

Demonstration of Equitable Control Solutions for Affordable, All-Electric Multifamily Housing to Increase Load Flexibility and Reduce Energy Costs and Emissions

Control Solutions for Affordable, All-Electric Multifamily Housing

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BACKGROUND

- 43.9 million residences in the U.S. are multifamily, within which 12 million households pay **more than 50%** of their annual incomes for housing.
- Affordable multifamily housing** is key to addressing the nation's housing crisis and achieving net-zero carbon emissions by 2050.
- Time-of-use or demand charge programs often require behavior change and smart home technologies to enable savings. It is imperative to ensure affordable housing residents can **equitably benefit** from those programs.

CHALLENGES

- Low-income families **may not own smart home technologies** or **lack flexibility** in their daily schedule to take advantage of time-of-use rates.
- Existing smart home solutions are either too expensive, prioritizing convenience over energy bill savings, or reliant on high-speed broadband internet connection. **Low-cost alternatives** are needed.
- Multifamily building owners and tenants may not have **aligned interests** when it comes to energy efficiency, emissions, and demand response.
- Existing research on affordable housing has primarily focused on efficiency enhancement or load monitoring, while neglecting to assess the **load flexibility** that can be unlocked by control solutions.

OBJECTIVES

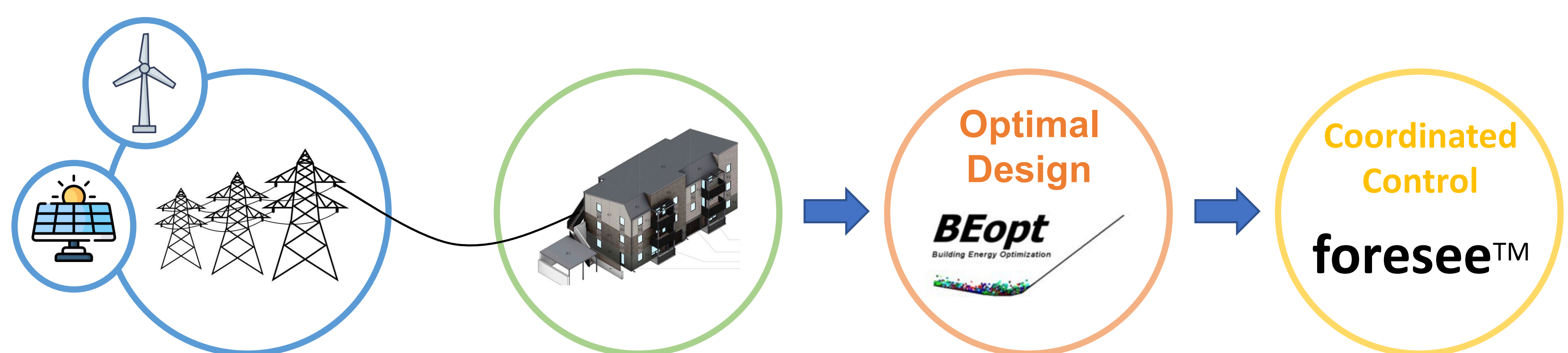
- Develop and demonstrate control solutions in all-electric, affordable multifamily housing in a cold climate.
- Advance multifamily housing control techniques equitably for cost and carbon emission reductions through coordination among units.
- Provide a template for integrating energy efficiency upgrades and DERs with control solutions in affordable multifamily housing across the U.S.

Approach



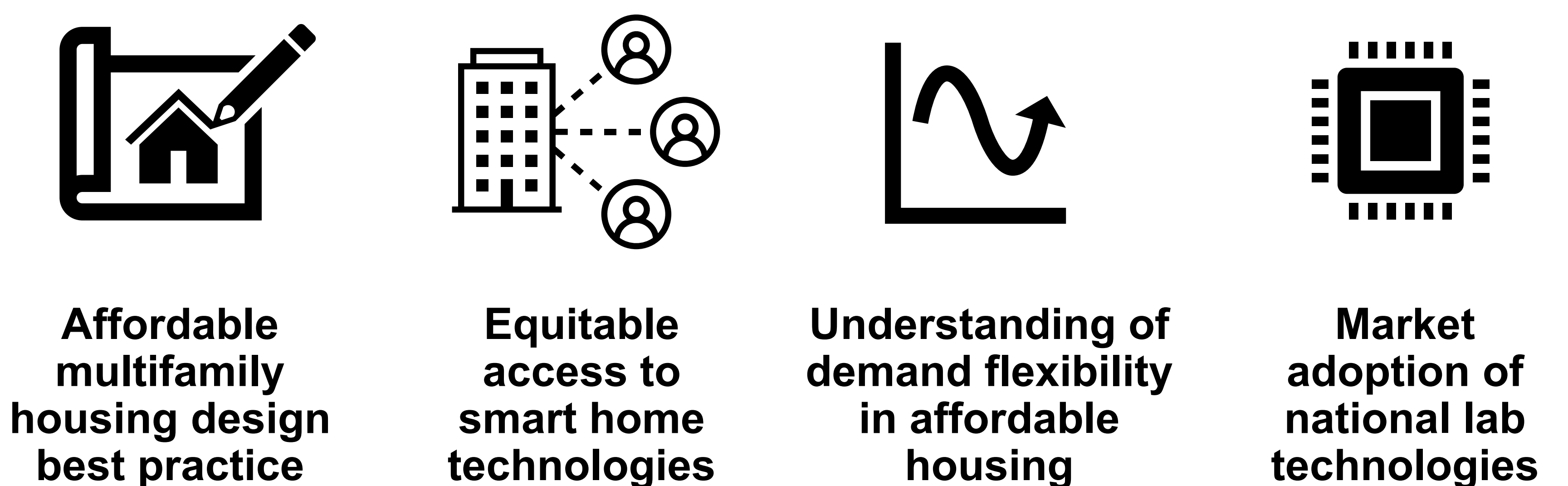
8th Street Community in Glenwood Springs, Colorado. Image credit: KEO studioworks

- NREL is partnering with an affordable housing developer, municipal utilities, and equipment manufacturers to optimize energy efficiency design and demonstrate coordinated control solutions of multiple building units to provide grid services.
- Our project focuses on a multifamily community being developed at Glenwood Springs, CO and will provide a template for affordable, all-electric multifamily housing in cold climates.



City of Glenwood Springs' electric utility imports wind and PV energy to achieve the goal of net-zero emissions. The multifamily housing community will be optimally designed for high energy efficiency and low carbon emissions with BEopt™ and controlled by foresee™.

Anticipated Outcomes



Impact

- Provide a **template** for affordable multifamily housing stakeholders to integrate efficiency upgrades and DERs in cold climate environments.
- Demonstrate a **workflow** for cost-effective energy efficiency upgrades and control deployment to help residents manage their end uses and save on energy bills.
- Unlock the **load flexibility** of all-electric homes, and field demonstrate that those homes can be controlled as a **virtual power plant** to mitigate peak demand and ensure grid reliability.
- Obtain better understanding of the needs and opportunities in all-electric, affordable multifamily housing to inform **future product design** to better serve the market.

