USGBC CA U.S. GREEN BUILDING COUNCIL CALIFORNIA | Climate Resolve | HARBOR COMMUNITY BENEFIT FOUNDATION | TECH CLEAN CALIFORNIA | LA DWP Los Angeles Department of Water & Power

Case Study: Heat Pump Water Heater and HVAC Retrofits for Single-family Affordable Housing

INTRODUCTION

USGBC California's (USGBC-CA's) Green Homes California initiative accelerates the decarbonization of single- and multifamily housing in communities on the frontlines of climate change by engaging owners and residents to deploy clean technologies.

Climate Resolve builds collaborations to champion equitable climate solutions. We connect communities, organizations and policymakers to address a global problem with local action. We inclusively develop practical initiatives that reduce climate pollution and prepare for climate impacts.

Under a Quick Start Grant from TECH Clean California, Climate Resolve and USGBC-CA implemented heat pump installations in the port-adjacent communities of Wilmington and San Pedro in Los Angeles. The retrofit projects generated data to identify key performance indicators ("KPIs") associated with building electrification to inform green financing strategies for energy efficiency projects. The goal was to quantify the effectiveness of heat pump retrofits in affordable housing and identify a measure and verification process that would be acceptable for use of green finance proceeds.

BACKGROUND

The property selected for this case study is a 3-bed/2-bath, 1,000-sq-ft single-family home built in 1947. The property is located in Wilmington, Los Angeles, CA, Climate Zone 6. USGBC California first engaged this property owner through a community outreach tabling event at a local farmers market in February 2024.

USGBC-CA first assessed the property to identify heat pump retrofit opportunities. The project team performed pre-electrification upgrades and installed a heat pump water heater to replace an aging gas tank water heater in April 2024, and decommissioned a gas gravity wall furnace and installed a mini split heat pump HVAC system in August 2024, both at no cost to the property owner.

IMPLEMENTATION



USGBC-CA first performed a physical survey of the property in February 2024. The property owner was an active participant throughout the project process and worked directly with USGBC-CA and the two selected contractors. Both heat pump installations qualified for TECH Clean California single-family equity incentives.

A new electrical panel (with expansion for future projects) was installed prior to the water heater retrofit. The HPWH was placed in a new, outdoor enclosure in the same location as the previous tank. The mini split heat pump HVAC was installed a mutually agreed upon location. A pad was installed in an open area of an outdoor planter to make the new outdoor unit appear less obtrusive. The inside unit was installed in a family room to optimize airflow to multiple areas of the home where the occupants spend most of their non-sleeping time, and the gas line of the old gas gravity wall furnace was capped.



Old panel



New 200-AMP panel

RESULTS

Completing these heat pump retrofit projects resulted in the following outcomes:

Systems installed:

Systems decommissioned	Heat pumps installed
GE SG40T12TXK00 40-gal. gas tank water heater	Bradford White RE2H65T10-1NCTT-CON heat pump water heater
Williams gas wall furnace (35GV-HA) for heating; No existing cooling	1-ton Mitsubishi MSZ-WR12NA mini split heat pump HVAC system
Pre-electrification work completed involved installing a 200-AMP panel, 30-AMP breaker, 240v line from subpanel, and 240v outlet.	

Occupant satisfaction: The property owner reported positive satisfaction with the performance of their new heat pumps and their participation in the program.

Energy and cost savings: Based on an assessment of pre- and post-installation utility data, electricity consumption increased while natural gas consumption decreased at the property after the retrofits were completed. When surveyed in October 2024, the property owner was not sure if the heat pump retrofits had impacted their household's utility costs.

Emissions reduction: Assuming an annual daily average of 4 hours of heating/3 cooling and 64 gallons of hot water, per a Department of Energy reference, retrofits at this property are estimated to mitigate **35,448 kg CO2e** over the lifetime of the heat pump equipment.

BEFORE & AFTER



Decommissioned gas water heater



New heat pump water heater



Decommissioned gas wall furnace



New mini split heat pump HVAC (outdoor unit)

Abatement cost: The abatement cost of performing both heat pump retrofits was **$0.55 / kgCO2e** when calculated at market rate without financial incentives applied, and **$0.27 / kgCO2e** with incentives applied.

LESSONS LEARNED

- Partnering with contractors who specialize in working with equity customers is key to overcoming barriers for deploying heat pumps in disadvantaged communities.
- Replacing gas wall furnaces with mini split HVAC systems is a cost effective way of mitigating greenhouse gas emissions.

CONCLUSION

Green Homes California piloted a replicable single-family engagement strategy to perform cost efficiency retrofits of space and water heating systems to all-electric heat pumps. Not only did these retrofits reduce emissions, they built awareness in the community around the benefit of electrification. USGBC-CA plans to continue to deploy heat pump technologies in homes, building on the lessons learned through this project.