carbonlighthouse

better building, better planet, better bottom line

Morgan Hill Community Center

One Year Measurement and Verification Results

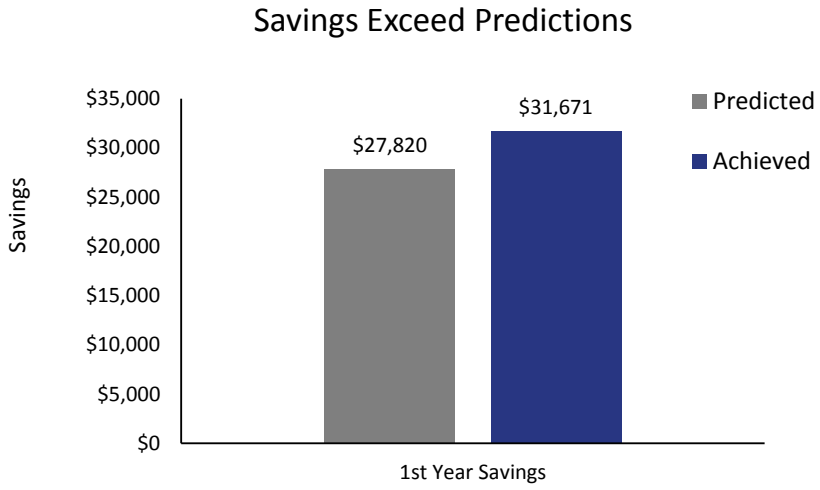
10/16/2015

ENERGY STAR PARTNER

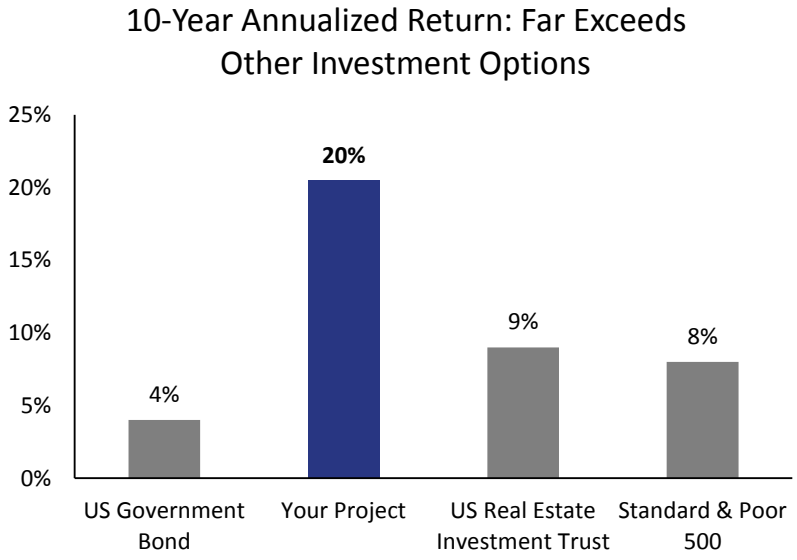
Green Buildings, Cost Savings - Delivered

To ensure Carbon Lighthouse achieved our goal of delivering profitable, environmentally beneficial energy projects, we conducted Measurement and Verification at Morgan Hill Community Center. We are delighted to report that over the past year Carbon Lighthouse saved the building $31,671. Morgan Hill Community Center is also carbon neutral - Carbon Lighthouse purchased carbon allowances to offset the remaining carbon footprint.

