

Heat Pump Water Heater

Elizabeth James House SEATTLE

BUILDING TYPE
multifamily
 affordable senior housing

SIZE
60 units
 1 bedroom apartments

COST PER UNIT
 \$2,711
 before incentives

RETROFIT
 2018

OWNER
 Community Roots Housing

ENGINEER
 Ecotope



TECHNOLOGY
 Sanden CO₂ Heat Pump Water Heater with Swing Tank

PERFORMANCE

Community Roots Housing provides housing for seniors and other vulnerable populations in our community. To reduce energy costs in Elizabeth James House Community Roots augmented a standard electric resistance water heater with a high performance heat pump system. A Sanden system was chosen for its use of environmentally friendly refrigerant (CO₂), improved energy efficiency, and the modular system's quiet compressors.

While it was believed the existing water heater would need to compensate during peak periods, the Heat Pump Water Heater (HPWH) system provides nearly 100% of the load with dramatic energy and bill savings. Even during periodic equipment issues, system efficiency was maintained – proving that domestic hot water for a large building can be supplied by a remarkably small HPWH (five tons of nominal capacity).



LESSONS LEARNED

- ✓ Monitoring the system online allowed the owner to detect when any component of the system was in need of maintenance. Due to the system's modular configuration, it was difficult to tell when one or more of the compressors were not working since hot water was still available.
- ✓ Installing additional, redundant stages of heat pumps and a larger swing tank will minimize the need for a backup water heater.

Photo by Community Roots Housing

ENERGY SAVINGS OF

70%

BASELINE: 76,083 kWh/year
 CURRENT: 23,055 kWh/year

COST SAVINGS OF

66%
 per year

EUI REDUCTION OF

4.7
 KBTU/sq ft/yr

SIMPLE PAYBACK OF

13.6
 years

BEFORE UTILITY INCENTIVES

exemplarybuilding.housingconsortium.org



¹ Bonneville Power Administration, CO₂ Heat Pump Water Heater Multifamily Retrofit: Elizabeth James House, May 2020 Case Study