

Solar Case Study

Kit Carson Electric Cooperative



1. Company Profile

Kit Carson Electric Cooperative (Kit Carson) serves approximately 29,000 meters in three counties in north-central New Mexico near the town of Taos, in the Sangre de Christo Mountains. The cooperative is an all-requirements member of Tri-State Generation and Transmission Cooperative. Kit Carson averages 11 members per mile of line. The terrain is on a high plateau with elevation starting around 6,900 feet, and the climate is semi-arid. Solar resources are in the 5-to 6-kilowatt hour/m² range per day on an annual average, according to National Renewable Energy Laboratory maps. The territory receives about 300 sunny days per year. Under a power supply contract with Tri-State, Kit Carson can self-provide up to 5 percent of its energy and 10 percent of peak demand in locally owned renewables. The makeup of Kit Carson's load is about 75 percent residential, 20 percent small commercial and 5 percent large commercial. The cooperative's largest single account is Chevron Mining, followed by a ski resort. Tourism, recreation and service industries make up a large part of the local economy. Special considerations are required in working with two Native American tribes, the U.S. Forest Service and the Bureau of Land Management.

Kit Carson has a telecom subsidiary, KC Telcom, which serves 1,996 members, as well as a propane subsidiary, KC Energy, which serves 2,816 members.

2. Renewable Profile

Since 2009, Kit Carson has undertaken 10 solar projects: four owned by the cooperative, three commercially owned, two owned by the school district with power purchase agreements (PPAs) with the cooperative and one community solar array. These projects currently total just over 6,000 kilowatts AC of solar capacity. They range in size from 45 kw to 1,550 kw. Kit Carson was not committed to any set model, design or components. Rather, it has used a number of different models to provide its community's solar needs. In fact, three entities own the three commercially owned arrays. For the community solar array located at the Taos Charter School, Kit Carson partnered with Clean Energy Collective (CEC).

The cooperative's membership is interested in solar, and Kit Carson is responding to its membership. Kit Carson anticipates developing additional solar projects and is currently in discussions with Tri-State to increase its self-provide limit in their supply contract. The four projects owed by Kit Carson are UNM Taos-435 kw, KCEC canopy-82 kw, KTAOS canopy-45 kw and Eco Park Canopy-60 kw.

Kit Carson estimates the solar production peak matches its system peak demand about 75 percent of the time.

On January 15, 2015, Kit Carson announced expansion of its community solar program with CEC to provide an additional 1.5 megawatts AC of solar to be located in four different areas within its service area. These projects will essentially follow the same ownership model used with CEC at the current community solar array.

3. Financing and Rate Design

Kit Carson used several models to incorporate solar onto its system. The cooperative received funding of \$5 million as part of the Clean Renewable Energy Bond program, which funded the four projects it owns.

For the Taos Charter School community solar project, members were able to purchase a 235-watt panel for an investment of \$845. Members who did so received tax credits and net metering of the output as if the panels were installed on their own roof—essentially a virtual net metering. All 420 panels available for sale sold out in a short period. This project was structured through CEC, where it owns, operates and maintains the array. At the start of the project, there was a PPA between Kit Carson and CEC whereby Kit Carson purchased all of the array output at a negotiated price. As each panel was sold, the PPA amount decreased by that amount and the purchasing member was credited as described below.

CEC has about 35 community solar projects across the country, 11 of which are operated in partnership with electric cooperatives. CEC is technically the owner of the Taos Charter School array, with all of the financial responsibility and risk. Kit Carson members who wished to participate purchased one or more panels at \$845 per panel, less any solar rebates available at the time. Monthly credits are calculated at the members' pro-rata share of the metered output of the array that month, less 5 percent times the current retail rate. Kit Carson and CEC have a standalone LLC that operates like a trust to ensure funding for the operations and maintenance of the array over the next 50 years, funded by the value of the 5 percent of the output produced monthly.

