Low-Income Community Solar Demonstration Project Case Study: Empire Electric Association

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COLORADO
Energy Office

Project Details

Empire Electric Association's Demonstration Project Highlights

- The project's target of approximately 50% subscriber cost savings was achieved.
- CEO dollars revitalized EEA's stranded solar asset to benefit low-income members.
- CEO dollars helped create a low-income solar resource where none existed before and brought more solar to an area which is traditionally served by conventional energy sources.
- On average, subscribers will realize annual cost savings of $485. When combined with average cost savings of $200 from CEO's WAP, subscribers could see total annual savings of $685.
- The project helped further CEO's goal to reduce Colorado's low-income energy burden.

INTRODUCTION

Approximately 30% of Colorado households pay more than 4% of their annual income on energy bills. Although several financial assistance programs exist to relieve high energy burden for low-income households, opportunities remain to achieve deeper cost savings by specifically targeting reductions in electricity costs.

The Colorado Energy Office's (CEO) Weatherization Assistance Program (WAP) is committed to improving energy affordability for low-income households. Guided by this commitment and in response to a gap in electricity cost reduction programs, the CEO launched the Low-Income Community Solar Demonstration Project (Demonstration Project) in 2015. The Demonstration Project is a statewide initiative that aims to reduce electricity costs for low-income households by offering community solar options to the same households that are eligible for weatherization services.

OBJECTIVE

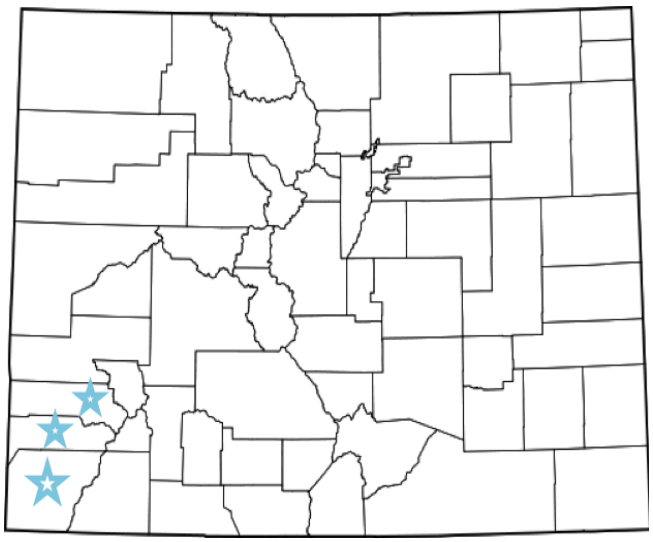
The Demonstration Project has eight utility partners, including Empire Electric Association (EEA), a rural electric co-operative utility serving Montezuma, Dolores, and San Miguel Counties. This case study describes EEA's community solar project and how it successfully reduced low-income energy burden.

The intent of this case study is to inform utilities, governments, and policy makers about how community solar projects can impact low-income communities.

PROJECT PARTNER ROLES

EEA partnered with the CEO and GRID Alternatives (GRID) to develop a 26 (kilowatt) kW community solar array for up to 7 low-income co-operative members. The primary goal of this project was to positively impact the low-income community through more affordable electricity costs.

FIGURE 1: COUNTIES SERVED BY EEA'S SOLAR GARDEN



Each partner played a key role:

- CEO provided project evaluation and funding support.
- GRID provided the design and implementation framework, designed and installed a new 21 kW system, provided workforce integration, provided outreach, and managed subscriptions. In addition, GRID will conduct primary operation and maintenance (O&M) activities and maintain equipment warranties.
- EEA provided the land and interconnection, donated 5 kW of community solar generation from an existing garden, and conducted outreach. In addition, EEA will provide solar credits, bill support, maintain full ownership, and support O&M.

PROJECT IMPLEMENTATION

The project was first introduced to EEA's Board of Directors in January 2016. It was approved within one month based on its value to low-income members and the ability to leverage CEO's grant. In June 2016, the solar garden was interconnected and fully subscribed with a waiting list. Subscribers began seeing cost savings in July/August 2016.

