GARFIELD CLEAN ENERGY Challenge!

Case Study: Garfield County Riding Arena, Rifle

By CLEER Staff

Efficiency, Energy Management, and On-site Solar Turn Garfield County Building into Net Energy Producer

The Garfield County riding arena, a 39,000-square-foot facility in Rifle, is showing how a combination of feedback on energy use, energy efficient technology, and on-site renewables can turn a large public building into a "net" electricity producer—meaning it produces more electricity than it uses—while saving local taxpayers a considerable amount of money.

Last spring, Garfield Clean Energy, CLEER, and SoL Energy, worked with county staff for the installation of a 440-panel roof-top solar-electric system, financed through a power purchase agreement. The project was partially funded by the Colorado Department of Local Affairs (DOLA) New Energy Communities Initiative grant. The solar was originally predicted to generate 57 percent of the electricity the building uses.

As part of the solar installation, the building was connected to the Garfield Energy Navigator, which provides data on both the solar panels' performance and the building's energy use in 24-hour increments. The Navigator showed that the building was using a great deal of energy at night and on the weekends. Staffers started shutting down the building during those times, and quickly saw the results. Even when they thought everything was shut down, the Navigator would show unexpected energy use, and staffers would look for additional ways to trim building energy use.

Then, in November 2011, also through the DOLA grant, CLEER worked with Garfield County staff to replace the riding arena lights with more efficient technology, cutting the arena's typical December usage from 22,000 kilowatt-hours to 6,000 kilowatt-hours (a typical U.S. home uses about 1,000 kilowatt-hours a month).

Above: Installers putting panels on the riding arena in early 2011. Photo by Jen Sanborn

These combined efforts—smart actions on the part of building managers through quick access to data, more efficient technology, and a power purchase agreement–financed solar system—mean that the building is now a mini power station,

The Upgrades

- 102 kilowatt solar-electric array on roof
- Replaced old lighting with more efficient lighting
- Active Energy Management helped facility managers cut considerable energy use
- **$700 a month savings on electricity during winter 2012**

Lessons Learned

- The most effective reductions in energy use come from combinations of tactics
- Power purchase agreement helped make the solar-electric array affordable

putting electricity back into the grid and saving the county dollars in the process.

Recent utility bills show that in December 2011 the arena saw a roughly 72 percent reduction in electricity consumption over December 2008, December 2009, and December 2010. According to utility data, cost savings in December 2011 were $778 (or 54 percent less than prior years) thanks to both the energy efficient lighting and lower-cost electricity, a result of the power purchase agreement.

Above: Attendees at the May 5, 2012 Encana Energy Expo enjoy the upgraded lighting in the riding arena. Photo by Cam Burns

At a recent Board of County Commissioners meeting, commissioners expressed their satisfaction with the project, and said they would entertain more projects like this—especially since the project required no upfront investment from the county and guaranteed energy and cost savings.

> *"By replacing aging lighting with new fixtures last fall, the facility cut nearly 16,000 kilowatt hours out of the arena's typical usage during December"*
>
> *— Rob Morey, CLEER*

"Through Garfield Clean Energy programs we've been able help hundreds of businesses, homes, and public buildings throughout the county with energy-saving projects," noted Greg Russi, Garfield Clean Energy Collaborative chairman. "We're finding that these energy-saving projects are a powerful way to help businesses, governments, and households save money and strengthen the economy at the same time."