Highlights – Substantially Reduced Operating Costs

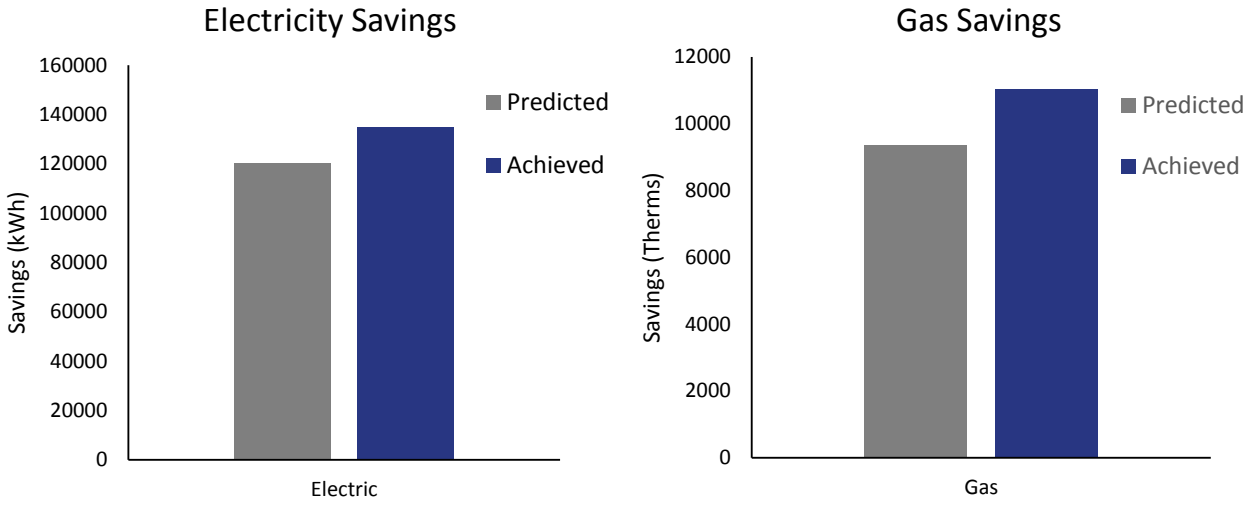


The project lifetime carbon savings are equivalent to avoiding 4,174,000 miles being driven by a typical passenger car



Prediction vs. Actual Outcome

As part of Carbon Lighthouse's verification services, actual savings are compared to predicted savings to ensure savings are as promised. The figure below shows the actual energy savings over the past year compared to Carbon Lighthouse's predictions. As can be seen, Carbon Lighthouse met and exceeded savings predictions for both natural gas and electricity usage



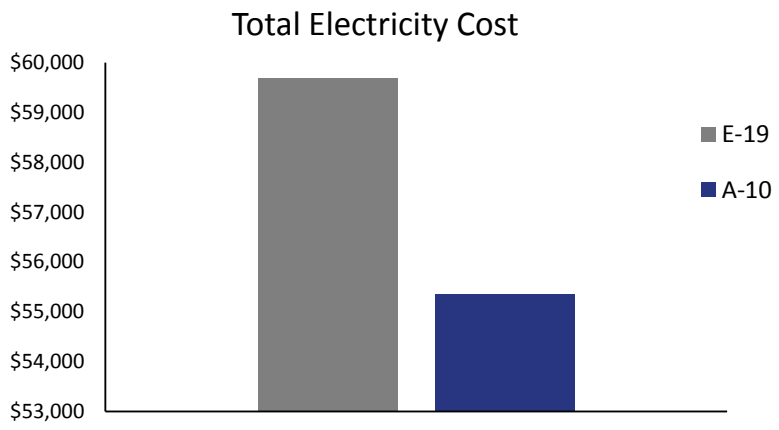
Measurement & Verification Methods

Carbon Lighthouse used a combination of information from the community center's building management system (BMS) and statistical analysis of 15-minute interval data, monthly bills, and local weather data to determine that the measures installed are still functional and quantify the weather-adjusted energy savings.

The statistical analysis confirmed that the community center's energy performance is exceeding predicted performance in both electricity and natural gas consumption. Additional analysis of the BMS confirmed that the control strategies implemented as part of the project have persisted, and data trends collected by the BMS show that energy efficiency measures are operating as intended.

Rate Switch Analysis

Carbon Lighthouse analyzed the most recent 12 months of utility consumption in order to determine whether the building is on the most appropriate rate schedule. Using 15-minute interval meter data, Carbon Lighthouse compared the time-of-use consumption over the past year with the E-19 rate schedule (the building's current rate) and the A-10 rate schedule. The analysis revealed that the previous year's utilities cost approximately $4,300 more on the E-19 rate schedule than they would have on the A-10 schedule. **Morgan Hill Community Center should switch to the A-10 rate schedule to reap these benefits in the years to come.**



Overview of Project and Outcomes

Carbon Lighthouse adopted a holistic approach to identify energy savings. Analytics uncovered savings in lighting, ventilation, heating and cooling. The project achieved substantive energy reductions through retrofits and new control strategies, without having to replace functioning systems with new, capital-intensive equipment.

