

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

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COLORADO
Energy Office

Project Details

Delta-Montrose Electric Association's Demonstration Project Highlights

- When built in 2016, DMEA's low-income community solar garden was the largest of its kind in the country.
- DMEA's Board of Directors was motivated to create a local and resilient energy source for low-income members.
- On average, subscribers will realize annual cost savings of \$312, and when combined with average cost savings of \$200 from CEO's weatherization assistance program, subscribers could see annual savings of \$512

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, additional opportunities remain to achieve deeper cost savings by specifically targeting reductions in electricity costs.

The Colorado Energy Office's (CEO) Weatherization Assistance Program is dedicated to improving energy affordability for low-income households. Guided by this commitment and in response to a gap in electricity cost reduction programs, CEO launched the Low-Income Community Solar Demonstration Initiative in 2015. The Delta-Montrose Electric Association (DMEA) demonstration project is part of the 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 Delta-Montrose Electric Association, a rural electric co-operative utility serving Montrose, Delta, and Gunnison counties. This case study describes DMEA's community solar project and informs utilities, governments, and policy makers how community solar projects can impact low-income communities.

PROJECT PARTNER ROLES

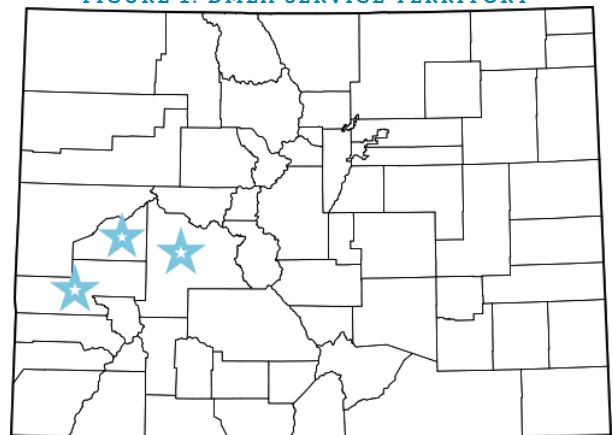
DMEA partnered with CEO and GRID Alternatives (GRID) to develop a 151 (kilowatt) kW community solar array. The primary goal of the project was to provide a local and resilient energy source for up to 43 low-income co-operative members.

Each partner played a key role:

- CEO identified the demonstration project opportunity and provided funding support and project evaluation.

- GRID developed the design and implementation framework, designed and led the installation of a new 151 kW system, provided workforce integration and outreach, and managed subscriptions. In addition, GRID will conduct primary operation and maintenance (O&M) activities and maintain equipment warranties.
- DMEA provided funding support, provided the land and interconnection, and conducted outreach. In addition, DMEA will provide bill credits and billing support, maintain full ownership, and support O&M.

FIGURE 1: DMEA SERVICE TERRITORY



PROJECT IMPLEMENTATION

The project was first introduced to DMEA's Board of Directors in January 2016. It was approved because of its benefit to low-income members and its synergy with member values, including support for renewable energy and energy independence. The solar garden was interconnected with DMEA's grid in September 2016. The first subscriber signed up in November 2016, with 100% subscription achieved within one month. Subscribers began seeing cost savings in December 2016.

To qualify, subscribers must earn less than 80% of HUD's area median income (AMI). DMEA may refer subscribers and deny subscriptions due to poor credit history, history

of unpaid bills, and/or illegal activity. DMEA has committed to providing subscriptions for 20 years, with individual subscriptions lasting five 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 DMEA. The panels were installed adjacent to DMEA’s headquarters on land owned by DMEA, and the community solar production meter was interconnected directly to DMEA’s electric grid. As an electric utility generation plant, DMEA’s income qualified community solar garden was exempt from the State Electrical Board’s regulations on solar generation; therefore, no state electrical permit was required. The meter was interconnected to DMEA’s electric grid because the array was too far from the building, and the extensive trenching and infrastructure changes proved to be too costly to net meter the array at DMEA’s headquarters building on site.



ENERGY GENERATION

Much of DMEA’s staff had little to no experience operating and maintaining renewable energy systems. DMEA trained staff and helped them understand their new role as a generation utility and the additional responsibilities that come with that role, such as advanced billing.

