purchase power from QFs supersedes its wholesale power contractual obligations to Tri-State Generation and Transmission Association, Inc. (Tri-State). This ruling, pending appeals, opens the way for renewable energy developers to build facilities in or near the KCEC Service Area and sell large amounts of renewable energy directly to KCEC. Effectively, the ruling jeopardizes the requirement that KCEC buy from Tri-State 95 percent of the energy it distributes to its customers.

RT also favors a new business model that could be applied in the KCEC Service Area, North Central New Mexico, and elsewhere. This business model involves creating a new renewable energy services entity conceived as a non-profit organization. Ideally, this non-profit would help solve many of the jurisdictional and policy problems that currently prevent KCEC and its members from rapidly creating and managing a local renewable energy economy.

The 2015-2016 work of RT will provide a comprehensive overview of the costs, policies, legal and regulatory issues, and technologies necessary for a full transition to renewable energy services. Guiding principles in the overview include locally developed and managed renewable energy generation, assurances of equal and affordable access to renewable energy by all regional citizens and businesses, and full transparency by means of strong local participation in designing the transition.

### **Problem Statement**

RT's initial focus is the Kit Carson Electric Cooperative, Inc. (KCEC) service area that encompasses Taos County and parts of Colfax and Rio Arriba Counties, NM. RT and KCEC work together on a suite of problems facing KCEC customers. These include frequent and burdensome electricity rate increases imposed by KCEC's wholesale electricity provider, Tri-State of Westminister, CO. Also, Tri-State imposes severe and long-term restrictions on the quantities of renewable energy that may be developed by KCEC and others. Tri-State's commitments to long-term use of coal and natural gas for electricity generation are contrary to the demands of KCEC customers for renewables. Further, Tri-State's long-term reliance on coal and natural gas favors obsolescent, increasingly expensive technology compared with the modern, proven cost effective technology of solar and wind energy.

Cost estimates for customers for all KCEC Service Area energy services – including electricity, natural gas, propane and transportation energy -- currently are in the range of \$90 million to more than \$110 million per year. Costs fluctuate rapidly with unpredictable changes in consumer prices of energy from non-renewable sources. Most of this money leaves the regional economy and offers little or no stimulus of local economic growth.

The suite of obstacles and constraints renewable energy confronts in the KCEC Service Area are common throughout rural America. RT intends that the products of this project will be applicable in other communities. Therefore, RT plans to make our findings and analyses as widely available and accessible as possible.

### **Renewable Taos, Inc. is Investigating a Path Forward**

During 2013-2015, political subdivisions of KCEC's service area voiced unanimous approval of deploying greater amounts of renewable energy. To date, ten public entities representing the bulk of the area's population have signed a Joint Resolution on Renewable Energy (JR) prepared by RT. The JR asks for removing obstacles to local generation of renewables and developing renewable energy to provide all energy demands. The JR signals a call for change in Tri-State's policies and practices. It asks for transitioning to renewable energy

that favors energy price stability and predictability while generating local economic growth.

In order to achieve the goals stated in the JR, RT has engaged local energy stakeholders to discuss possibilities and outline a feasible technical and economic path forward. One of RT's activities, called the Renewable Taos Project, is focused on accelerating a renewable energy transition by creating new business models and customer solutions and evaluating regulatory and legal opportunities for the KCEC Service Area. As part of the scope of investigation, the project seeks to compare the costs of energy services under business-as-usual (BAU) and forward-looking scenarios. It considers a full range of stakeholders and their demands. It reviews the meaning of a full transition to renewables to replace all other energy sources for electricity, heating, cooling, cooking, and transportation.

Initial estimates based on recent and current total energy use suggest a renewable energy requirement of 150-200 megawatts (MW) to meet 100% of current and near-future demands. The data suggest current electricity demand is about 25% of total energy use in the KCEC Service Area; natural gas and propane demand is about 25%; and transportation demand is about 50%.

### **Next Steps: Three Scenarios**

Highest priorities for RT include restructuring, exiting or otherwise coping with the electricity services contract between KCEC and Tri-State. They include careful evaluation of the FERC-DMEA ruling and other regulatory and legal constraints and opportunities, and a new business model for KCEC that allows grid maintenance and expansion as more renewables are brought online. Priorities include equal access to renewable energy services for all customers with an emphasis on low-income and fixed-income households.

One scenario is that KCEC separates from Tri-State and contracts with a new wholesale energy provider. The contract would specify requirements for bringing more and more renewables online. It would specify provisions for selling excess local generation to the wholesale energy provider for redistribution to the regional electrical grid.

Another scenario is based on the FERC-DMEA ruling. RT and signatories of the JR will solicit renewable energy developers who may be interested in developing QFs to submit proposals for new projects as defined by PURPA. RT and regional energy stakeholders would facilitate this kind of project by adjusting building codes, permitting, and other regulations; assisting in site identification and selection; and working with developers and KCEC to advance projects.

A third scenario is a feasibility study of a modern energy services entity that would build or contract for renewable energy assets. This entity, described herein as "Land of Enchantment Renewables (LER)," would provide distributed renewable energy resources, including energy storage, energy efficiency, and load management. LER would be a non-profit organization and exist in parallel with KCEC. LER would collaborate with KCEC under the provisions of the Public Utility Regulatory Policies Act of 1978 (PURPA). Customers in

the KCEC Service Area would belong to either KCEC or LER throughout the transition to 100% renewables.