The demand control ventilation strategy implemented at the community center epitomizes Carbon Lighthouse's approach to analytics and implementation. By collecting an abundance of data and understanding the community center's unique demands, we were able to install a system that only expends energy on ventilation, heating, and cooling when it is needed. This provided the flexibility to save energy and preserve tenant comfort, even with the irregular occupancy shedules the Morgan Hill Community Center sees.

Carbon Lighthouse worked with the onsite facilities staff to commission the system and address any issues that came up with the new systems during the year after installation. Through this process, we have been able to maintain occupant comfort while exceeding predicted energy savings.

Measurement & Verification - Selected Analysis

The demand control ventilation control strategy is a great example of a project measure behaving optimally. The behavior of the HVAC system serving the Poppy Jasper Room (VAV 1.6) is demonstrated below. This mode of operation has maintained occupant comfort while reducing the amount that unoccupied spaces are conditioned, one of the reasons the energy savings achieved has surpassed those predicted.

Figure 1: Occupancy periods for the space are highlighted by the yellow windows. This data is provided to the BMS via occupancy sensors that were installed as part of the project.

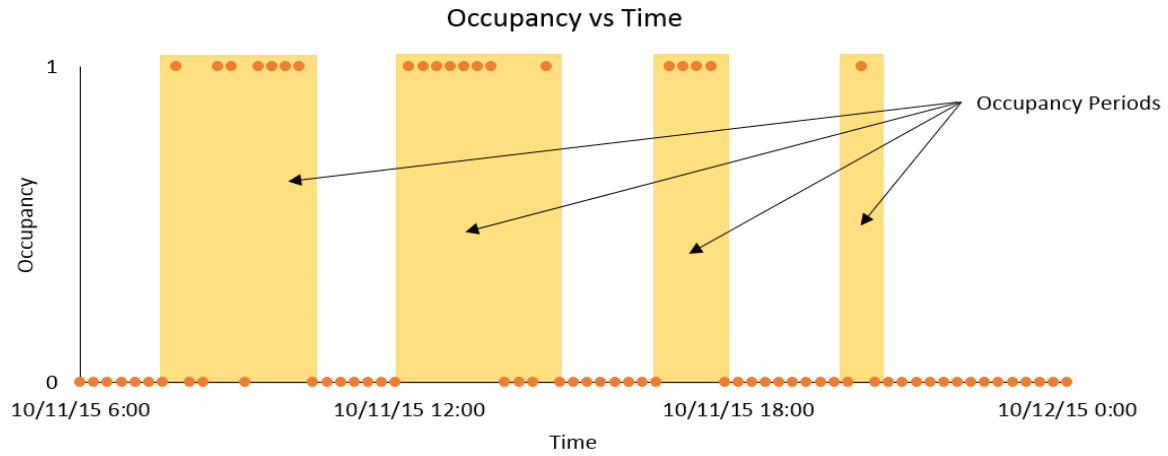


Figure 2: Zone air temperature data collected in the same space over the same period of time. Note the occupied heating and cooling setpoints. When the zone air temperature (shown in gray) is outside of the upper and lower setpoints, the space needs to be conditioned when it's occupied.

