

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

## Case Study

**Site Description:** Single-family detached home to a family of three in Huntington Beach, California

**Existing water heater:** 0.67 EF 40-gallon gas-fired PowerVent 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

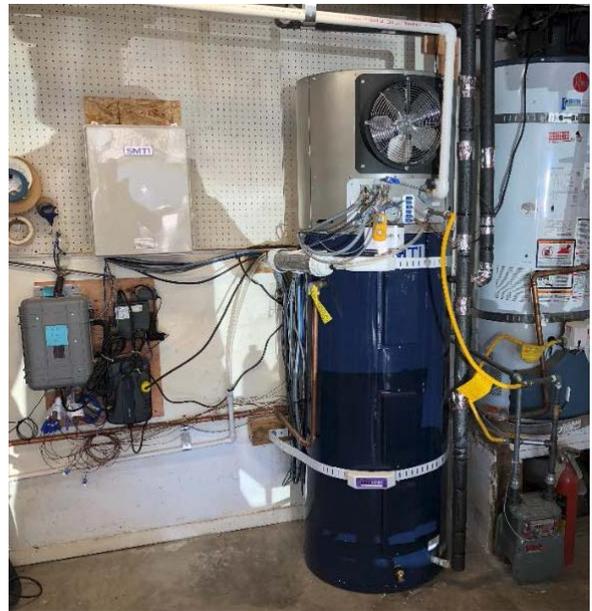
**Baseline water heating use:** average of 29.3 gal/day, with an estimated annual gas use of 78 therms/yr

**GHPWH water heater performance:** average of 28.5 gal/day, with an estimated annual gas use of 50 therms/yr and electric use of 299 kWh/yr

**Energy savings summary:** Estimated 36% annual natural gas 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 0.67 EF and a measured delivered efficiency of 0.47 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 totaled 36%. This modest savings mirrors the relatively modest hot water usage at the home, well under the average seen across the other homes in this study. 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 excellent.