RT will:

- **Evaluate communities, cities and states that have achieved or are targeting transitions to 100% renewable energy.** Georgetown, TX created a contract that ensures 100% renewable energy for electricity by 2017. Burlington, VT similarly converted to 100% of its electricity from wind and solar sources in early 2015. In these cases, the motivations for shifting to renewables were grounded in cost savings, price stability, and local economic growth. There are numerous examples in the USA and worldwide that show renewables to be reliable, cost effective, and offer long-term price stability for all customers, but especially the poor and lower income sectors of our communities. The LER concept requires coping with numerous regulatory and legal restrictions that must be identified and analyzed to pursue a 100% renewables target.
- **Prepare a Joint Powers Agreement (JPA) to be reviewed by signatories to the earlier Joint Resolution on Renewable Energy (JR).** The JPA is intended to formalize regional support and directions for a renewable energy transition.
- **Begin an investigation of legal issues that accompany a transition to renewable energy.** The legal research will result in a report setting forth an analysis of various possibilities and hurdles for RT to consider as it pursues ways to develop renewable energy. The report will specify issues unique to New Mexico, as well as those of general concern. The legal issues are also relevant to Rural Electric Cooperatives (RECs) throughout the U.S. that are seeking to transition to increased use of renewable energy.
- **Convene an advisory committee composed of national experts.** These experts will oversee the study of legal and regulatory constraints and opportunities for renewable energy; the cost analysis of renewable resources; and the development of a business model for LER. RT also is selecting leaders from different economic sectors of the KCEC Service Area to form a local steering committee. This group would be charged with ensuring full transparency in all transition actions, as well as substantiating RT's full attention to stakeholder demands.
- **Begin a comprehensive cost study to determine the advantages of a renewable energy transition over business as usual using fossil fuels.** The cost study will evaluate a suite of scenarios for local renewable energy generation, renewables purchases from sources outside the KCEC Service Area, and combinations of these. For a transition to be feasible, cost projections must show economic advantages for the KCEC Service Area.



- **Lead messaging efforts for a renewables transition.** RT developed a program of one-on-one interviews with local political and business leaders during 2013-15. The next steps for the program include promoting the Joint Powers Agreement throughout the region, and making presentations to governing entities, businesses, NGOs, and the general public. RT and its partners need to create a suite of materials such as fact sheets, formal presentations, press releases, news articles and reports as necessary elements of an effective messaging campaign.

RT's ongoing work includes examining the costs, policies, and technology necessary for transition to a 100% renewable energy economy. Guiding tenets are locally developed and managed renewable energy generation, equal and affordable access to renewable energy by all customers, and full transparency in designing the transition with strong local participation.

KCEC is also taking immediate action on several related steps for transitioning to renewable energy, including preparing a formal study of the costs of electrical services for its service area.

## Introduction

### The Renewable Taos Project

The [Renewable Taos Project](#) arose from a renewable energy transition study outline prepared by Renewable Taos, Inc. (RT) during 2013-2014. The study suggested beginning the planning process by consulting with the Rocky Mountain Institute (RMI), the [National Renewable Energy Laboratory \(NREL\)](#), the City of Boulder, CO, [Local Governments for Sustainability \(ICLEI-USA\)](#), and other experts. RT Board Members met with some of these entities in the summer of 2014 to assess planning tools such as the [RMI eLab Accelerator Program](#) and [Hybrid Optimization of Multiple Energy Resources \(HOMER\)](#) microgrid modeling tool used by the City of Boulder, CO.

RT's successful application to the 2015 eLab Accelerator program included a seven-member team of stakeholders in North Central New Mexico's electricity system. With the help of RMI consultants the RT team constructed an approach to overcome the principal constraint on local expansion of renewable energy, the restrictive contract that limits KCEC to purchasing 95% of its energy from [Tri-State Generation and Transmission Association, Inc. \(Tri-State\)](#) through 2040. The approach centered on development of a new business model for KCEC, and development of a renewable energy utility that will use KCEC distribution and other services, as well as continued support for expansion of behind-the-meter renewable resources.

The potential for KCEC and other RECs to purchase renewable energy from Qualifying Facilities (QFs) rather than Tri-State under a [June 18, 2015 Order by the Federal Energy Regulatory Commission \(FERC\)](#) raises a new and very promising avenue of exploration.

In either case, RT's goal is rapid transition to 100% renewable energy and stable, predictable energy prices.

In response to consultations with RMI principals, RT applied to participate in the 2015 RMI Electricity Innovation Lab (eLab) Accelerator Program. RT's successful application resulted in building a seven-member team focused on developing a new utility business model, including significant behind-the-meter (customer-sited)\* strategy, to transition North Central New Mexico to 100% renewable energy.

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\* "Behind-the-meter" or "customer-sited" refers to energy produced on-site for many residential, commercial and industrial uses. A behind-the-meter renewable energy generating facility, such as a residential solar or wind system, produces power intended for on-site use in a home, office building, or other commercial facility. The location of the system is literally behind the meter, on the owner's property, not on the side of the electric grid/utility.

## Joint Resolution on Renewable Energy

During 2013-14, ten local governments and other major stakeholders throughout the Kit Carson Electric Cooperative, Inc. (KCEC) service area signed [RT's Joint Resolution on Renewable Energy \(JR\)](#). The JR calls for local development of renewable energy to provide all energy demands for the KCEC Service Area.