“Even with a diverse staff, we needed a perspective change.

We need to get familiar with being a generation and transmission utility.” Jim Heneghan, DMEA’s Renewable Energy Engineer

DMEA entered into a contractual relationship with DMEA’s wholesale electricity provider, Tri-State Generation and Transmission Association, Inc. (Tri-State). Tri-State’s Board of Directors’ renewable energy policies 115 and 117 govern the contractual agreement between DMEA and Tri-State. Policy 115 governs the terms under which DMEA can develop “self-generation” and lists the bill credit rates paid by Tri-State to

DMEA for the electricity generated by the community solar array and put on to the electric grid. Tri-State will provide bill credits to DMEA for the life of the five-year Policy 115 contract (which presumably will be renewed during DMEA’s 20-year contract with GRID) and then will bill DMEA for the electricity produced by the community solar array. DMEA’s wholesale electric contract also limits co-operative owned electricity generation system sizes to no more than 5% of the co-operative’s total load.

Policy 117 lists the Renewable Energy Credit (REC) amount paid by Tri-State to DMEA for the environmental attributes (e.g. avoided greenhouse gas emissions) generated by the community solar array. Tri-State will purchase and retain ownership of the RECs throughout the five-year term of the Policy 117 contract. Tri-State will apply the RECs to their state Renewable Portfolio Standard requirements in which Tri-State is required by Senate Bill 13-252 to generate 20% of their electricity from renewable energy sources by 2020.

PROJECT COSTS

According to Jim Heneghan, DMEA’s Renewable Energy Engineer, the project was completed at a lower cost than other solar projects presented to the utility. Yet, DMEA partially subsidized the project since they were required to pay wholesale electricity costs to Tri-State and substantial interconnection fees.

Tri-State’s renewable energy policies require DMEA to pay Tri-State for electricity consumed by its members even though that consumption is offset by the community solar project. Interconnection costs were high because DMEA used a transformer with voltage control and incorporated Tri-State’s specific metering equipment.

“The biggest hurdle was getting to a point where the cost to the utility and the benefit to the participant were both manageable.” Jim Heneghan, DMEA’s Renewable Energy Engineer

CEO’s grant was essential to making this project happen. Without CEO investment, DMEA would have had to extend the length of their internal loan or provide fewer savings to subscribers, which would have forced them to miss their target of 50% cost savings.

DMEA borrowed its contribution from an internal loan, and will repay the loan using money received from the subscriber’s solar payment over the next 20 years.

The project cost \$315,900, with \$180,000 covered by CEO’s grant and \$135,900 contributed by DMEA. 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. DMEA provided in-kind support including billing software, ongoing program administration, and the donation of land.

The total cost per watt was slightly lower than CEO's other low-income community solar demonstration projects since the array was larger than most other projects, which optimized economies of scale.

“The biggest advantage of most renewable energy sources is that it has high capital costs but low operating costs.” - Jim Heneghan, DMEA's Renewable Energy Engineer

PROJECT PRODUCTION

The estimated annual kilowatt hour (kWh) production of the solar garden was modeled using PVSystem, and the system's long-term degradation was assumed to equal 0.7% per year. In Year 1, the system is expected to produce 243,128 kWh. Actual production data from October 2016 through April 2017 shows that the system produced 127,650 kWh, while estimated production during that same period was 129,045.5 kWh. During this timeframe, the system produced 1% less electricity than expected. (Note: solar radiation was well below average during portions of December 2016 and January 2017.)

PROJECT OUTREACH

DMEA 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. Both DMEA and subscribers reported successful outreach.

SUBSCRIBER STATISTICS

The 151 kW solar garden serves 43 subscribers, with each utilizing varying amounts of solar energy from the garden. System sizes range from 2.4 kW to 4.8 kW, with an average system size of 3.6 kW. Subscribers have a five-year contract with DMEA, and subscription contracts can be renewed. Systems are sized to offset approximately 50% of subscribers' electricity costs, based on the subscribers' previous 12-month electricity consumption.

