

# NU HOME

by engiNUity

Northwestern University Urban Single-Family Home



The Concept

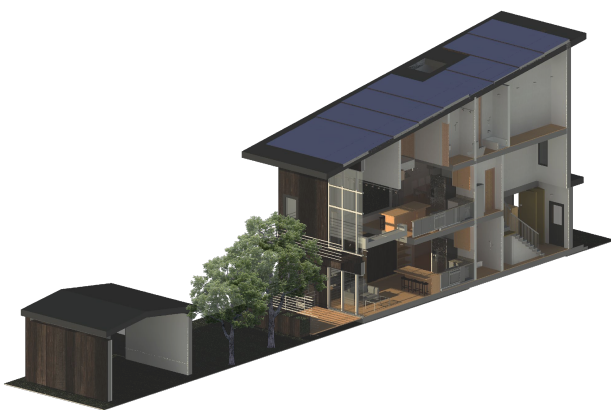
**NUHome** shows the adaptable and sustainable future of the urban single family home. Centered in the heart of Chicago, **NUHome** shows how energy efficient homes can be versatile, marketable, comfortable, and economical. This ADU-ready home enables a more resource-conscious lifestyle to be accessible as well as plans for the changing future of the urban fabric through the building's design. A fully contained living unit on the first floor of **NUHome** provides a space to extend family-housing, quarantine housing, or a space for owners as they age. This space, designed to be an accessory dwelling unit (ADU), prepares the home for the increased density of urban living and, diversifies the housing types in the area. The concepts behind the **NUHome** design can be applied to typical lots in Chicago and other urban neighborhoods.

Local Context

In Lakeview, a neighborhood along Chicago's northern lakeshore, residences sit mere feet away from their neighbors. Single family homes in densely populated, high priced urban areas are built on narrow lots, challenged with limited daylight access. Furthermore, a lack of diversity in affordable housing options prevents lower income individuals employed in the area from residing in the neighborhood. The continued prevalence of fossil fuel consumption for electricity and heat production compounds the challenges faced by the housing status quo.

**NUHome** addresses the challenges of climate change, a narrow urban lot, and accessible housing concerns with a sustainable and community-focused design.

Technical Specifications



### Typical Chicago Lot

Lot size: 25' x 125'  
East & West Setbacks: 2' & 3'  
Street to the North  
Alley to the South

### Size

2326 square feet  
2 bed, 2 bath  
1 bed, 1 bath ADU

### Envelope

Walls: R-37  
Roof: R-62  
Foundation: R-16

### Power

11.3 kW Rooftop Solar  
EUI: 12.2 kBtu/ft<sup>2</sup>/yr  
HERS (w/ PV): -22  
HERS (w/o PV): 31

## ARCHITECTURE

**NUHome** employs passive design principles to balance energy efficiency and comfort. Large windows emphasize the openness of the lot to the south, bringing both light and warmth into the home. Inspiration draws from local residences, paying homage to iconic Chicago exterior of two-flat bay windows. The ADU adapts to the homeowner's needs; serving as its own space for senior or workforce housing, or being seamlessly integrated into the natural flow of the house. The multi-functionality and ability of the home to adapt give it resilience in change.

## MARKET ANALYSIS

Targeted toward young and financially well-off professionals looking to start a family, **NUHome** addresses the need for diverse and sustainable housing options in Chicago. **NUHome** has a \$420,000 construction cost (\$178/sqft), within the marketable range. **NUHome** uses ubiquitous and standardized materials compatible with prefabrication, which allows for simple low-waste renovations if desired. Energy efficiency minimizes life cycle costs due to minimal electricity and nonexistent gas bills. The addition of a multifunctional ADU can serve as additional living space, in-law suite, or rental unit, giving homeowners and the city at large diverse housing options.

## OCCUPANT EXPERIENCE

Located in Chicago's Lakeview District, **NUHome** provides an unmatched community experience. Surrounded by culturally-significant architecture, accessible public transit, and family-friendly stores and restaurants, the residents will have prime access to enjoy the city's culture, community, and history. Inside the home, sustainability features such as daylighting sensors, reclaimed materials, and a moss wall are seamlessly integrated into the home, making healthy city-living easy. The modular floor plan maximizes **NUHome's** usability and efficiency, creating multipurpose areas allowing for guests, extra living areas, and supplemental income.

## COMFORT AND ENVIRONMENTAL QUALITY

**NUHome's** 24kBtu air-source heat pump provides all-electric heating and cooling with unparalleled efficiency. The building materials meet Indoor AirPlus air quality standards and have strong acoustic performance to create a quiet and healthy home. An indoor moss wall boosts indoor air quality, provides acoustic insulation, and integrates biophilic design. The tight thermal envelope meets Passive House standards and facilitates optimal indoor temperatures. Lunos ductless ERV's provide fresh air to the residents with maximum efficiency.

## ENGINEERING

Lutron daylighting sensors control LED fixtures and window shades maximize useful natural light while minimizing energy use and unwanted heat gain. Integrated occupancy sensors and smart controllers increase the efficiency of the HVAC system. Ductless heating and ventilation decreases construction cost and enables the prefabrication of building structure. **NUHome's** centralized plumbing core decreases hot water wait time and maximize heating efficiency. 60.5% water savings relative to the LEED, EPA, and ENERGY STAR baselines are achieved through WaterSense low-flow fixtures and greywater reuse.

## DURABILITY AND RESILIENCE

Passive House design principles maintain livable indoor conditions during disaster events through minimizing resource demand. The solar system allows **NUHome** to function during grid outages to maintain livable temperatures and protect water pipes. The building is designed to withstand fire, flooding, power outage, and snowstorm events.

## EMBODIED ENVIRONMENTAL IMPACT

Salvaged, recycled, and recyclable materials minimize **NUHome's** embodied environmental impact. For example, cellulose insulation is made from recycled materials and has high thermal resistance, making it an effective insulator with minimal embodied energy. Similarly, the use of reclaimed wood for exterior paneling and furniture reduces environmental impact.

## ENERGY PERFORMANCE

A south-angled 11.3 kW rooftop solar array covering the roof of **NUHome** generates 14 MWh of electricity each year. This level of generation, paired with efficient HVAC and lighting systems, enables **NUHome** to have a HERS score of -22. On-site PV enables **NUHome** to operate off-grid for 64% of daytime hours, and reduces load on the grid during peak times by 43%. ENERGY-STAR top-rated appliances are used to minimize appliance loads. The garage supports EV-charging and additional space for a PV system to potentially offset EV-related energy consumption.

## INTEGRATED PERFORMANCE

**NUHome's** airtight double-stud walls and double-pane windows increase energy efficiency. Daylighting sensors control window shades to provide passive cooling and optimize natural lighting. The heat pump water heater and low-flow fixtures save both water and energy. Recycled shou sugi burnt wood siding provides natural pest protection and reduces environmental impact.