ICLEI USA Google Action Fund

Healthy Homes Electrification: Improving Indoor Air Quality and Climate Outcomes in Denver, CO

Overview

- **Grantee**: Energy Outreach Colorado
- **Local Government Partners**: City and County of Denver – Climate Action, Sustainability and Resiliency (CASR) Office
- **Project Period**: January 2023 – July 2025

Project Summary

Energy Outreach Colorado (EOC) partnered with the City and County of Denver to expand the Healthy Homes Program, integrating home electrification with health-focused housing upgrades for low-income households. The initiative aimed to reduce greenhouse gas (GHG) emissions while improving indoor air quality and energy affordability for residents experiencing chronic respiratory conditions. Through a combination of home assessments, targeted retrofit measures, and community partnerships with healthcare providers, the project delivered electrification and weatherization improvements to 52 homes (19 homes supported with the Google Action Fund award) in the Denver metro area. The program demonstrates how coordinated climate, health, and housing strategies can produce measurable benefits for residents while advancing local climate goals.

Photo credit: Kalen Jesse Photography Co.
Participants outside of their home

Key Objectives

The project sought to achieve the following objectives:

Expand Access to Healthy Homes through Electrification

Expand the Healthy Homes program to include home electrification technologies—such as heat pumps, induction cooktops, and heat-pump water heaters—with the goals of reducing greenhouse gas emissions, improving public health outcomes. The program also provided access to solar garden credits to offset energy costs from electrification.

Improve Health Outcomes for At-Risk Residents

Target home retrofits for low-income households with residents experiencing chronic respiratory health challenges. Improve health outcomes by addressing indoor environmental hazards, improving ventilation, and reducing exposure to pollutants from fossil-fuel appliances.

Reduce Energy Burden and Emissions

Invest in weatherization, efficient appliances, and electrification upgrades to lower household energy use, reduce natural gas consumption. Funding from Denver's Climate Protection Fund directly supported implementation of the City's Climate Action Plan.

Use of Data to Drive Climate Action

The Healthy Homes program developed a data-driven decision matrix to prioritize and guide implementation of home electrification and healthy housing improvements. The decision matrix integrates information collected during home assessments—including building conditions, indoor air quality measurements, energy usage data, and participant health needs—to assess needed housing upgrades. By systematically evaluating factors such as potential reduced energy usage, health risks, and the feasibility of different improvements, the evaluation process enables program staff to make informed decisions about how to allocate limited funding to maximize climate and public health outcomes.

In addition to the decision matrix, the program created a process map and supporting data tools that outline the full project lifecycle—from participant intake and pre-assessment to installation and post-retrofit monitoring and evaluation. Data collected during each stage, including energy consumption records, indoor air quality monitoring, and home assessment findings, inform the scope of work for each home. Building on the learnings from the grant, EOC developed a heat pump decision tree with guidance for administrators, assessors and contractors on how to determine if a project is eligible for heat pump electrification and contractor installation standards laying out best practices. These tools helped ensure that upgrades—such as heat pumps, ventilation improvements, insulation, and appliance replacements— are selected based on measurable environmental and health benefits and played a larger role in successfully ensuring the Program's broader scalability beyond the life of the grant.

The Healthy Home model that was developed by EOC and local partners provides a scalable, data-informed framework for delivering electrification improvements that reduce emissions and improve health outcomes. By standardizing how interventions are prioritized and implemented, the Healthy Home program reduces variability across projects, improves program efficiency, leverages different funding programs and incentives, and supports more transparent and equitable decision-making. The framework can be adapted to different climates, housing conditions, and energy markets, providing an adaptable model for helping local governments and program administrators in other regions advance climate and public health goals through housing retrofits.

Achievements

The project delivered meaningful public health and climate outcomes for both homeowners and the City:

Assess and Upgrade Homes

21 homes were assessed for electrification updates; 21 homes received full Healthy Home retrofits (2 leveraging Denver CASR funding), including weatherization and electrification upgrades. Installed upgrades included 17 heat pumps, 2 mini split heat pump systems, 11 heat pump water heaters, 9 induction cooktops, insulation upgrades, air sealing, and ventilation improvements.

Reduce Greenhouse Gases

These investments delivered an estimated 1,712 metric tons of CO_2-equivalent emissions reductions annually from installed measures across participating homes.