To qualify, subscribers must make less than 80% of HUD's area median income (AMI). EEA may refer subscribers and deny subscriptions. Subscriptions may be denied due to poor credit history, history of unpaid bills, and/or illegal activity. EEA has committed to providing subscriptions for 20 years, with each subscription lasting 5 years.

The project was implemented using a turn-key installation in a "barn- raising" community development model, where subscribers donated 16 hours of sweat equity and worked alongside GRID and EEA. The panels were installed adjacent to EEA's headquarters on land owned by EEA. The meter was put on EEA's main meter using a "behind-the- meter" approach, where the solar production meter was installed on the customer's side.

ENERGY GENERATION

EEA noted that there was "no downside" and "no risk" to hosting the solar array due to very little monetary requirements and streamlined implementation. EEA was able to connect to their existing community solar garden, simplifying interconnection and associated costs. Since the panels were connected to an existing garden there was no additional permitting. Though all normal electrical permits were still required. EEA reported "very little O&M effort", with staff conducting visual checks once or twice per month.

"The whole project went smoothly, including design and implementation. GRID has good experience and good people." - Clint Rapier, EEA's System Engineer

Tri-State Generation and Transmission Association, Inc. (Tri-State) provides wholesale electricity to EEA. Tri-State's Board of Directors' renewable energy policies were not applicable to this project because EEA used a "behind-the-meter" approach where the system was connected to the customer's side of an existing meter at EEA's headquarters. This approach was possible due to the garden's small size and was also simpler and more streamlined than going through Tri-State. Also, since the project did not go through the renewable energy policies, it was not subject to Tri-State's 5% cap on member-owned energy projects. Since this project required no financial transactions with Tri-State, EEA owns the Renewable Energy Credits (RECs).

PROJECT COSTS

The project cost $78,750 and was covered by CEO's grant. Direct project costs included operations, such as equipment, construction materials and GRID staff time, outreach and administration. Operations accounted for approximately 96% of total project costs, while outreach and administration accounted for approximately 1% and 3% of project costs, respectively. EEA provided $32,677 in leveraged funds that included EEA's donation of 5 kW of capacity from the existing array, land donation, and estimated O&M contribution.

Per EEA, CEO's grant was essential; without the grant, the project would not have been built. Its small size and strategic location enabled CEO grant dollars to cover project costs.

"The grant from CEO made the project make sense. We were able to leverage the grant with existing EEA resources to provide maximum benefit to our members." – Josh Dellinger, EEA's General Manager

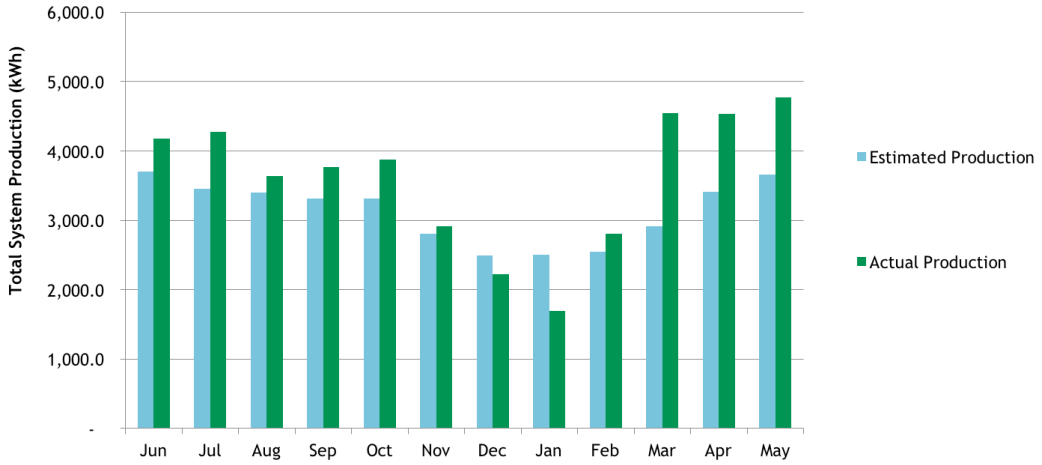
The total cost per watt was slightly higher than CEO's other low-income community solar demonstration projects since the array used a ballasted system and the capacity was small compared to the capital investment.

