



Research: Heat Pump Water Heaters in Apartments Show Promise

Carefully implemented iHPWHs deliver savings without compromises.

Heat pump water heaters have a checkered reputation in multifamily buildings due to space constraints, noise, and comfort concerns. But a new study by Steven Winter Associates (SWA) found that when integrated heat pump water heaters (iHPWHs) are designed and installed correctly, they can operate efficiently with virtually no resident complaints.

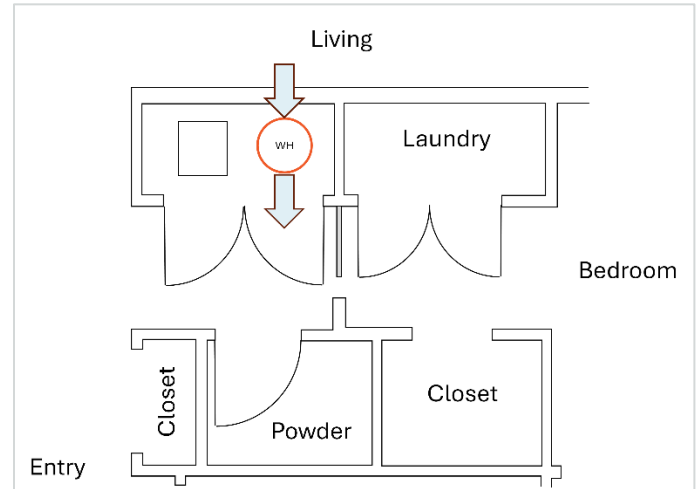
SWA monitored nine iHPWHs installed in apartments at a senior living community in southeastern Pennsylvania as part of a project funded by the U.S. Department of Energy Building Technologies Office.

Key Takeaways

- No comfort, noise, or hot water complaints.
- Approximately 500 kWh of water heating electricity savings per apartment each year compared to electric resistance hot water.
- HVAC impacts were small. The average net increase in heating and cooling energy use was 73 kWh per apartment annually.



iHPWH (right) installed in a mechanical closet



Plan view showing the iHPWH drawing warm air from the living room and discharging cool air to a hallway within the apartment

Thoughtful design eliminated comfort and noise issues.

Many multifamily heat pump water heater problems stem from poor design rather than the technology itself.

In this project, water heaters were installed in enclosed mechanical closets, but the intake air and discharge air were both ducted. The cool discharge air was directed to locations where it would not affect occupant comfort.

The result: building maintenance reported no complaints related to noise, cold air, or hot water availability.

While these findings are encouraging, the apartments in this study were relatively large and specifically designed to accommodate the equipment and ductwork. Other buildings may require different design approaches.



Water heating electricity use was cut roughly in half.

Across eight properly functioning units, average annual electricity consumption for water heating was 508 kWh per apartment.

Based on measured performance, SWA estimates the systems reduced water heating electricity use by approximately 500 kWh annually compared to conventional electric resistance water heaters.

One unit operated only in resistance mode because of an equipment issue and used substantially more energy than neighboring apartments, highlighting the importance of commissioning and maintenance.

Space conditioning impacts were much smaller than water heating savings.

Because these units extract heat from indoor air, they affect apartment heating and cooling loads. In the summer, cold air from the iHPWHs offsets air conditioning energy, but in the winter, space heating must compensate for the air cooled by the water heater.

Across the monitored apartments, iHPWH operation resulted in a net HVAC energy increase of 73 kWh per apartment per year.

Compared to the estimated 500 kWh annual water heating savings, the HVAC impact represented only about 15% of the total benefit.

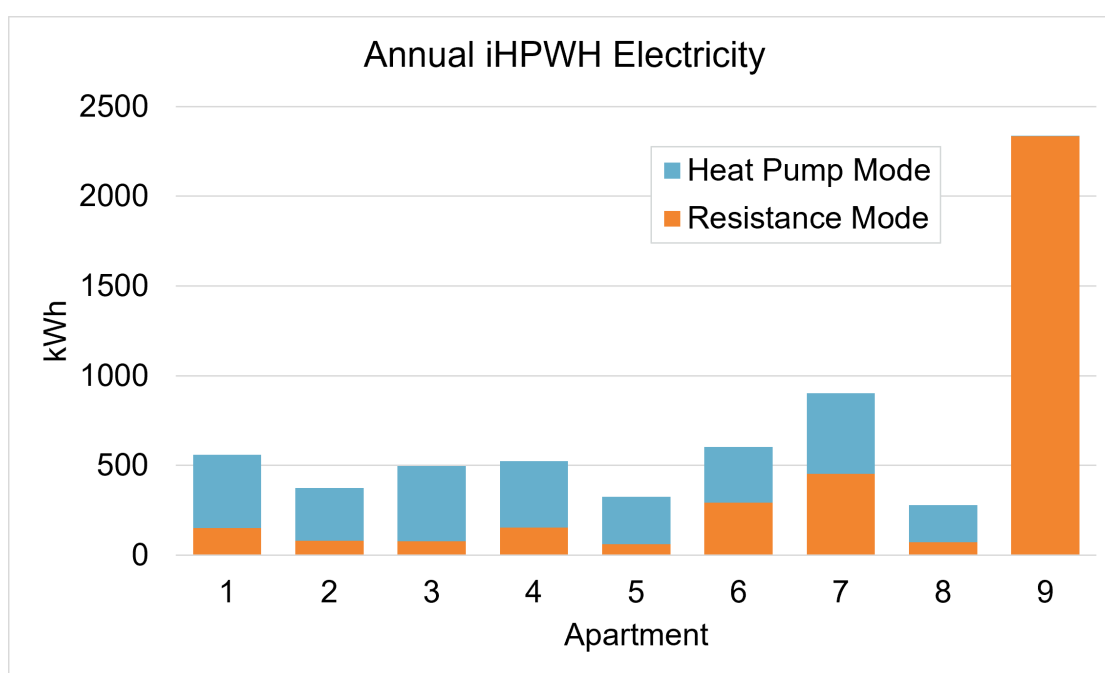


Chart: Annual iHPWH electricity use by apartment

The Bottom Line

With **thoughtful airflow design and equipment placement**, integrated heat pump water heaters can work well in multifamily apartments.

In this study, they delivered **substantial energy savings**, generated virtually **no resident complaints**, and produced only **modest impacts on space-conditioning energy use**.