All remaining project costs were blended into the overall power cost of the cooperative. Kit Carson feels that all of the PPAs should stabilize prices and make them more predictable, due to the fixed price nature of the PPAs. Traditionally sourced power costs are increasing with unknown or unpredictable increases.

4. Project Development

Kit Carson's projects used different designs and specifications based on the best available at the time. The four projects owned by Kit Carson were standardized. As some projects were only for purchased power, the cooperative had less influence, but it did attempt to keep as much of the work with local firms as practical, and specified so in each project contract. Sol Luna Solar and PPC Solar are two local contractors that were used. Each project was developed on a turnkey basis with the developer responsible for engineering, procurement and construction.

The UNM Taos array consists of 2,640 Canadian Solar panels of varying sizes (180, 190 and 200 watts) that use a 500-kw Satcon PowerGate inverter. The KCEC Canopy has 528 156-watt Yingli Panels and a 100-kw Satcon PowerGate inverter. The KTAOS Canopy has 242 180-watt Trina panels and a 50-kw Satcon PowerGate inverter. The EcoPark Canopy uses 308 230-watt Yingli panels and two 35-watt Advanced Energy inverters. The UNM Taos array has single-axis tracking racks manufactured by Array Technologies; the other three canopy arrays use fixed racks.

5. Operations and Maintenance

Kit Carson has contracted with a local installer to perform semiannual inspections of the arrays it owns. Procedures and checklists are still under development; at this point, only a visual inspection has been necessary. No failures or maintenance issues have developed. A third party is under contract to perform required maintenance. A copy of the inspection form is on pages 42-43.

No operational issues have been encountered. Mitigation studies were performed prior to installation by Los Alamos National Labs. Kit Carson developed an internal policy that any array in excess of 50 kw would have voltage regulation installed or upgraded in conjunction with the interconnection at the site. This seems to have precluded any voltage problems.

Kit Carson is not aware of any warranty or operations and maintenance issues encountered by the six arrays owned by other parties and connected to its system.

6. Telemetry

Kit Carson operates both a Cannon power line carrier and Next Grid mesh network smart metering systems to monitor output from the arrays. In addition, those units in excess of 1 MW are also monitored by Tri-State as part of its network. The community solar array at Taos Charter School has its output posted on the CEC website and linked to the Kit Carson website. The other arrays do not have production data available for public viewing at this time.

7. Administrative Impacts

No additional personnel were required as a result of participating in the solar projects. However, staff time was directed toward communicating with members about the cooperative's participation in these projects. Press releases, including photos, were developed for each of the projects. In addition, the cooperative has a special section located on the Kit Carson website (www.kitcarson.com/content/go-green) pertaining to solar that includes fact sheets about its involvement. The community solar array is also linked to the CEC website dedicated to Kit Carson (www.kcecsolar.com), and the FAQs are attached.

8. Renewable Policy Development

Kit Carson's solar projects are a response to feedback provided in member meetings over several years. Kit Carson participates in a net metering program, as required by the New Mexico Public Utility Commission, and currently has 189 net metering solar members. The cooperative has developed an advisory solar committee of its membership, with subcommittees focusing on the areas of finance, education, technical and workforce development. A copy of the subcommittee's mission statements is attached. Early on, the committee of 22 members met quarterly, or more often as necessary. However, the committee is not active at this time.

9. Member Interest in Solar

Starting with a series of meetings in 2005, Kit Carson first became aware of member interest in solar. Since then, member interest and support have steadily grown. A large segment of the membership is environmentally conscientious, and the public response to Kit Carson's solar initiatives has been overwhelmingly positive; for example, the community solar array at Taos Charter School quickly sold out. Given the sunniness of the cooperative's territory, solar is a natural fit. Member preference is for local, independent control of the power supply, which solar partially provides. The cooperative positioned itself for change according to its members' wishes. Kit Carson has received positive local press for its solar initiatives, and it was named Solar Utility of the Year by the Solar Electric Power Association (SEPA) in 2013, recognizing its achievement in developing solar.