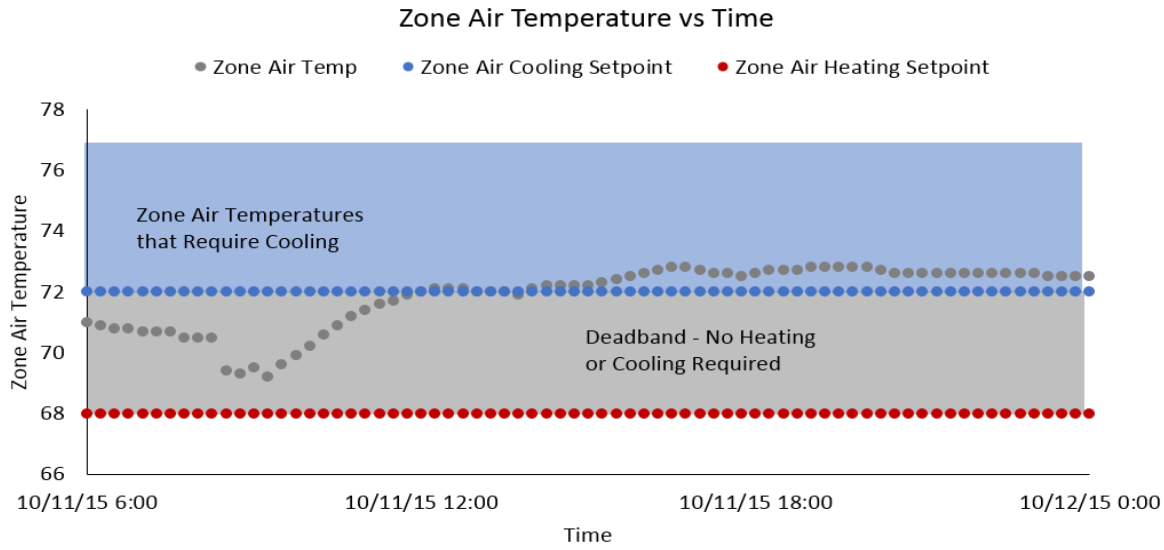


Figure 3: Superimposing the occupied periods over Zone Air Temperature (ZAT), we can see that that ZAT is only outside of the deadband three out of the four instances the zone is occupied this day. When the ZAT is within the deaband, there is still no reason for the HVAC system to start conditioning the space.

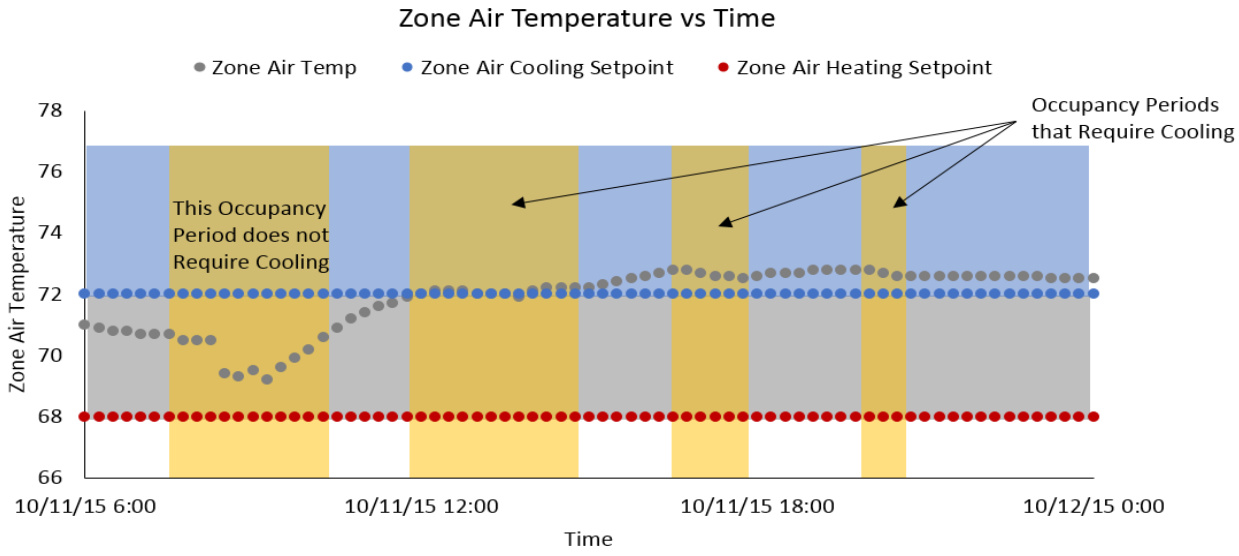


Figure 4: In the instances where the zone is occupied and the ZAT is above the cooling setpoint, we can see the VAV box damper has opened up, allowing conditioned air to enter the space. In the second, longest period of occupancy, it's clear the system is maintaining the 72 degree cooling setpoint. In the last two instances, the HVAC system is working to lower ZAT to the setpoint, which can be seen by the downward slope of the ZAT after the Airflow has turned on. Had the space remained occupied, one would see the ZAT continue to drop until reaching the setpoint at 72 and then remain constant.