Reduce Energy Cost Burden for Residents

Housing retrofits delivered an estimated annual energy savings of 82,050 kWh of electricity and 21,981 therms of natural gas. The average CO household uses 10,715 kWh/year of electricity and ~654 therms/year of natural gas, so the energy savings delivered by this project is the equivalent of saving ~7.6 households worth of electricity and ~34 households worth of gas per year.

Improve Indoor Air Quality for Residents

Indoor air quality monitoring showed reductions in particulate pollution (PM2.5), with average decreases of ~5 $\mu g/m^3$ in bedrooms and ~4 $\mu g/m^3$ in living spaces. Across all homes these retrofits delivered improved respiratory health conditions for residents.

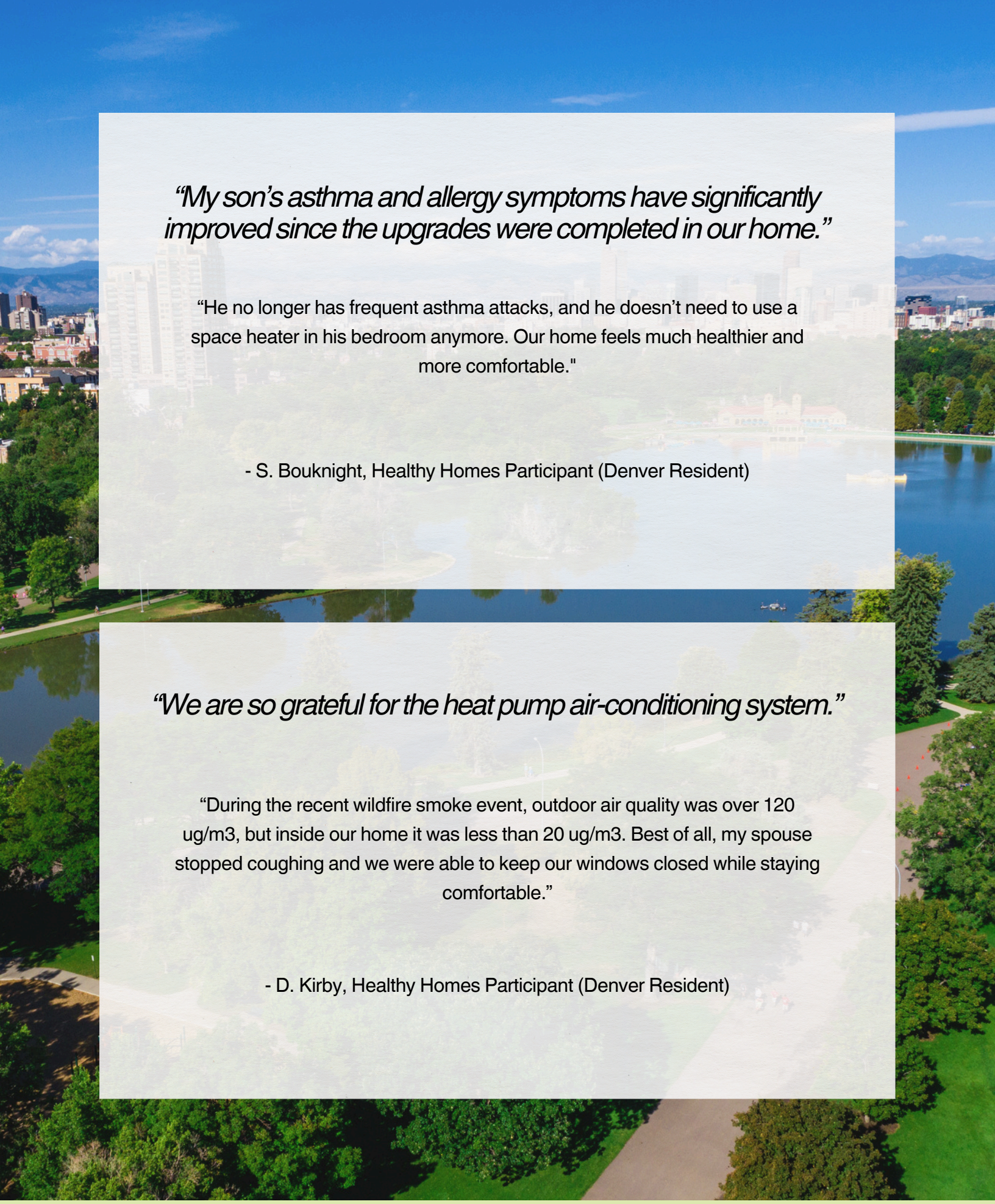
Leverage Funding and Incentives

EOC leveraged over $2.18 million from the City of Denver and Xcel Energy rebates expanding the reach of the Healthy Homes program. The average cost per household was approximately $65,000, which reflects the significant retrofits supported through this initiative. In 2023 and 2024, approximately 25% of the total project cost was offset with Xcel Energy rebates, and in 2025, that percentage increased to 50%.