EEA will take on some costs over the duration of the program such as administration and O&M, but EEA has not and will not track these costs individually. These costs will be rolled into existing budget categories.

PROJECT PRODUCTION

The estimated annual kilowatt hour (kWh) production of the solar garden was modeled using PVSyst. Long-term degradation is assumed to equal 0.5%. In Year 1, the system is expected to produce 37,499 kWh. Actual production data from June 2016 through May 2017 shows that the system produced 43,225.1 kWh. During this timeframe, the system has produced 15% more electricity than expected.

FIGURE 2: ESTIMATED VERSUS ACTUAL SYSTEM PRODUCTION



Data was provided by EEA and assumes that 50% of production from the existing 10 kW system (5 kW was donated to the demonstration project) applies to low-income community garden.

PROJECT OUTREACH

EEA and GRID partnered to provide subscriber outreach using program brochures and through two in-person workshops. Each workshop discussed program and contract details and established expectations for system performance and cost savings.

Even with strong outreach, one subscriber stated that the program seemed "too good to be true", and the initial outreach did not discuss the program's funding sources. This was particularly concerning for older subscribers who are routinely the focus of various financial scams. Through multiple discussions during in-person workshops, many subscribers finally overcame their initial skepticism and signed up for the program. Despite some subscriber hesitation, EEA fully subscribed the garden and developed a waitlist. EEA was forced to limit the size of the garden due to available land space.

SUBSCRIBER STATISTICS

The 26 kW solar garden can serve 7 subscribers, with each utilizing varying amounts of solar energy from the garden. System sizes range from 2.7 kW to 4.3 kW, with an average system size of 3.7 kW. Subscribers have a 5-year contract with EEA, and subscription contracts can be renewed. Systems are sized to offset approximately 50% of subscribers' electric costs based on the subscribers' previous 12-month electricity consumption.

COST STRUCTURE

The subscriber pays EEA the retail rate for electricity consumed plus fixed monthly charges. Fixed charges include a grid access charge. The 2017 residential retail rate is $0.096/kWh and the fixed monthly charge is $32.

Electricity generated by the solar array is metered behind EEA's office meter. In return, EEA provides a solar credit to subscribers for the electricity produced by their panels. This credit is currently equal to $0.072/kWh and will increase as EEA's residential rates increase. Subscribers will pay EEA a solar payment of $0.024/kWh, which is based on solar energy generated by the subscriber's panels and will remain fixed for the life of the contract.

On average, EEA's project is expected to save subscribers approximately $485 each year. Assuming average annual electric costs of $1,000, this community solar garden, when combined with potential cost reductions of $200 achieved through CEO's WAP, could reduce low-income subscribers' annual energy costs by approximately 69%.

EEA'S NEXT STEPS

Unless another grant becomes available, EEA has no plans to pursue another low-income community solar garden. While EEA believes that many of its members support renewable energy, a new renewable energy system could increase electricity costs and they do not believe that their members are willing to pay for it.

Subscriber Spotlight: Lloyd Gallion

Lloyd Gallion, an EEA community solar garden subscriber, lives with his family on a fixed income. He came across a brochure for EEA's community solar program and participated in a GRID/EEA sponsored outreach workshop.

"We are on social security. We didn't know how we would make it through this winter. This [program] was the answer." – Lloyd Gallion, subscriber

Though it was difficult for Lloyd to believe that the program would play out as intended he signed up and encouraged his friend to sign up as well. He could not be happier. Lloyd is saving money, relying on solar energy to power his home, and enjoying the fruits of his labor. As a subscriber to the system, Lloyd spent two rainy days installing panels alongside GRID staff, EEA staff, and fellow volunteers as part of GRID's barn-raising model, which uses volunteer labor to help install the systems.

Estimated Versus Actual Performance

In the past, Lloyd's household used 6,526 kWh and spent $1,030 per year on electric bills. To offset usage, Lloyd's household was allocated 3.6 kW of solar energy.

Lloyd's solar system performance has exceeded expectations. The solar system was expected to offset 97% of his usage and save 45% of his costs annually. Lloyd's own analysis of utility bills shows that the expected values match initial predictions.

