

DR14.01: A Replicable and Scalable Near-Zero Net Energy Retrofit of Low-Income Multifamily Housing: Electric Energy Efficiency

OPPORTUNITY

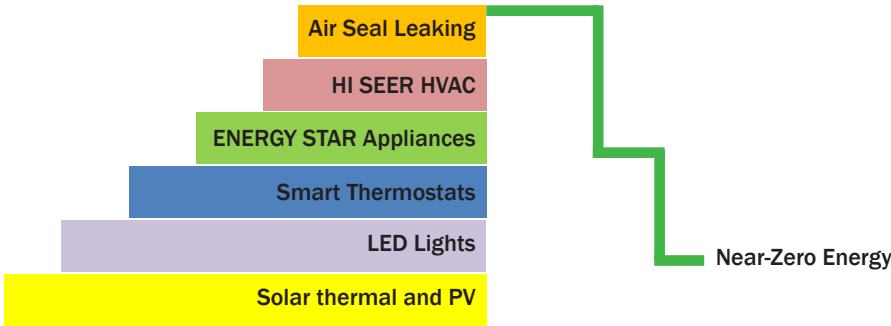
Low-income households can spend as much as **16.4%** of their income on residential energy services, more than double what an average household spends.

This project evaluated technical and financial models for scalability of deep, near-zero net energy (ZNE) retrofits in existing low-income multi-family (LIMF) housing. The project was implemented at The Villages at Beechwood, a 100-unit apartment development in Lancaster, California. This property was chosen, in part, because its location has a climate requiring substantial heating and cooling energy loads, and it represents a large share of the low-income market. However the technical and financial information, retrofit packages, practices, and methods are applicable to the entire multifamily (MF) market. The work took place over the four year period from 2013 to 2016.

TECHNOLOGY

Stacking Energy Measures The ability to apply multiple EE measures drives usage down and reduces the size of expensive renewable systems.

Emerging Technology Considered for Evaluation: Twenty-three energy efficient technologies were considered for installation. Some of the more cost effective measures selected were: spray foam insulation, aerosol envelope sealing, ozone retrofit kits, smart thermostats with energy efficiency (EE) and Demand Response (DR) capability, and evacuated tube solar collectors,



RESULTS

Projects that include multiple stacked EE measures and PV savings have paybacks that are around 23 years.

The installed efficiency measures were effective in delivering electric and gas energy savings to the low-income households. The average electric energy use for the units in 2013 was about 22.5 kWh/day, and the net reduction from EE equates to **5 kWh/day/unit**. Since California has about seven million apartment residents, the potential for electric energy savings equates to 12.75 GWh annually.

The apartments with EE measures reduced their natural gas use by about 10%, and for the community water heating natural gas use dropped 58%. For the community scale, this is approximately a 28% reduction in gas use, or about 14,400 therms annually (144 therms/unit).

DEPLOYMENT

Scale deployment of multiple measures faces financial hurdles across all MF housing.

Due to the complexity of funding sources for EE measures, PV and related items, there is no single “one size fits all” scalable financial solution for funding these types of retrofit projects, though the team has identified that successful ZNE retrofits can be financed. If financing is not available in the amount needed to install a full package of measures, another option may be to fund a portion of the work, from which savings could support additional measures at a later time.

The team also recommends financial models, similar to those used in the solar industry, be encouraged in the EE industry, and future research be conducted to fill any gaps in the data required by financial institutions, such as private and public banks.