COST STRUCTURE

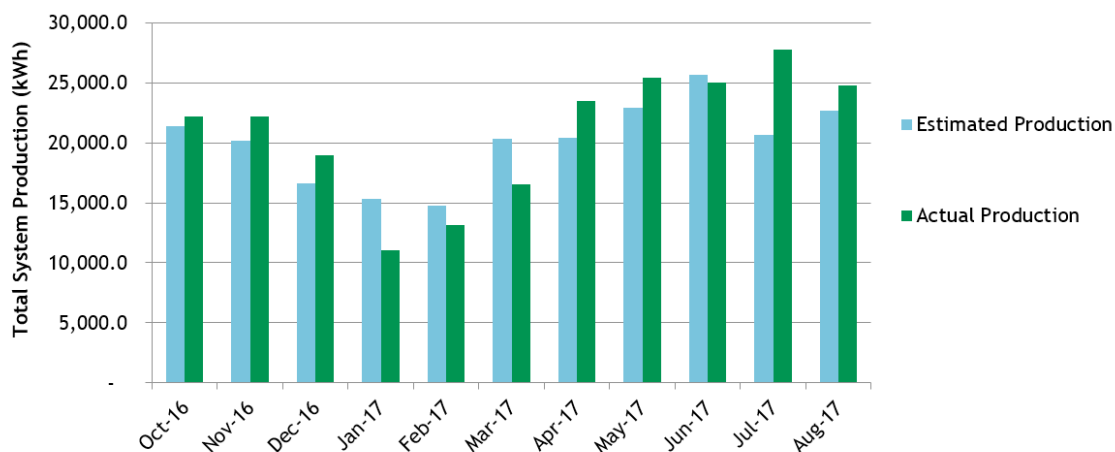
The subscriber pays DMEA the retail rate for electricity consumed plus fixed monthly charges. In return, DMEA provides a bill credit to subscribers for the electricity produced by their panels.

The 2017 residential retail rate is \$0.1045/kWh. Fixed charges include a monthly base charge, taxes, and a franchise fee (the franchise fee only applies to DMEA Members who live in municipal areas that implement a franchise fee). The total fixed charges are approximately \$32, whereas the monthly base charge is \$25 and other fees are \$7.

The bill credit is equal to \$0.0645/kWh and will increase as DMEA's residential rates increase. DMEA set the solar credit at a value slightly higher than what it receives as a bill credit from Tri-State; however, Tri-State's bill credit rate will increase over the five-year contract term and will be close to the solar credit that DMEA offers to its subscribers.

The difference between the retail rate and the bill credit is the solar payment, which DMEA will collect to pay off its internal loan. In 2017, it is set at \$0.04/kWh and will remain fixed for the term of the contract. The solar payment was set at a rate that would allow DMEA to repay its loan at 0% interest over a 20-year loan term. For subscribers, a constant and known solar payment provides insulation against rising electricity costs and helps subscribers budget for long-term energy costs.

FIGURE 2: ESTIMATED VERSUS ACTUAL SYSTEM PRODUCTION



“One of the greatest aspects of this program is locking in [electric] rates. The cost of electricity will be fixed even with inflation.” Jim Heneghan, DMEA’s Renewable Energy Engineer

On average, DMEA’s project is expected to save each subscriber approximately \$312 each year. Assuming average annual electric utility costs of \$1,250, based on DMEA’s historic data, the community solar garden, when combined with potential cost reductions of \$200 achieved

through CEO’s weatherization assistance program, could reduce low-income subscribers’ annual energy costs by approximately 41%.

DMEA’S NEXT STEPS

Since DMEA’s renewable energy growth is restricted by Tri-State’s 5% co-operative-owned generation cap, and they are operating the community solar project at a loss, DMEA is not sure if they can or will pursue additional community solar projects. However, they are open to additional projects if the economics are favorable and the project could be exempt from Tri-State’s generation cap.



Subscriber Spotlight: Steve and Sue Sidebottom

Steve and Sue Sidebottom were hit hard with the 2008 Recession and were looking for ways to save money. They signed up for DMEA's program November 2016, and expect to save 30% to 50% of electricity costs each year.

"It is a big thing to know what our bill costs will be for the next few years. It helps us with budgeting." Steve Sidebottom, subscriber

Renewable energy has always been of interest. Yet, Steve was concerned with ongoing maintenance and siting challenges. A direct-owned rooftop system has always been too expensive.