Specifically, the JR calls for:

- Formation of a regional committee to plan the transition to local renewable energy;
- Working with New Mexico and Federal officials, utilities and rate payers to remove obstacles to local generation of renewable energy;
- Development of local and regional energy transition plans; and
- Development of a regional marketing plan based on our commitment to local generation of renewable energy.

The JR's widespread local government support is a strong indicator of regional support for a renewable energy transition.

## Rocky Mountain Institute eLab Accelerator Program

[RMI's eLab Accelerator](#) is an assembly of thought leaders and decision makers from across the USA electricity sector. The group focuses on collaborative innovation to address critical institutional, regulatory, business, economic, and technical barriers to the economic deployment of distributed resources in the U.S. electricity sector.

During March 23-26, 2015 RMI convened the second annual eLab Accelerator event at Sundance Mountain Resort in Utah. This invitation-only working meeting, consisting of eLab faculty and a select number of teams from throughout the nation, was designed to accelerate high-impact projects from teams who are innovating at the electricity system's distribution edge. [The Renewable Taos Project was one of twelve teams](#) chosen in 2015 to participate in e-Lab's collaborative approaches and subject-matter expertise for delivering transformative change in the electricity sector across North America.

RMI's 2015 elab Accelerator focused on:

- **New Business Models:** New utility business models, electricity pricing structures, and regulatory reform efforts focused on distributed energy resource (DER) issues
- **Energy Innovation Districts:** Demonstration projects, microgrids, downtown clean energy zones, and other localized projects to integrate and test innovative DER solutions
- **New Customer Solutions:** Customer engagement programs, innovative financing, strategies for low-income populations, or other initiatives to support clean DER adoption by customers

## Setting the Context

## Today's Energy Costs

RT is convinced that continuing to operate under business as usual (BAU) will result in persistently increasing costs to KCEC customers as fossil fuel and nuclear energy costs continue to escalate. KCEC's wholesale electricity provider [Tri-State Generation and Transmission Association, Inc. \(Tri-State\)](#) raised rates for its 44 member rural electric cooperatives (RECs) nine times between 2000 and 2012. [KCEC currently is protesting additional Tri-State proposed rate increases](#) for 2013 and beyond. The result of accumulative rate increases is a doubling of electricity costs to consumers over the past decade. Projection of electricity costs under business-as-usual practices indicate these costs will more than double again within the next few years.

Electricity bills are only part of the energy cost burden on KCEC Service Area households.\* The average residential household spent about \$765 for electricity, \$4,300 to \$7,000 for gasoline, and \$990 for natural gas in 2014. Many rural citizens without access to natural gas use propane, and were burdened with an estimated \$3,000 per household for propane in 2014 (Renewable Taos, Inc., 2015).

There are approximately 15,700 households and 3,800 businesses in the KCEC Service Area, with about 46 percent using natural gas and the rest using propane, wood, electricity, solar and other sources for heating. Additionally, each household uses from one to more than three passenger vehicles for regular transportation. Renewable Taos, Inc. calculated that the total cost of fossil fuel energy services for KCEC Service Area households could exceed \$115,000,000 per year (Renewable Taos, Inc., 2015). RT uses an estimate of about \$94,000,000 to \$115,000,000 per year for discussion and planning purposes. Most of this money is paid to energy and fuel providers in Colorado, California, Texas, Nova Scotia, Canada, and other places. Very little of this money circulates in the KCEC Service Area economy.

Average annual electricity demand for all uses in the KCEC Service Area was 34.07 megawatts for 2011-2014. Average annual electricity consumption for the period was 298,453,200 kilowatt-hours (kWh). At an average retail consumer price of \$0.1275 per kWh, the average total electricity cost for all customers was \$38,053,000 per year.

Current annual natural gas deliveries for all residential and commercial customers in the KCEC Service Area averaged 1,120,000 cubic feet per year for 2009-2014. The total annual customer cost for natural gas averaged about \$9,200,000 per year for the period.

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\* For the KCEC Service Area, the average household consists of about 2.4 people. Total population for the KCEC Service Area in 2014 is about 37,000 people living in about 15,700 households. KCEC in December 2014 had more than 28,000 members, of which 22,600 were full-time residents, and 3778 were commercial customers.

Propane deliveries are estimated at about 5,000,000 gallons annually for all residential, commercial and other uses in the KCEC Service Area. The total customer cost of propane was an estimated \$12,455,000 in 2014. Propane price swings are abrupt and unpredictable, exemplified by prices that more than doubled in the winter of 2013-2014 because of increased demand in the central and eastern USA.

For all consumers, the price of gasoline at the pump ranged between about \$2.50 per gallon and \$3.50 per gallon during 2014-2015. This implies a range of gasoline costs of about \$2,150 to \$3,500 per year per 2-vehicle household.

Fossil fuel prices are volatile, meaning they can vary rapidly for a variety of reasons, and these variations cannot easily be predicted. Over the long term, price increases for fossil fuels are firmly established, while renewables prices continue a downward trend.

There are other costs associated with reliance on fossil-fuel and nuclear energy. Of special interest to Northern New Mexico citizens are the costs of the [Water-Energy Nexus](#). This means the costs of water required for energy production, together with the costs of energy required to move water. RT intends to estimate the costs of the water-energy nexus related to all forms of energy production for comparative purposes and to demonstrate water costs that can be offset by using renewable energy. Renewable Energy development and energy efficiency standards are methods of treating the water-energy nexus. Most forms of renewable energy use little or no water, and these will be replacing more water-intensive thermal power generating sources like coal or natural gas.