Community Impact

This project served low-income households with residents experiencing chronic respiratory illnesses and disproportionately affected by poor air quality.

Results from air quality monitoring data were modeled from a sample of 40 homes (including homes retrofitted with City and County funding and the 21 homes retrofitted with funding from ICLEI USA's Google Action Fund award). Energy Outreach Colorado. ICLEI Healthy Homes Program. July 2025. p. 20



"My son's asthma and allergy symptoms have significantly improved since the upgrades were completed in our home."

"He no longer has frequent asthma attacks, and he doesn't need to use a space heater in his bedroom anymore. Our home feels much healthier and more comfortable."

- S. Bouknight, Healthy Homes Participant (Denver Resident)

"We are so grateful for the heat pump air-conditioning system."

"During the recent wildfire smoke event, outdoor air quality was over 120 ug/m3, but inside our home it was less than 20 ug/m3. Best of all, my spouse stopped coughing and we were able to keep our windows closed while staying comfortable."

- D. Kirby, Healthy Homes Participant (Denver Resident)

Lessons Learned & Next Steps

Lessons from this project will inform future project implementation at EOC and the City of Denver:

Comprehensive Home Assessments Are Critical

Each home has unique health, infrastructure, and energy needs. Detailed assessments are essential to identify hazards, prioritize upgrades, and ensure that investments address the most high-priority issues needed to deliver a "Healthy Home".

Investments in Contractor Training Is Necessary for Quality Assurance

Electrification technologies such as heat pumps require specialized expertise. Proper contractor vetting, training, and installation standards are necessary to ensure accurate load calculations, efficient system performance, and participant satisfaction.

Homeowner Education and Engagement is Critical to Success

Homeowners need clear guidance on how electrification technologies operate and how energy use may change after installation. Providing educational materials and ongoing support helps residents maximize the benefits of new systems.

Healthy Housing Requires a Holistic Approach

Electrification projects often uncover additional building related issues such as mold, asbestos, roof repairs, or outdated electrical panels. Programs should plan for integrated upgrades—including remediation and building repairs—to fully address health and safety concerns.

Strengthen Cross-Sector Partnerships

Continued collaboration with healthcare providers, local governments, non-governmental organizations (i.e., community and advisory groups, nonprofits, neighborhood associations, etc.) and contractors will help expand referral networks and ensure that programs reach households with the greatest health and energy needs.

Scale and Replicate the Program Model

Future efforts will build on the decision matrix, process map, and lessons learned to expand the Healthy Homes approach to additional communities and support broader electrification and climate goals.

Conclusion

The Healthy Homes Electrification program demonstrates how climate action can simultaneously improve housing quality, public health, and energy load reduction for low-income communities. By combining electrification technologies with weatherization, the program improved indoor air quality, helped low-income households transition away from fossil-fuel appliances. This program showed how home retrofits can both reduce greenhouse gas emissions and energy consumption while mitigating environmental hazards in homes that contribute to respiratory illness.

Data collection and evaluation played a central role in demonstrating the program's impact. Through utility data analysis, utility incentives, indoor air quality monitoring, and participant feedback, the project documented measurable reductions in emissions, energy use, and air pollution inside homes. The program also developed practical tools—including a decision matrix and standardized implementation process—to guide data-driven retrofits and prioritize investments based on both climate and health benefits.

The project also highlights the importance of partnerships in advancing equitable climate solutions. Collaboration between Energy Outreach Colorado, the City of Denver, healthcare providers, and contractors enabled an integrated approach that addressed multiple community needs at once. By documenting lessons learned and building a replicable program model, the Healthy Homes initiative provides a blueprint for other communities seeking to expand electrification while improving health, housing quality, and climate outcomes.

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