Steve and Sue both attended workshops held by DMEA and GRID and volunteered at the solar installation event. Although outreach went smoothly, putting ink to paper was a bit more challenging. Steve and Sue noted that many were cautious of signing a new contract, and did not feel that outreach efforts adequately covered contractual requirements. However, they trusted DMEA and, therefore, put their trust in DMEA's community solar project.

"Once we signed up, it was easy. It was streamlined, and we had good customer service and good response time. DMEA was fabulous." - Sue Sidebottom, subscriber

They noted that getting the word out in person or via newspapers or bill inserts was essential. Many of the members are older and do not use electronic devices and high-speed Internet is limited.

Estimated Versus Actual Performance

In the past 12 months, the Sidebottoms' household used 11,233 kWh and spent \$1,460 on electric bills. To offset



usage, the household was allocated 4.8 kW of solar energy. The solar system was expected to offset 64% of their usage and save 31% of their costs annually.

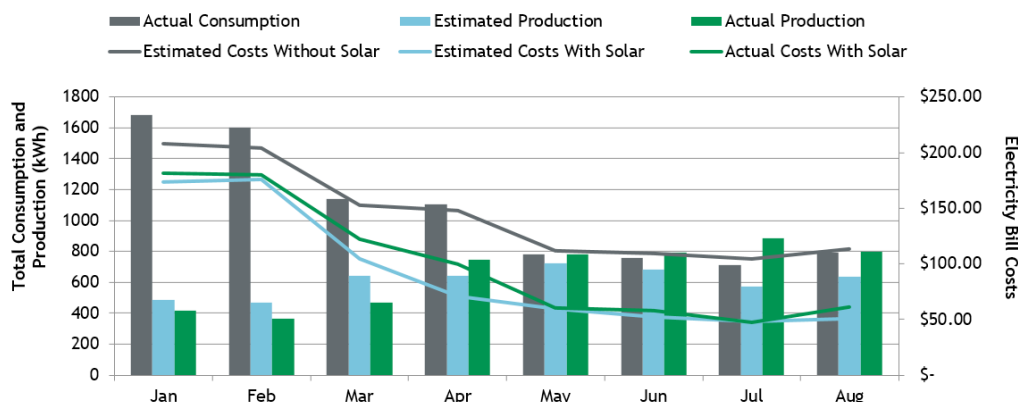
To date, the solar systems offset the Sidebottoms' usage by 61% and saved 31% of their electricity costs.

Utility data show that the Sidebottoms' consumption to date was slightly higher (around 1%) than it was during the same time last year, and their solar allocation produced 8% more electricity than expected to date.

Even if the solar array produces more electricity, subscriber costs will never be fully offset. Subscribers are required to pay a solar payment of \$0.04/kWh and fixed charges of approximately \$25, which include a monthly base charge.

For example, the Sidebottoms' average annual consumption is 11,233 kWh and they spend on average \$1,460. If their system were to produce 100% of their usage at 11,233 kWh, the Sidebottoms will be required to pay an annual solar payment of \$449 (11,233 kWh at \$0.04/kWh) and 12 monthly charges of \$300 (12 months at \$25 each month) for a total annual payment of \$749. In this example, the most that the Sidebottoms could save would be 49%.

FIGURE 3: ESTIMATED VERSUS ACTUAL SYSTEM PRODUCTION FOR THE SIDEBOTTOMS





Lessons Learned

SUCCESES

- When it was built in 2016, this project was the largest community solar garden completely dedicated to low-income households in the country.
- The project has low operating costs and minimal O&M.
- The project aligned with DMEA's core values.
- Subscriber electricity costs were reduced.
- The project provided much needed renewable energy experience to DMEA staff members.
- Lower electricity costs will help reduce the number of non-payments that DMEA will receive.
- GRID's solar price was less than other solar models that were presented to DMEA.
- When coupled with CEO's weatherization assistance program savings, this project has the potential to reduce energy costs by approximately 51%.
- DMEA will use subscriber solar payments to pay back their internal loan.