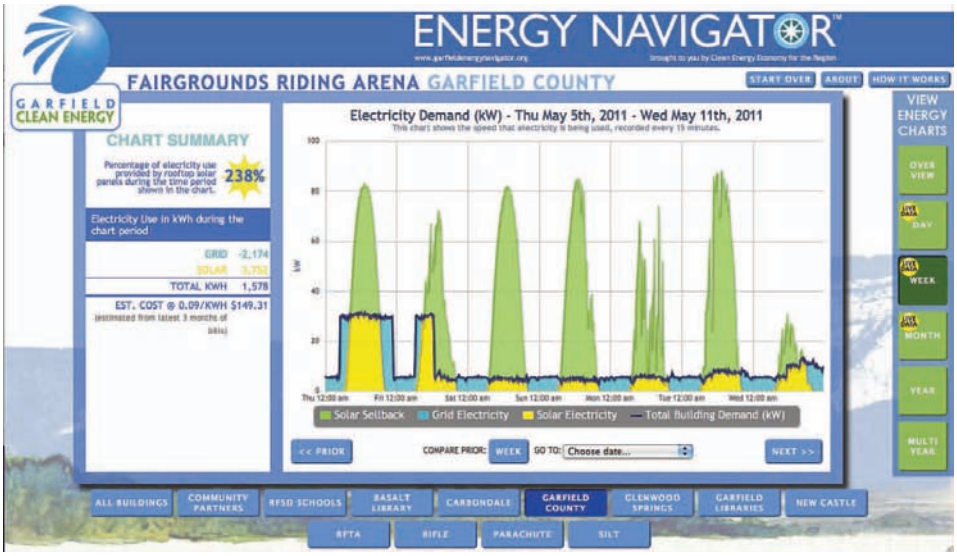
"Because the building is equipped with the solar array, these savings in energy use mean that the solar panels installed in spring 2011 covered 106 percent of the building's electricity needs in November, 117 percent in December and 108 percent in January 2012, with the excess put back onto the grid and credited to Garfield County's electricity bills," said Michael Ogburn, Energy Engineer for CLEER. "In monetary terms, the combination of a lighting retrofit and the solar power purchase agreement brought the electricity bills down to approximately $700 per month this winter compared to approximately $1,400 per month in prior winters." These combined numbers mean that the building should be producing more electricity than it consumes throughout the year, making it one of the first "net-zero electricity" riding arenas.

Detailed background on the three efforts that resulted in a net-zero electricity building (i.e., renewables, smart energy management, and better lighting technology):

1. Roof-top renewables: The riding arena's solar-electric system was made possible through a power purchase agreement, put together by CLEER (Clean Energy Economy for the Region), and Garfield County. In a power purchase agreement, the user (Garfield County) agrees to have a solar system owned by a third party financier (Rockwell Energy) set up on the user's roof or land, and the user agrees to buy power from the system at a fixed rate for a period of time (Rockwell Energy received state and federal grants to cover the cost of the system).

Power purchase agreements are a mechanism that—in practice—are being used by non-tax-paying entities (e.g., non-profits and governments), and with bigger solar systems.

By using a PPA, the non-tax-paying entity allows the third-party financier to benefit from rebates, renewable energy credits (RECs), and the 30 percent tax credit available to them. In return, the PPA provider charges a cheaper rate for electricity for the non-tax-paying entity than it would be paying the local utility. Garfield County agreed to buy power from the $385,000 solar-electric system for twenty years. The new riding arena installation is the largest power purchase agreement in the county to date. The 440 modules were initially expected to produce about 140,000 kilowatt-hours per year, which would be about 57 percent of historical energy use of the building; in its first month of operation, the system actually produced 62 percent of the building's electricity needs.



Riding arena staff used "Active Energy Management" to cut energy use by 80 percent on days when the facility was not in use. This screen shot shows the week of May 5–11, 2011.

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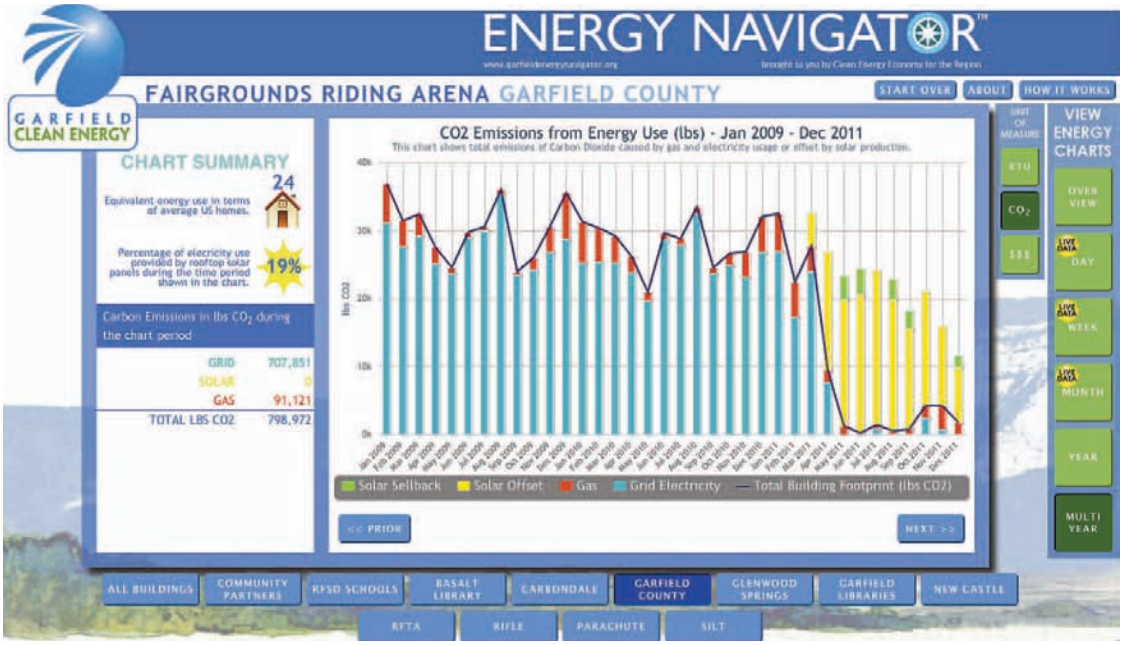
> *— Mike Ogburn, CLEER*

