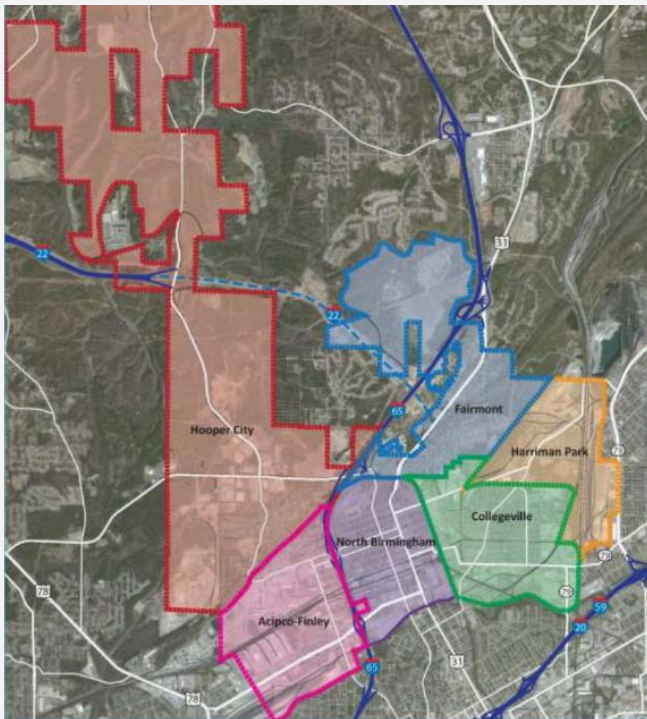




Energy Efficiency Analysis for Residents of North Birmingham, Alabama

Many households in the community of North Birmingham, Alabama, could reduce their energy bills by hundreds of dollars per year and reduce carbon emissions with energy efficiency retrofits and upgrades in their homes and apartments. As part of the U.S. Department of Energy’s (DOE) Communities LEAP (Local Energy Action Program) pilot, the National Renewable Energy Laboratory (NREL) analyzed energy efficiency and electrification upgrades for North Birmingham.



North Birmingham is a community made up of six neighborhoods: Acipco-Finley, Collegeville, Fairmont, Harriman Park, Hooper City, and North Birmingham. (Source: City of Birmingham’s North Birmingham Community Framework Plan)

Top End Uses of Energy in North Birmingham

Space heating is the dominant end-use for energy, and natural gas is the dominant fuel type.

Top 4 residential energy uses in North Birmingham:

- 23% for cooling using electricity
- 22% for heating using natural gas
- 14% for heating using electricity
- 12% for plug loads using electricity

Building envelope: the barrier that separates a home’s interior from the exterior, including walls, windows, the attic and roof, foundation walls, and floors.

Cost Effective Energy Efficiency Upgrades for North Birmingham Homes

An estimated 74% of the homes and apartments analyzed in North Birmingham have poor building envelopes, meaning inadequate insulation and sealing allows air in and out of homes. Inadequate building envelopes increase the cost of heating and cooling homes and contributes to home health hazards. Updating the building envelope could help lower the share of income residents must spend on energy, known as energy burden, and provide a more comfortable and safe indoor environment.

NREL analyzed a total of 16 energy efficiency upgrades for North Birmingham. The most cost-effective upgrade was defined as the energy efficiency and retrofit package that provides the most energy bill reductions per upgrade cost. Actual upgrade costs will vary depending on many factors, including the price of materials, contractor, size of the project, current incentive programs, and more. Modeled energy burden and bill reductions vary by ownership (resident-owned or rented), housing type, natural gas or electric heating, and other factors.

This analysis does not account for federal, state, and local rebates or programs that may further lower energy burden, upgrade costs, and payback periods.

For more information about the Communities LEAP effort in North Birmingham, visit: <https://www.energy.gov/communitiesLEAP/north-birmingham-alabama>

Modeling Assumptions

Analysis based on ResStock™ modeled energy consumption. Assumed equipment costs and labor costs were taken from national data sources from 2023; upgrades did not consider new electric panel requirements. Details at <https://data.nrel.gov/submissions/224>.

Most Cost-Effective Upgrade Strategies for Homes in North Birmingham

Energy Efficiency Upgrade Strategy*	Average Upgrade Cost** (per home)		Energy Reductions	
	Natural Gas Heating	Electric Heating	Natural Gas Heating	Electric Heating
Basic Enclosure	\$5,900	\$5,900	23%	21%
Enhanced Enclosure	\$8,100	\$7,800	27%	24%
Heat Pump Water Heater (HPWH)	\$2,800	\$2,700	9%	6%
Minimum Efficiency Heat Pump with Electric Heat Back Up	\$14,000	\$15,000	30%	20%

Actual site energy reductions, energy bill reductions, and changes to energy burden for any individual household will vary.

*Upgrade strategy does not include upgrades that may be required to be completed before upgrade, including new electric panel and wiring upgrades.

**The average upgrade cost does not account for current incentive programs. Prices of heat pumps are changing; local costs may differ.

Housing Energy Efficiency Upgrade Strategies

1. **Basic Enclosure Upgrade:** this includes upgrading attic insulation to modern building codes; reducing air leakage by 30%; sealing ducts and adding R-8 insulation; and adding drill and fill wall insulation to R-13.
2. **Enhanced Enclosure Upgrade:** this includes everything in the Basic Envelope Upgrade, as well as adding R-10 insulation to foundation walls and rim joists, sealing crawlspace vents, and insulating the attic and cathedral ceilings to R-30.
3. **HPWH:** replacing an existing natural gas or electric water heater with a HPWH can provide significant energy savings without sacrificing comfort.
4. **Minimum Efficiency Electric Heat Pump with Electric Heat Backup:** a minimum efficiency electric heat pump meets minimum code requirements. A heat pump is efficient, can provide heating and cooling, and helps dehumidify the air. When replacing existing gas heating, heat pumps with electric backup also remove the risk of dangerous combustion byproducts that can result from improperly installed or malfunctioning gas furnaces or boilers.

Paying for Energy Efficiency Upgrades

Home Efficiency Rebates*: State energy offices (SEO) will provide rebates that discount the price of energy-saving retrofits in homes.

Home Electrification and Appliance Rebates*: SEOs will develop a rebate program that can cover up to 100% of a project's costs for low-income households.

Weatherization Assistance Program: Local weatherization programs provide low-income households with weatherization projects to reduce energy use and improve home health and safety.

For more information regarding incentive opportunities for energy efficiency upgrade strategies, visit the North Birmingham Housing Energy Baseline and Upgrade Strategies presentation: <https://www.nrel.gov/docs/fy24osti/89662.pdf>.

Note that a home may only use one of these programs.

*The final rules for these programs are being developed (as of March 2024).

R-Value is the measure of insulation's ability to resist heat traveling through it. Details about R-value for North Birmingham can be found on page 8 of the ResStock Methodology document.



This work presents energy efficiency and electrification modeling results for dwelling units using ResStock EUSS 2022.1, which is a statistical representation based on modeling predictions of energy use and savings, and actual results may vary. Scan the QR code to access the methodology document at <https://www.nrel.gov/docs/fy24osti/88058.pdf>.