

## The White Residence



### General Information

**Building:** Residential Home

**Location:** Eagle, CO

**Type:** Residential

**Size:** 2,500 sf

**Year Built:** 2006

**Year of Renovation Completion:**  
2021

**Project Team:**

*Engineer* - R&H Mechanical, Inc

*Contractor* - R&H Mechanical, Inc

*"I can't believe how quiet the HVAC system runs, and it's cool to see how much energy we produce at any given time."*

**-Homeowner**

### Project Goals

This home was initially a standard residential home, run on natural gas. The project began when the owners wanted to install a breezeway and a lock-off, then it grew to become an all-electric, net-zero project.

### Initial Analysis and Next Steps

The owner signed up for a home energy assessment to receive a rebate on his newly installed hyper heat cold climate heat pump. The previous gas boiler was 14 years old, indicating it was a good time for replacement, and the assessment detected a small amount of air leakage, so a few things needed to happen:

1. Convert the gas furnace to an all-electric the heat pump.
2. Install electric heating system for two new zones: the breezeway and lock-off.
3. Aeroseal the existing ductwork to address the conditioned air loss.
4. Insulate well to seal the building envelope.

Once these efficiency and electrification steps were completed, roof-top solar PV was added and final touches were made that helped the home achieve net-zero status.

### Project Results

#### *Efficiency Gains*

The house sees energy savings of **24%** each year as a result of the improvements made.

#### *Energy Costs*

Shifting the cost from natural gas to electricity and adding a solar system to offset energy use created utility cost savings of about **\$647 per year**.

The estimated Return on Investment for all improvements is 10-12 years.

### Total Project and Rebate Costs

Direct Install Costs	\$42,000
HCE + WMSC LED Rebates	(\$494.14)
HCE + WMSC Heat Pump Rebates	(\$7,675)
WMSC Insulation Rebate	(\$166.86)
WMSC Cellular Blinds Rebate	(\$500)
WMSC + HCE Solar Rebates	(\$3,775)
<b>Total Rebate Amount</b>	<b>\$12,500</b>
<b>Total Cost After Rebates</b>	<b>\$29,500</b>

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## Electrification Work Accomplished

Equipment	Notes
Mitsubishi Hyper Heat Solution Multi Position Air Handler, 4 ton, 3-zone	Has variable speed motor. Serves the main house
Mitsubishi 1.5 ton Heat Pump	Serves the lock-off
Branch box	Feeds main home and breezeway, serving two different units
Ceiling Cassette Unit	Provides different options for thermostats
Outdoor unit	Goes down to -13°F
Ducted system in lock-off	Well-insulated
Solar Panels on separate meter	11 KW System, LG panels
EV Ready	Solaredge
LED Lighting	Installed throughout the home



## Lessons Learned

- Wall brackets that are mounted on the outdoor unit were creating some vibrations, which needed to be addressed to reduce noise.
- Adding square footage with the lock-off and breezeway increased energy demand, but the home was still able to achieve net-zero status with solar.
- Backup electric heating is needed if temperatures go below -13°F. The home does not have a gas line, so this heat cannot be from a gas furnace or dual fuel system. Thus, a backup electric resistance system is necessary.
- R&H Mechanical volunteered work on this project, resulting in a lower-than-normal overall cost.