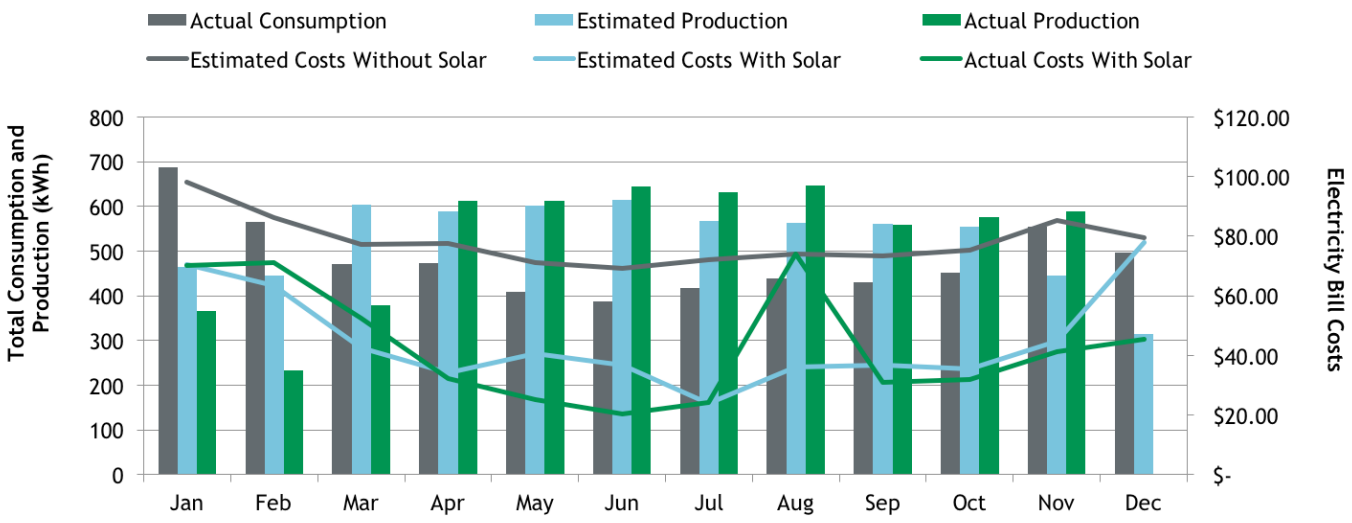
"This time of year our bills would be right around $100. [The solar garden] cut our bills down to $47 last month." – Lloyd Gallion, subscriber

EEA's data verifies that the system is performing above and beyond expectations: to date, Lloyd's usage was offset 101% and he saved 45% of his electricity costs.

Even though Lloyd's usage has been offset by more than 100%, his costs will never be fully offset. Subscribers are required to pay a solar payment of $0.024/kWh and fixed charges of approximately $32, which include a grid access charge.

For example, Lloyd's average annual consumption is 6,526 kWh and he spends on average $1,030. If his system were to produce 100% of his usage at 6,526 kWh, Lloyd will be required to pay an annual solar payment of $157 (6,526 kWh at $0.024/kWh) and 12 monthly charges of $384 (12 months at $32 each month) for a total annual payment of $541. In this example, the most that Lloyd could save would be 47%.

FIGURE 3: ESTIMATED VERSUS ACTUAL SYSTEM PRODUCTION FOR LLOYD GALLION



Lessons Learned

SUCCESSES

- The low-income solar garden was easily interconnected with EEA's existing garden.
- This project had low risk since there was no capital cost and very low on-going costs.
- There were few O&M requirements.
- The time from approval to interconnection was relatively quick (6 months).
- The garden was fully subscribed within one month.
- The subscribers had fun!
- Both the community and students were involved.
- The solar garden's production and savings exceeded expectations.
- When coupled with WAP savings, this project has the potential to reduce energy costs by approximately 70%.

CHALLENGES

- Many potential subscribers were skeptical.
- The garden's size was limited by available space.
- EEA was not willing to contribute funds and they will only pursue another project if they receive funding.
- A lot of residents could benefit from this program; however, participation is limited to seven subscribers.
- If "behind-the-meter" is not pursued, future gardens will be limited by Tri-State's 5% member-owned energy generation cap.