Quantifying the tradeoffs of the water-energy nexus will be an important element of water and energy planning throughout New Mexico, the USA Southwest, and arid regions throughout the world for the foreseeable future (U.S. Department of Energy, 2014).

RT began an energy cost study in 2015 to determine the relative costs of business as usual dependent primarily upon fossil fuels. These costs will be compared with an alternative that moves towards increased reliance on local renewable resources for electricity generation, increased energy efficiency investments, reduced natural gas and propane use through electrification and increased solar thermal, and reduced gasoline and diesel fuel consumption through electrified vehicles.

The relative cost analysis will then be used to develop estimates of economic effects on jobs and income in the region. The economic effects analysis will capture how the change in investment and expenditure strategies for renewables may impact local development.

## **The Local Landscape**

Renewable energy resources, especially wind and solar resources, are abundant and can be readily developed throughout North Central New Mexico. Local renewable energy resources can ultimately replace most or nearly all fossil fuels for the composite of electricity services demanded by regional citizens and businesses. KCEC customers,

through their local political representatives and the KCEC Board of Trustees, are demanding renewable energy solutions, especially solar energy solutions, for the region's energy future.

Currently, KCEC must purchase 95 percent of the energy it distributes to its customers from Tri-State. The all-services contract with this specification extends to 2040. Many customers and their political representatives are dissatisfied with the length and other restrictions of the contract. They are displeased with the inability of KCEC to readily change the terms of the contract. They are frustrated with frequent electricity rate increases imposed by Tri-State.

Renewable energy generation and distribution are already in operation within the KCEC Service Area. However, KCEC is near the limit of energy generation that it may develop locally under its contract with Tri-State. KCEC and its partners have installed four small-scale utility solar arrays with a combined nameplate output of about 4.5 megawatts since 2009. Additional smaller community solar, government, business and residential arrays produce an additional 2 megawatts of solar power. Work is underway to upgrade the local distribution grid using a modern [Fiber-Optic \(Broadband\) network](#) that will allow greater efficiencies in managing electricity loads.

Whereas the Town of Taos has a building energy efficiency ordinance ([The Taos High Performance Building Ordinance](#)) enacted in 2009, other communities in the KCEC service area have not pursued similar ordinances. RT is suggesting that all communities consider energy efficiency ordinances similar to that of Taos. Additionally, RT, KCEC and partners are assessing demand response and load management as major opportunities for reducing energy costs.

## **Regional and National Influences**

While North Central New Mexico stays dependent upon fossil fuels, the region remains exposed to fossil-fuel cost increases plus price volatility and uncertainty. Whereas renewables represent new capital investments, they also represent substantially reduced fuel prices that help communities hedge against rising or volatile costs. Utilities and other entities can lock in long-term, predictable electricity rates by means of a power-purchase agreement (PPA) such as a [solar PPA \(SPPA\)](#). The PPA can specify consumer costs for up to several decades that are not subject to the highly variable costs of fossil fuels.

To achieve the next level of adopting renewable energy, the biggest barriers are policy, economic and social considerations, to a much greater extent than technical obstacles. Other communities across the nation and the world are setting and achieving unprecedented renewables goals. They recognize that questions about high levels of renewables integration can be answered, and they understand the opportunities for local economic benefits. Demonstrated technology advances include demand response, microgrids, distributed renewables generation, storage, and upgrading the electrical grid from its antiquated analog design to a more modern digital system.

## **Models for 100% Renewable Energy Electricity Services**

Renewable energies that provide 100 percent of electricity and other energy services are now both targets and realities for communities, cities, states and countries throughout the world. Renewables technology and economics today demonstrate that getting to 70 percent or greater renewables electricity generation is not even a technical or economic discussion, but mainly a political question. Numerous studies and demonstration projects continue to confirm the feasibility of moving to 100 percent renewables (Budischak, and others, 2013; Pyper, 2015).

RT is evaluating communities, cities and states that have achieved or are targeting transitions up to 100% renewable energy. Georgetown, TX has signed contracts that ensure 100% renewable energy for electricity by 2017 (Ross, 2015). According to Dale Ross, Mayor of Georgetown:

“The city’s contracts for solar and wind power will provide wholesale electricity at a lower price than our previous contracts. These long-term agreements also provide a fixed cost that will enable the city to avoid the price volatility and regulatory costs we were likely to have seen had we continued to use electricity generated by burning fossil fuels. With energy costs locked in for the long-term, we can maintain competitive, predictable electric rates through 2041.”

Burlington, VT similarly converted to 100% of its electricity from wind and solar sources in early 2015 (Burlington Electric Company, 2015). In these cases, the motivations for shifting to renewables were grounded in cost savings, price stability, and local economic growth. The LER concept involves coping with numerous regulatory and legal restrictions that must be identified and analyzed in order to move quickly to high percentages of renewable energy generation.

The U.S. Environmental Protection Agency (USEPA) proposed the [Clean Power Plan \(CPP\)](#) on June 2, 2014. Under the CPP, [USA States must craft plans](#) for cost-effective strategies to reduce carbon emissions from power plants fired by fossil fuels. Renewable energy, energy efficiency and related strategies are high on the list of cost-effective options for states. Thus, new business models and other actions to create a renewable energy transition in North Central New Mexico will feed directly into New Mexico’s planning efforts.

