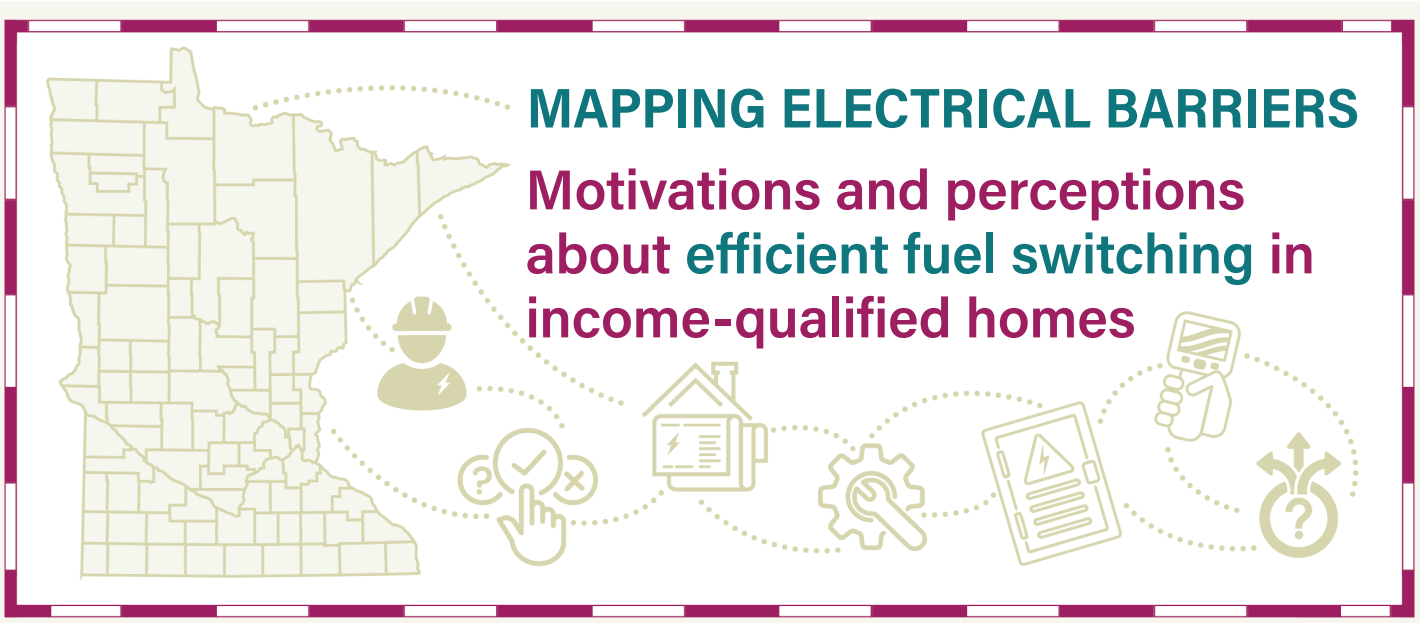


MAPPING ELECTRICAL BARRIERS

Motivations and perceptions about efficient fuel switching in income-qualified homes

This study maps the technical, financial, and behavioral barriers that prevent **income-qualified (IQ) homeowners** from accessing and adopting **efficient-fuel-switching (EFS) technologies**, with the goal of informing strategies for **Minnesota's Energy Conservation and Optimization (ECO) programs** to accelerate EFS in the state, particularly for single-family, IQ households.

Efficient Fuel Switching in Minnesota

Minnesota's ECO Act enables utilities to promote EFS measures provided the switch reduces source energy consumption and meets the Act's performance criteria. Current programs replace fossil-fuel end uses with electricity. For IQ households, EFS holds real promise: technologies like air source heat pumps (ASHPs) and heat pump water heaters (HPWHs) can meaningfully reduce energy burden, particularly for homes heated with delivered fuels like propane or fuel oil.

Research Tasks

Literature Review and Initial Contractor Interviews

We conducted a literature review to identify the primary technical, economic, cognitive, and behavioral barriers and opportunities for IQ EFS. The team used insights and **interviewed five non-Minnesota Electrification Service Providers (ESP)** to assess the practical feasibility and challenges of EFS deployment.

Homeowner and HVAC Contractor Interviews

We conducted in-depth interviews with 11 IQ single-family homeowners, including both English- and Spanish-speaking participants, and four HVAC contractors.

Homeowner Survey

We conducted a statewide survey of 291 low-to-moderate income (up to 150% of AMI) single-family households across Minnesota.

Electrician Interviews

We interviewed four Minnesota-based electrical contractors to better understand their approach to panel upsizing and other electrical upgrades during EFS retrofits.

Electrification Service Provider (ESP) Interviews

The project team also interviewed ten Minnesota-based contractors to assess barriers and opportunities for trade contractors to adopt the ESP model and where utilities could provide support.

Findings	ECO Program Recommendations
 **Emergencies drive heating equipment replacements,** yet contractors rarely raise ASHPs as an option, citing installation complexity, panel upgrade risk, and outdated cold-weather performance concerns. ECO programs currently offer little programmatic support for EFS at these replacement moments.	**Make the emergency replacement moment a designed program entry point** complemented by a proactive replacement program through recognizing and integrating electricians trained in power-efficient design into a referral EFS network alongside HVAC trade allies; and encouraging contractors to set customer reminders for equipment installed ten or more years ago and flag aging systems during tune-ups, before failure.
 Homes with existing central ACs and ≥100A panels can add a dual-fuel ASHP or HPWH without a panel upgrade. **The electrical barrier is real but concentrated in a definable minority of Minnesota IQ homes.**	**Tailor EFS programs to home electrical readiness** by providing streamlined EFS for electrically ready homes (≥100A panels) to build contractor familiarity, then extend that infrastructure to homes with steeper barriers (<100A panels or full electrification).
 **Tiered incentive amounts are working, but delivery timing and coverage levels are not.** Covering the full cost at check out, not reimbursing later, is what changes the adoption decision for IQ households.	**Apply IQ incentive delivery at contractor invoicing,** consolidating federal, state, and utility funds into one transaction that fully covers costs—including panel upgrades. Design IQ incentive tiers explicitly around full cost elimination.
 **Contractors are the primary information resource for IQ households** at equipment replacement, yet many lack the training and program knowledge to raise EFS options.	**Treat the contractor as the primary program intervention target.** Embed incentive stacking tools, lifecycle-cost messaging, and pre-qualified household lists into contractor training, and build a centralized platform for incentives and program updates so contractors can promote EFS options and incentives with confidence.
 **The whole-house coordination that IQ households need to navigate EFS already happens informally.** Community Action Agencies (CAA), general contractors, and energy auditors already help households navigate multiple trades and incentives.	**Grow the ESP model from existing market actors,** via a tiered trade ally designation and whole-house building science training, rather than building new ESP businesses from scratch.

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