CHALLENGES

- The project had a high capital cost.
- The biggest financial burden was the interconnection costs.
- As a Tri-State member, DMEA is limited by the 5% member-owned energy generation cap.
- Even with the CEO grant and GRID's support, it was difficult for DMEA to provide maximum benefit to subscribers while balancing utility costs.
- DMEA's staff had a lack of experience with installing renewable energy systems.
- It was difficult to set up new billing practices.

BEST PRACTICES

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

Install the array on utility-owned land. Installing the array on land owned by the utility and adjacent to utility headquarters can simplify interconnection and help to save costs. Land that allows for a three-phase system will add system flexibility.

Focus on the benefits to the utility when marketing the project to the utility's Board of Directors. Utilities are more likely not to receive electricity bill payments from low-income households than from non-low-income households, and they may have to turn off electricity service as a result. This results in high administration costs and negative public relations. Reducing electricity costs for low-income households can reduce the number of non-payments received by the utility company, thereby reducing administration burden and avoiding negative public relations.

Consider in-person outreach methods. Many income-qualified households are older and may not have access to electronic outreach methods. Traditional outreach conducted through in-person workshops, newspaper announcements, and bill inserts may be more accessible to potential subscribers.

Research billing software in advance. New software, such as software that calculates and administers solar credits, may be difficult to master at first. Spend time researching software and training staff up front.

Educate utility staff about renewable energy generation, transmission, and distribution practices. Utility staff members may be new to renewable energy systems, and it is important that staff become familiar with new procedures and practices prior to administering a new community solar program.

Consider developing an internal loan program to finance a community solar project. If funds are not available, consider borrowing from internal reserves to develop and maintain a community solar project. The utility can pay back the internal load with solar payments provided by the subscribers.

POLICY CONSIDERATIONS

Lessons learned from the DMEA 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 DMEA'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.

Lessons Learned

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. DMEA was limited in its ability to offer more community solar and to manage operating costs because of Tri-State's Board of Directors' renewable energy policies 115 and 117, which limit self-generation to 5% of total consumption and require that DMEA pay for the electricity consumed by its members that is offset by solar. In addition, Tri-State's renewable energy policies prohibit the community solar array from offsetting peak demand charges. If Tri-State had accepted peak demand offsets from DMEA, DMEA could have realized an additional few thousand dollars of savings each year.

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. DMEA solar payments do not escalate even though electricity costs do. Therefore, solar credits will grow over time and the subscriber's savings will stay relatively the same or slightly increase.



Project Snapshot

QUICK STATISTICS

- 151 kW solar garden
- Maximum 43 subscribers
- 100% subscribed
- Largest LMI community solar garden project in the nation
- 53% of current subscribers have received CEO's weatherization services, while another 39% qualify
- Uses Tri-State Board of Director's Renewable Energy Policies 115 and 117

UTILITY TYPE

- Rural electric co-operative
- Serves 12,000 members in Montrose, Delta, and Gunnison counties
- Receives wholesale electricity from Tri-State Generation and Transmission, Inc.

ENERGY BURDEN

- Approximately 18% of Montrose County, 16% of Delta County, and 13% of Gunnison County residents live below the poverty line, compared to a statewide average of 12%.
- For those living at 50% of the poverty line, Montrose County residents have an energy burden of 23%, Delta County residents have an energy burden of 23%, and Gunnison County residents have an energy burden of 27%.

PROJECT GOALS

1. Reduce members' energy costs by approximately 50%
2. Provide a local, resilient electricity source
3. Provide locked-in energy prices
4. Provide renewable energy and diversify energy supply
5. Enable DMEA staff to get hands-on experience

PROJECT PERFORMANCE

- Project target is approximately 50% cost savings
- Expected to produce 243,128 kWh annually
- Within four months, the system has produced 1% less electricity than expected

PROJECT COSTS

- Total project cost \$315,900
- CEO grant \$180,000
- DMEA contribution \$135,900 plus in-kind support

SUBSCRIBER PAYMENT STRUCTURE

- Costs and credits for 2017:
 - Retail rate \$0.1045/kWh
 - Monthly fixed charges ~\$32
 - Solar credit rate \$0.0645/kWh
 - Subscriber solar payment \$0.04/kWh

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