Global and national trends are towards ever increasing renewable energy investment and development driven by the economic superiority of wind and solar power over fossil fuels and nuclear power.

## Stakeholders

Critical to planning are the potential energy wants and needs of key stakeholders, and their motivations for making changes to existing energy systems. The suite of stakeholders discussed by The Renewable Taos Project team at RMI eLab Accelerator 2015 included:

- Individual Members, with emphasis on low-income and fixed-income members
- Business Community, with emphasis on small businesses
- Key Accounts, with emphasis on large electricity consumer accounts
- Other Rural Electric Cooperatives (RECs), especially New Mexico and Colorado RECs
- Third-Party Providers, such as utility-scale solar and wind companies
- Native American Communities, especially Taos and Picuris Pueblos
- [Joint Resolution on Renewable Energy Signatories](#)
- [Tri-State Generation and Transmission Association, Inc.](#)
- [Kit Carson Electric Cooperative, Inc.](#)
- New Mexico State Elected Officials, with emphasis on the [New Mexico Public Regulation Commission](#)
- Non-Government Organizations, especially those based in the KCEC Service Area, New Mexico, and southern Colorado.
- Regional and National Allies and Agitators, with emphasis on the [National Rural Electric Cooperative Association](#) and similar entities

Stakeholder wants and needs help provide a framework and direction for more detailed work on new utility business models. The full suite of wants and needs may not necessarily be met for all parties. However, the different perspectives of the wide variety of interests are instructive in creating a renewable energy future for the KCEC Service Area.



## How Renewables Can Meet Our Diverse Energy Demands

Renewable Taos, Inc. envisions a full transition to renewable energy services for the KCEC Service Area. This means converting to renewables not only for current electricity demands, but also for all other energy demands including heating and transportation.

A goal of 100% renewables for energy services should address all energy services. While the Renewable Taos Project focuses initially on transitioning electricity services for the KCEC Service Area to renewables, we also encourage stakeholders to think long-term about renewable options for residential and business heating and cooking, light industrial uses, and transportation energy. Renewables promise rapid transitions for electricity and replacing fossil fuel energy for heating and cooking. For transportation, the timeline for replacement of fossil fuel energy is expected to be considerably longer for a variety of practical and economic reasons. This section provides a high-level description of different energy services in our region and describes the roles renewables can play in the near future. Whereas RT recognizes efficiency, demand response and load management can play major roles in reducing the amount of energy required in the first place to meet energy demands, this section addresses energy supply.

### Electricity

#### Current Snapshot

Average annual electricity demand for all uses in the KCEC Service Area was 34.07 megawatts for 2011-2014. Average annual electricity consumption for the period was 298,453,200 kilowatt-hours (kWh).

The KCEC Service Area currently (2015) draws about 90 percent of its average annual electricity demand from coal-fired power from the San Juan Generating Station, Waterflow, NM (SJGS). KCEC provides most the remaining 10 percent of electricity with small utility-scale solar arrays in the range of 0.5 to 1.5 megawatts, and smaller community solar, business and other arrays in the range of 50-100 kilowatts. Local, grid-tied residential solar systems provide about 1 megawatt of solar-electric power to KCEC's distribution system.

Tri-State is one of nine different owners of SJGS power that flows to Arizona, California, Utah and New Mexico. Tri-State provides electricity for KCEC by purchasing about [40 megawatts of power from SJGS Unit 3](#). The bulk of this power flows to the KCEC Service Area by way of a 200-mile transmission corridor from the SJGS to the Taos Electrical Substation. KCEC's electricity services for 2015 show an average service area demand of about 36 megawatts, with a winter peak demand of about 65 megawatts and summer minimum demand of about 23 megawatts.

## Renewable Options

Solar resources estimates for the KCEC Service Area suggest that practical, locally generated solar power close to transmission and distribution systems could easily exceed many hundreds of megawatts. Without energy storage, solar power facilities to meet the bulk of daytime demand could be built quickly to offset the use of coal-fired or other fossil fuel power. With energy storage, local solar facilities could provide the bulk of KCEC Service Area electricity demands, thus requiring minimal uses of coal-fired and other power backup from the regional transmission grid. If it becomes possible to sell excess local generation to the transmission grid, then local solar facilities could provide most or all KCEC demand without the use of storage. Wind power, whether generated locally or purchased from the nearby regional grid, complements solar generation with power peaks that typically occur in the early evening and after dark when KCEC electricity demand is at its greatest.

A blend of solar and wind energy could provide nearly 100% of our needs. RT needs to conduct modeling exercises to determine more precisely the blend of wind, solar, storage, and backup from sources like natural gas plants that would be required to support the KCEC Service Area. RT will define the requirements for this analysis together with a plan for accomplishing the work.

## Heating and Cooking

### Current Snapshot

In addition to electricity, natural gas, propane and wood serve hot water and space heating plus cooking demands for the KCEC Service Area. Natural gas is supplied by the [New Mexico Gas Company](#) through a pipeline branch originating from a main interstate pipeline in central New Mexico and continuing north to Taos, thence to its terminus in Red River. Natural gas primarily serves built-up areas immediately surrounding the Town of Taos, plus smaller communities to the north. Most rural residents throughout the region rely on propane, electricity or wood for primary heat and cooking demands.