BEST PRACTICES

EEA's case study provides insight on how to optimize future low-income community solar garden projects.

Design effective outreach. Consider the subscriber's perspective and conduct in-person outreach when possible. Outreach by word of mouth is a strong endorsement.

Promote transparency. Build subscriber trust through transparency and talk about the funding providers. Address skepticism by talking about common fears. If an organization(s) is making money or losing money on this project – talk about it.

For small gardens, consider a "behind-the-meter" installation and net-metering. The "behind-the-meter" approach avoided Tri-State's 5% member-owned energy generation cap and enabled retail net metering. A net metering structure can simplify billing and interconnection.

Focus on serving the low-income segment when marketing to the Board of Directors. The utility's Board of Directors may be motivated to support low-income members.

Connect the panels to an existing solar array. An expansion of an existing array does not result in additional permitting. However, the system is still subject to normal electric permits.

If space allows, size the system based on the number of subscribers. Size the system based on the potential number of subscribers and their collective electricity needs.

POLICY CONSIDERATIONS

Lessons learned from the EEA community solar garden present the following policy considerations.

Fixed charges play a significant role in the potential for reducing energy costs. Community solar incentives are typically provided as bill credits – credits on utility bills – and are issued as a dollar per kWh amount at a value less than retail rates. Fixed charges are not affected. While a subscriber's bill will be reduced by the bill credit amount, the subscriber will always be responsible for paying fixed charges. The degree to which a subscriber's energy costs are reduced is a direct function of the amount of fixed charges relative to the cost of electricity. In the EEA's solar model, subscribers will be responsible for paying approximately 50% of the bill even when total electricity consumption is 100% offset by community solar.

Community solar can leverage stranded solar assets. EEA had a community solar garden in place that was not fully utilized by co-op members. CEO's grant leveraged the stranded asset and made it useful to the low-income community.

Wholesale power purchase agreements affect a co-operative utility's ability to offer community solar. Where and how a co-operative utility purchases its power can greatly affect its ability to provide community solar. EEA's solar garden was installed "behind-the-meter" and was net metered, which both simplified the process and avoided financial transactions with Tri-State and Tri-State's 5% member-owned energy generation cap.

The solar payment structure affects subscriber's total cost savings. The amount that each subscriber pays to participate in community solar and associated escalation rates affect the subscriber's total savings. EEA solar payments do not escalate even though electricity costs do. Therefore, bill credits will grow over time and the subscriber's savings will stay relatively the same or slightly increase.

Project Snapshot

QUICK STATISTICS

- 26 kW solar garden, including 5 kW from an existing array and 21 kW from the new array
- Merged with existing 5 kW stranded solar asset
- Maximum 7 subscribers
- 100% subscribed with waiting list
- All subscribers are eligible for WAP

UTILITY TYPE

- Rural electric co-operative
- Serves 12,000 members in Montezuma, Dolores , and San Miguel Counties
- Receives wholesale electricity from Tri-State Generation and Transmission, Inc.

ENERGY BURDEN

- Approximately 19% of Montezuma County, 15% of Dolores County, and 11% of San Miguel County residents live below the poverty line, compared to a statewide average of 12%.
- For those living at 50% of the poverty line, Montezuma County residents have an energy burden of 25%, Dolores County residents have an energy burden of 27%, and San Miguel County residents have an energy burden of 26%.

PROJECT GOALS

1. Provide benefit to low-income members
2. Leverage financial investment from CEO

PROJECT PERFORMANCE

- Project target is approximately 50% cost savings
- Expected to produce 37,499 kWh annually
- To date, the system has produced 11% more electricity than expected

PROJECT COSTS

- Total project cost $78,750
- CEO grant $78,750
- EEA leveraged funds $32,677

SUBSCRIBER PAYMENT STRUCTURE

- Costs and credits for 2017:
  - Retail rate $0.096/kWh
  - Monthly fixed charges ~$33
  - Solar credit rate $0.072/kWh
  - Subscriber solar payment $0.024/kWh

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