10. Business Options

In short, Kit Carson took an all-of-the-above approach to solar. Members can subscribe to the community solar program for direct ownership. If they choose, they can install their own rooftop solar array. All members receive a portion of solar as part of the standard generating mix under the cooperative's ownership of solar arrays and through power purchase agreements.

11. Lessons Learned

Kit Carson plans to review its pricing and rate structure, given that solar is becoming a larger part of its overall portfolio. The cooperative found several good sources of information, including local contractors, a University of New Mexico branch college and SEPA. Its advice to cooperatives starting from scratch would be to begin by educating board members, soliciting member input, listening to different opinions and educating the membership about what is feasible.

For additional information, contact:

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Semi-Annual Site Visit Checklist for KCEC Solar Electric Systems

Sites: Klauer Campus, KCEC HQ, KTAO, Eco-Park

Technician(s):

Date:

Site Inspection

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection for erosion control	
	Visual and physical inspection of all fencing	
	Visual and physical inspection of landscaping	
	Visual and physical inspection of service road	

Photovoltaic Modules

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection for plant growth or any obstructions causing shading	
	Visual and physical inspection for corrosion on all terminals, cables and enclosures	
	System testing (operating current of each string)	

Tracking System (Klauer Only)

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection of module clamp fasteners, bushing housing, gear box brackets, and torque tube fasteners.	Semi – Annual
	Visual and physical inspection of gear drives and drive-shaft assemblies for proper gear-tooth alignment, limit switch integrity, and overall structural integrity	Semi – Annual
	Test wind stow function	Semi – Annual
	Visual and physical inspection of Slew Rings, torque markings are aligned (Gear Drives)	Semi – Annual
	Visual and physical inspection of top cap and torque tube welds	Semi – Annual
	Inspect drive-shaft assemblies and column housings for misalignment due to <u>grnd</u> settling	Annual
	Inspect Bearings for excessive wear and check torque marks on column	Annual
	Inspect seals on electronic enclosures	Annual
	Grease Slew Rings (aka: gear drives), center zerk 80cc, outer zerks 40cc each	Every other yr.
	Inspect all hardware on one row per motor block, if loose expand inspection	Every other yr.

Inverter

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection of appearance/cleanliness of the cabinet, ventilation system and all exposed surfaces, clean as necessary.	
	Visual and physical inspection of air filter elements, clean/replace as necessary	
	Visual and physical inspection for corrosion on all terminals, cables and enclosure	
	Visual and physical inspections of all fuses and fuse holders	
	Visual and physical inspection of the internally mounted equipment including sub-assemblies, wiring harness, contactors, power supplies and all major components	
	Visual and physical inspection of the condition of all the AC and DC surge suppressors	
	Torque terminals and all fasteners in electrical power connections	
	Check the operation of all safety devices (E-Stop, door switches)	
	Record all operating voltages and current readings via the front display panel	

PV Array Combiner Boxes

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection for corrosion on all terminals, cables and enclosure	
	Visual and physical inspections of all fuses and fuse holders	

Square D Ventilated Dry Type Transformer (Klauer Only)

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection for corrosion on all terminals, cables and enclosure	

Square D 800 Amp 480 VAC 3 Phase Heavy Duty Safety Switch

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection for corrosion on all terminals, cables and enclosure	
	Check the operation of all safety devices	

Fat Spaniel Monitoring System

Initials	Inspection	Notes – Status, Failures, Remedies, Repairs
	Visual and physical inspection for corrosion on all terminals, cables and enclosure	
	Visual and physical inspection of weather station	

Kit Carson Electric Cooperative Inc.

FAQ: Solar Projects

575-758-2258 * 800-688-6780* www.kitcarson.com

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KCEC Solar Questions & Answers

We've heard Kit Carson Electric Coop is a national leader in solar energy production. What does that mean? The Solar Electric Power Association (SEPA) ranks utility companies according to the amount of solar power they utilize in their system. In 2012 KCEC was ranked third in solar watts produced per consumer and fourth in overall solar watts produced. SEPA also nominated KCEC as the UTILITY OF THE YEAR for 2011. KCEC CEO Luis Reyes was on of the two finalists in a nation-wide competition between all utilities for CEO of the Year in 2012.