Estimates derived from a report on KCEC Service Area energy consumption (Renewable Taos, Inc., 2015) show volumes and costs of natural gas and propane that might be offset using renewables. Average natural gas consumption during 2009-15 was equivalent to about 35 megawatts, and propane consumption was an estimated 15.8 megawatts.

### Renewable Options

Heating and cooking can be transitioned to renewable electricity or to non-fossil-fuel heating sources. Solar-electric, wind-electric, solar thermal, and geothermal heating systems can offer economical alternatives to both natural gas and propane. For planning purposes, RT is compiling comparative costs of heating systems using those based on renewables, and those using combustion of natural gas and propane.

The economical advantages of solar, wind and other renewable energy facilities over other forms of energy strongly suggest replacing most natural gas and propane systems within a few years, or at least offsetting the bulk of natural gas and propane demand. The transition to renewables for heating and cooking can accelerate quickly during the next decade, and may be only slightly slower than the transition to renewables for electricity.

## **Transportation**

### **Current Snapshot**

The overwhelming majority of transportation in the KCEC Service Area relies on gasoline and diesel fuel. For 2014, consumers in the area used about 11,340,000 gallons of gasoline and about 2,830,000 gallons of diesel fuel. The total cost of fuel consumed by all on-road vehicles is estimated at nearly \$38,300,000 for 2014 (Renewable Taos, Inc., 2015, p. 17-21).

### **Renewable Options**

Replacing these fuels with renewables requires replacing most of the current passenger and commercial vehicle fleet with cars and trucks that operate using batteries charged with solar-electric or wind-electric power. Development of economical, battery-powered transportation is external to the region, but ongoing within the domain of global and national vehicle and battery manufacturers. Projecting a time period in which passenger and commercial vehicles become available and cost-competitive to the general public warrants continuing study.

Nonetheless, stakeholders in the KCEC Service Area can look to early adopters of electric vehicle and hybrid electric-gasoline or electric-diesel powered vehicles that are charged using residential and business solar arrays. They can also plan for the elements of an electric vehicle infrastructure, including charging stations and battery services. Local governments and businesses are the most likely candidates for leadership in transitioning to vehicle fleets that rely substantially on solar-electric or wind-electric power.

Estimates derived from a report on Taos County energy consumption (Brown, 2011) show volumes and costs of gasoline and diesel fuel that might be offset using renewables. These volumes and costs strongly suggest a detailed, comparative cost analysis of transitioning to electric or hybrid-electric vehicles that can be charged with renewable energy.

## Renewable Energy Needed To Offset Other Energy Sources

The following table includes estimates of energy-use data by sector and source of energy for Taos County in 2009 (Brown, 2011, p. 126). All energy units are converted to their kilowatt-hour (kWh) equivalents for ease of comparisons and for estimating total energy that might be supplied by electricity. The total energy use figure of about 1,352,000,000 kWh for Taos County is equivalent to about 154 megawatts (MW) for the year. Extrapolating similar energy use to KCEC Service Area communities and households outside Taos County suggests a total energy use estimate of about 172 MW for 2009.

### Estimated Community Energy Use and Greenhouse Gases Emissions By Sector in 2009, Taos County, New Mexico

Sector	Energy Use (Kilowatt-Hours, kWh)*	Percent of Total	Greenhouse Gases Emissions (Tons, CO2 equiv.)
<b>Residential</b>			
Electricity	97,400,000	7.2	64,100
Natural Gas	193,600,000	14.3	38,750
Propane	37,200,000	2.8	8,900
Subtotal	328,200,000	24.3	111,750
<b>Commercial</b>			
Electricity	112,900,000	8.4	74,350
Natural Gas	91,900,000	6.8	18,400
Propane	20,000,000	1.5	4,800
Subtotal	224,800,000	16.6	97,550
<b>Transportation</b>			
Diesel	128,800,000	9.1	35,500
Gasoline	670,000,000	50.0	182,500
Subtotal	798,800,000	59.1	218,000
<b>Total</b>	1,352,000,000	100.0	427,300

\*All figures were converted to kilowatt-hours (kWh) for direct comparisons of estimated energy use. Natural gas is commonly reported and priced in therms or cubic feet. Propane, diesel fuel and gasoline are commonly reported and priced in gallons.

This tabulation was generated for Taos County, New Mexico using ICLEI's Clean Air and

Climate  
Protection 2009 (CACP 2009) Software (Brown, 2011, p. 126; ICLEI USA, 2015).

The data show a potential for offsetting more than 427,000 tons per year of greenhouse gases emissions from fossil-fuel energy sources. Electricity use by the residential and commercial sectors accounts for slightly more than 32 percent of these emissions. The transportation sector, responsible for more than half the greenhouse gases emissions from energy use in the Taos area, remains an important target for conversion to renewable energy.

A major element of The Renewable Taos Project will be updating all energy, greenhouse gases emissions, population, and related information using the most current available data.

## Priority Questions to Consider for Transitioning to Renewables

There are important questions to be answered before the goal of 100% renewables can be achieved. From a suite of questions, those of highest priority arise in consideration of what citizens and institutions in the KCEC Service Area have the power to influence. The eLab Accelerator team selected three questions from a much longer list because they were critical and appropriate for the team to discuss.

1. How can the contract between Tri-State and KCEC, be restructured, or can KCEC negotiate a new contract with another wholesale electricity provider?
2. How can we create a business model that generates revenues for KCEC required to support the grid, while accelerating adoption of renewable energy?
3. How can we determine solutions for low-income and fixed-income households' adoption of renewables?

