

# Demonstration of a Residential Gas-fired Heat Pump Water Heater in California

## Case Study

**Site Description:** Single-family attached home to a family of four in Stanton, California

**Existing water heater:** 0.62 EF 40-gallon gas-fired storage water heater, located in the garage

**GHPWH water heater:** pre-commercial 65-gallon gas heat pump water heater with a 1.25 kW supplemental electric heating element to accommodate instances of extreme hot water demands

**Baseline water heating use:** average of 56 gal/day, with an estimated annual gas use of 195 therms/yr

**GHPWH water heater performance:** average of 50.6 gal/day, with an estimated annual gas use of 77 therms/yr and electric use of 433 kWh/yr

**Energy savings summary:** Estimated 53% annual energy savings compared to the baseline water heating system

On behalf of the California Energy Commission GTI led a demonstration and assessment of five residential gas heat pump water heaters (GHPWH) in the Los Angeles Basin. This case study focuses on a single installation to illustrate the performance and savings of the GHPWH and individual experience of these homeowners.

This home had an existing water heater with a rated efficiency of 0.62 EF and a measured delivered efficiency of 0.51 EF based on monitoring and verification. The pre-commercial GHPWH that replaced the existing water heater was a direct-fired ammonia-water, single-effect absorption cycle system integrated with a storage tank and heat recovery. The GHPWH was designed as a fully retrofittable unit with most common gas storage water heating systems, without the need for costly infrastructure upgrades. The unit had a 10,000 Btu/hr output with a firing rate of 6,300 Btu/hr. The unit was installed adjacent to the existing water heater, enabling a simple switch over to allow the existing water heater to run when the GHPWH was down for servicing. The units never operated in tandem.

The GHPWHs were monitored over a period of approximately 12 months, with some downtime to allow for adjustments and repairs. The estimated annual energy savings of gas and electricity combined totaled 53%. The homeowner indicated that the hot water supply was better with the GHPWH than their previous water heater and their overall experience with the GHPWH as moderately positive. They noted that the GHPWH was larger than their existing storage water heater. Although the unit is taller than a typical storage water heater, it does not require a stand. Without the stand, the units are of roughly equal height (see photo).