2. Active Energy Management: Garfield Clean Energy's Energy Navigator website (http://garfieldenergynavigator.org) allows the public and riding arena staff to view the solar array's energy production each day, as well as how much energy is being used by the building or being sold back onto the grid.

Working with CLEER, the facility staffers realized that they could run the facility more efficiently. Using simple "Active Energy Management" techniques, the staff identified times when they could turn off the facility's lights by disabling a time-clock. The staff was also able to use 15-minute electricity data to detect times when a facility user may have left the lights on all night; staff then took actions to prevent it from reoccurring. These simple steps allowed the staff to cut electricity use by 80 percent on days when the facility was not in use. As a result, the electricity for the facility was 100 percent solar powered most months in the summer of 2011.

3. Energy efficient lighting: In October 2011, Garfield Clean Energy helped Garfield County with a lighting retrofit. Lighting is the main electricity use in the riding arena, due to the intensive use of the large indoor arena. CLEER and Garfield County worked with Franklin Energy (contracted by Xcel Energy) to identify lighting that was outdated and inefficient. Old 400-watt high-intensity-discharge (HID) bulbs and ballasts were failing, and soon-to-be-discontinued T-12 fluorescent tubes

needed to be upgraded to longerlife, brighter lights with modern electronic ballasts. Garfield County hired One Source Lighting to replace 66 old fixtures with 57 new T-5 fluorescent fixtures. These fixtures use four high efficiency narrow fluorescent tubes each and are equipped with mirrored reflectors. Each fixture also has a built-in motion detector ("occupancy sensor") that turns the fixture off when the facility is unoccupied. Additionally, 13 exterior lights on the walls of the building were upgraded with ultra-long-life and super efficient LED bulbs.



Above: The Navigator showing the drop in emissions associated with electricity use at the arena. This screen shot shows January 2009 through December 2011

The new modern and efficient indoor lighting is equipped with built-in motion sensors that turn lights off when the facility is not in use. By combining an empowered facility staff, better bulbs, and automatic motion sensors, the facility cut its energy use 72 percent in December 2011 compared to the previous Decembers. The electricity saved by this combination meant that the riding arena building's electricity needs were more than 100 percent solar-powered during the winter months after the lighting upgrade, despite the shorter winter days, which reduce solar output.

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>
> *— Erica Sparhawk, CLEER*

Conclusion: Through this three-pronged approach to energy mangement, emissions associated with the operation of the Riding Arena have been drastically reduced. In fact, the excess solar energy now being generated may even be sufficient to offset the natural gas used to heat the building in the winter. The chart above shows the past 36 months of utility bill data and illustrates just how dramatic the changes in emissions from energy use at the Riding Arena are.

To see more information about these kinds of savings and to view daily electricity consumption data at the Riding Arena, visit www.garfieldenergynavigator.org. Other buildings throughout the county fairgrounds are also being upgraded with better bulbs and occupancy sensors, including offices, animal stalls, restrooms, exit signs, exterior lights, and maintenance garage areas. In total, more than 500 new high-efficiency light bulbs were installed throughout the fairgrounds.

Public buildings aren't the only buildings getting help in cutting their energy bills through Garfield Clean Energy. "To date, Garfield Clean Energy's Commercial and Residential Energy Challenge participants have invested over $1.2 million in upgrading commercial buildings and homes, generating local contractor jobs and keeping energy dollars in our local economy," said Erica Sparhawk, Program Manager at CLEER.

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