RT, KCEC and other stakeholders place a high priority on ensuring equal access to renewable energy for all customers, with an emphasis on more affordable energy for low- and fixed-income customers. RT continues to explore ways low- and fixed-income customers can stabilize and reduce their energy costs with renewable energy. RT's ongoing research involves community solar facilities that allow renters to own or lease renewable energy generation, and lowers the barriers to renewable energy for low-income homeowners. It includes replacing parts of current indigent services programs\* that spend tax dollars on fossil fuels year after year with dedicated renewables services that are free after the initial investment is paid. Other answers involve low-cost financing, home inspection and weatherization, and designated panels on community solar arrays that can be given free to qualifying low-income customers. RT wants to ensure that low-income customers are aware of programs such as the Low Income [Home Energy Assistance Program \(LIHEAP\) of the U.S. Department of Health and Human Services](#). RT intends to merge its low- and fixed-income renewables program with its business planning begun in April 2015.

In the last analysis, however, the most reliable method of ensuring low energy costs for all KCEC members, especially those with low or fixed incomes, is to secure stable, low cost energy for the long-term. Clean, renewable energy is the solution. A transition to 100% renewable energy is the best strategy to serve the needs of the entire community.

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\*Government-sponsored indigent programs treat those who cannot afford hospital and medical care, including medications, or basic necessities such as rent, food, and utilities. The state or local government is generally required by law to assist indigent people in paying for these basic services on a temporary basis.

## Opportunities for Progress: New Business Models

There is a suite of options for meeting the goals of the [Joint Resolution on Renewable Energy](#). From RT's perspective, these can be grouped under the headings of:

- actively partnering with Tri-State,
- remaining a member of Tri-State while working around constraints on local development of renewables,
- separating from Tri-State in favor of contracting with another wholesale energy provider, and
- recruiting renewable energy development to the KCEC Service Area, a task that can be spearheaded by the signatories of the JR.

KCEC currently (May 2015) is negotiating with Tri-State and other regional wholesale electricity providers on the possibilities of changed or new contracts. KCEC hopes to finalize these negotiations by late 2015.

[The Federal Energy Regulatory Commission \(FERC\) on June 18, 2015 issued an Order](#) supporting the appeal of [Delta-Montrose Electric Association \(DMEA\)](#), a Tri-State Rural Electric Cooperative (REC) in western Colorado, for relief from Tri-State's contractual cap on local generation of renewable energy. The FERC Order will have major implications for KCEC's negotiations with Tri-State, and for other Tri-State member RECs in terms of caps on local generation of renewable energy.

The RMI eLab Accelerator exercise led to focusing on these three major opportunities:

1. A new business model that introduces a new distributed energy resources entity while expanding KCEC's service types. Local leadership could create a new distributed renewables entity, Land of Enchantment Renewables (LER)\*, that builds assets and signs and agreement with KCEC under the provisions of the [Public Utility Regulatory Policies Act of 1978 \(PURPA\)\\*\\*](#). LER would exist in parallel with KCEC, which could expand its services in grid maintenance, load management, customer interface, and other areas. Members could elect to belong to either KCEC and/or LER.
2. A new wholesale contract model. KCEC could separate from Tri-State and contract with a new wholesale energy provider. The contract would specify reopeners and/or a sliding scale for bringing more and more locally generated renewables online as improvements occur in renewables technology and economics. Provisions for selling excess local generation to the wholesale energy provider could be included or negotiated later.
3. The implications of the FERC Order will have impacts on both (1) and (2). Depending upon appeals of the Order, and legal details about how the Order applies to Tri-State member RECs, the opportunities above must be adjusted accordingly.



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\* “Land of Enchantment Renewables (LER),” as used in this report is a temporary, informal name adopted by Renewable Taos, Inc. as a placeholder for a potential new distributed renewables services entity concept. As such, “LER” offers a convenient way to report, plan and discuss options, and does not meet any legal or other requirements for a formal business name.

**\*\*[Public Utility Regulatory Policies Act of 1978 \(PURPA\)](#)\*\***

PURPA is a US federal law enacted in 1978 (U.S. Code, 2015), which was intended to encourage more energy-efficient and environmentally friendly commercial energy production. PURPA defined a new class of energy producer called a qualifying facility (QF). QFs are either small-scale producers of commercial energy who normally self-generate energy for their own needs but may have occasional or frequent surplus energy, or incidental producers who happen to generate usable electric energy as a byproduct of other activities. When a facility of this type meets the Federal Energy Regulatory Commission’s (FERC’s) requirements for ownership, size and efficiency, utility companies are obliged to purchase energy from these facilities based on a pricing structure referred to as avoided cost rates. These rates tend to be highly favorable to the producer, and are intended to encourage more production of this type of energy as a means of reducing emissions and dependence on other sources of energy.

**4.**

# New Distributed Renewables Energy Services Concepts

## New Business Models

The RMI eLab Accelerator team discussed concepts for two business models. One is where customers' electricity demands are met with two entities:

- (1) Land of Enchantment Renewables (LER) that builds, contracts for, manages, finances and sells renewable energy, and
- (2) KCEC that continues its grid maintenance role and grows its revenue services to include load management, energy storage, energy efficiency and other services.

This concept would allow developing new distributed, renewable energy resources while maintaining KCEC's regional role based on its experience and long term customer relationships.