We've been hearing a lot of talk about Community Solar. What is it? KCEC is the first New Mexico electric company to utilize Community Solar. The Clean Energy Collective sells individual and multiple panels from the solar array at Taos Charter School to KCEC members. The electricity produced by the purchased panels is then credited to the member's bill. This allows members who can't install solar panels at the home or business to still take advantage of the power of the sun. For instance, if a member rents their home or business, lives in a location that does not get full sunlight, has neighborhood restrictions or just doesn't want to bother with a home system, KCEC Community Solar is a great alternative. The panels are real property, so the energy can continue to be applied to the member's bill if he or she happens to move within the KCEC service territory. The panels are affordable and can be purchased on a low interest payment plan. KCEC Community Solar is our way of making renewable energy available and affordable to all KCEC members.

It's been said the northern part of KCEC's territory is solar powered. What does that mean? On a sunny day, every home and business from Questa north is powered by the sun. The solar array outside Amalia, which was energized in June 2012, produces 1.25MW AC power. The Chevron Mining concentrated solar array produces 1MW. The two arrays produce enough power to provide all the electric needs for every home, retail business, school, village government and medical facility in Questa, Cerro, Sunshine Valley, Costilla, Amalia and everything in between.


Does KCEC actually own all these solar arrays? KCEC owns the UNM-Taos, KTAO, Taos High School and our headquarters parking lot arrays. The rest of the solar arrays in our service territory were built by other parties. We have Power Purchase Agreements with them.


What is a Power Purchase Agreement? When an investor plans to build an array a power purchase agreement can be put in place. This means KCEC agrees to purchase the power produced by the array at a certain price. The electricity produced is metered before it is fed into the electric grid. KCEC pays for the power that is produced. At this time we are limited to 5% of our total electric needs coming from these agreements.

Can KCEC add more solar arrays to their portfolio? At this time, due to the 5% limit, we are at the maximum for solar production. We are working with our power provider, Tri-State Generation and Transmission, to increase the percentage of power we receive for our abundant sunshine.



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Mission Statements for Solar Committee Sub-Committees

Finance: It is the mission of the Finance Committee to provide funding resource information and to research loan options, grant options, lease options and other cost effective ways to finance solar applications to all those who wish to utilize solar photovoltaic energy in their homes or businesses and make it affordable for all to take advantage of this renewable energy technology.


Education/Policy: It is in the mission of the Education Committee to encourage local and regional colleges and high schools to provide students with instruction that will make the workforce ready in the area of renewable energy installations. To educate the community on issues of energy conservation and renewable energy sources. To educate the community on how the KCEC solar energy program can assist homeowners and businesses to install their own solar system, reducing grid consumption and reducing carbon footprint.

Technical: It is the mission of the Technology Committee to explore advanced solar technology available in the markets today that applies to roof top, solar array, distributive generation, interconnection and net metering applications. Disclose proven research technology of how these applications work in conjunction with traditional grid power.

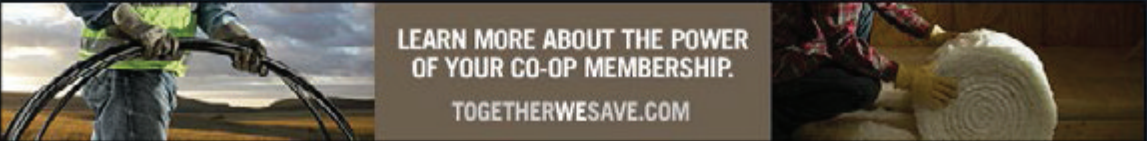
Work Force: It is the mission of the Work Force Committee to explore job creation and economic development opportunities in the field of installation, repair, manufacturing, maintenance, marketing, training, delivery and construction of solar applications.

Quick Links


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