A second business model concept involves a new contract between KCEC and Tri-State or another wholesale energy provider. This concept moves away from business as usual towards a rapid buildup of renewable energy.

### 1. A New Distributed Renewable Resources Entity

The concept is to provide customers with the option of 100% renewable energy supply **while reducing costs for customers** through economies of scale and negotiation. Land of Enchantment Renewables (LER) will be non-profit. There will be one bill for each customer whether they are members of KCEC and/or LER.

In this concept, KCEC remains responsible for electricity distribution. This includes maintaining and upgrading the electricity distribution system. This is ideal because KCEC has the experience, track record, and capital to maintain quality and upgrade the system.

Energy efficiency, whether through mandated or voluntary programs, requires significant efforts by LER. Also, KCEC and LER must examine electrical energy distribution management using the new fiber-optic (Broadband) system now being installed throughout the KCEC Service Area.

RT, with assistance from RMI and others, will explore potential legal and institutional obstacles facing LER and its intended operations. RT will create a separate report on the details of such obstacles and plans to cope with them.

## **2. A New Wholesale Contract Model**

KCEC negotiates a new contract with Tri-State or another wholesale electricity provider. The new contract is set up with reopeners and/or sliding scale local generation targets. These targets would bring more and more locally generated renewables online as improvements occur in renewables technology and economics. The scale would allow a high percentage of local generation of renewable energy by KCEC by a specified date. Key customers using behind-the-meter distributed renewables generation would meet the balance of the 100% goal.

Due to KCEC's nighttime and winter peaking demand, it will be necessary to generate or purchase significant amounts of renewable electricity in order for local renewable generation to meet 100% of electricity use. Therefore, contracts with wholesale electricity providers should include the purchase by the provider of excess local generation at reasonable rates. Contracts should include specifics on purchasing renewable energy from elsewhere on the regional grid. One alternative is storage of excess local generation that currently might be too expensive to implement quickly. The contract approach could be a low-conflict and legal solution while creating a trajectory towards more local renewable energy generation.

Over time, the wholesale electricity provider would increase renewables generation as a part of its continuing business. Concurrently, the total wholesale electricity purchases by KCEC would decrease as a result of local generation.

## **Action Items for 2015-2016**

### **Cost of Electrical Services Study**

KCEC is proceeding with a Cost-of-Services study with its contractor, The Blake Group. RT will approach KCEC regarding RT's possible involvement in this study and access to results as they become available. RT's interests lie in electricity rate structures that may be applicable for planning for a new distributed renewable energy services entity.

### **Joint Powers Agreement Among Local Governments**

The Town and County of Taos and RT are drafting a Joint Powers Agreement (JPA), initially targeted for signatories of the RT Joint Resolution on Renewable Energy. This agreement is intended to formalize support for progress towards a renewable energy economy for the KCEC Service Area through funding, in-kind services, and local mandates for energy efficiency and deploying renewable energy facilities.

### **Advisory Committee (Local and National)**

To continue with the work initiated by the Renewable Taos Project eLab team, RT is assembling an Advisory Committee of experts from across the USA national electricity industry. The Advisory Committee will oversee RT's progress on LER cost analysis, energy economics, energy policy, technology innovations, legal issues, and related topics. The Advisory Committee will track the RT's work, and offer guidance and resources for renewable energy transition planning. RT will report to the Advisory Committee on as needed basis.

### **Steering Committee (Local)**

For purposes of transparency, buy-in, education and direction, RT is assembling a Steering Committee with members drawn from local government, business, and non-government leadership in the KCEC Service Area. Interviews with local leaders beginning in 2013 suggested many candidates for a Steering Committee. RT currently (mid-2015) is compiling a list of potential candidates and confirming commitments to serving on the Steering Committee. The Joint Powers Agreement will include wording to help insure all local governments are represented regarding decisionmaking on a renewable energy transition. Based on an earlier experience in crafting the [Town of Taos High Performance Building Ordinance](#) in 2008-2009, RT and KCEC expect enthusiastic and widespread participation on or associated with the local Steering Committee.

## **Costs of Transitioning to Renewables**

An essential part of accelerating a renewable energy transition is ensuring the outcome is economically superior to business as usual based on fossil fuels. Whereas the general case for the economic superiority of renewables is being proven throughout the world, projections must demonstrate economic advantages specific to the KCEC Service Area. RT, with input from RMI and others, is commencing a yearlong business planning and costs study targeted for completion by the second quarter 2016.

## **Legal Issues**

RT will begin an investigation of legal issues that accompany a transition to renewable energy. The research will result in a report setting forth an analysis of various possibilities and hurdles for RT to consider as it pursues ways to develop renewable energy. The report will specify issues unique to New Mexico, as well as those of general concern. The legal issues are also relevant to Rural Electric Cooperatives (RECs) throughout the U.S. that are seeking to transition to increased use of renewable energy.

## **Messaging**

RT is the most appropriate entity to organize messaging associated with a renewables transition for the KCEC Service Area and/or the North Central New Mexico region. During 2012-2015, RT devoted major efforts to developing partnerships with individuals and organizations key to the success adopting renewable energy and energy efficiency. RT will continue to nurture its relationships with political and community leaders and local and regional media to develop an effective messaging campaign. Messaging will adhere to the [Core Values](#) and [Mission](#) of Renewable Taos, Inc. that specify a full and rapid transition to renewable energy.

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