Residential Air-Source Heat Pump Local Government Toolkit

For Elected Officials and Executive Office Staff

Midwest Air Source Heat Pump Collaborative

This initiative is delivered by Center for Energy and Environment, Slipstream, MEEA, and Elevate.

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ELEVATE

MEEA MIDWEST ENERGY EFFICIENCY ALLIANCE

Overview

- Heat Pump Basics
- Heat Pump Benefits
- Technology Considerations
- Cost Considerations
- Program & Policy Design
- Community & Stakeholder Engagement
- Next Steps & Resources

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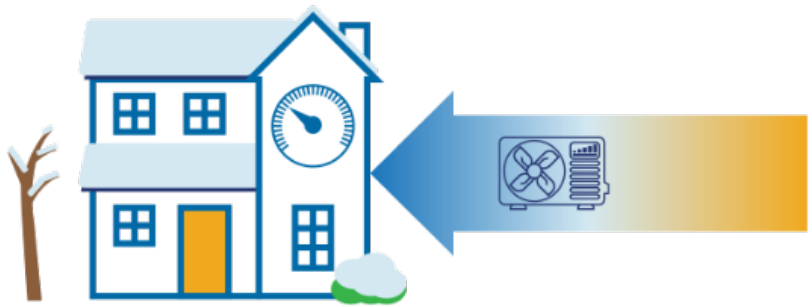
Heat Pump Basics

What is an Air-Source Heat Pump (ASHP)?

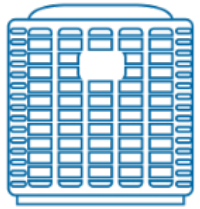
In the summer,
heat is pumped from the inside of a home to the outside



In the winter,
heat is pumped from the outside of a home to the inside

For more detail, see a short video on "what is a heat pump?"

ASHPs are the same technology used in:



Air Conditioners

Refrigerators

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Air-Source Heat Pump Overview

- Heat pump types
  - **Air-source heat pumps (ASHPs) are the most common and the focus of this toolkit**
  - Geothermal heat pumps
- ASHP is a broad term used to describe a variety of heat pump types and configurations
  - Cold-climate rated
  - All-electric vs. hybrid systems
  - Ducted, ductless, or hydronic distribution (e.g. boilers)
- **Takeaway:** heat pump designs are customizable and suitable for a wide variety of applications including single-family, multifamily, and manufactured homes

Image source: Green Energy Futures

Heat Pump Benefits

Reduce Carbon Emissions and Utility Bills

- **Increase energy efficiency**
  - ASHPs are 2-4x more efficient than electric resistance or fuel burning heat systems
  - ASHPs are typically 2x more efficient than window AC units
- **Reduce utility bills**
  - Switching from **electric resistance or propane fuel** for heat can save 30-55% on your heating costs
  - Hybrid heat pumps allow for optimizing economics and respond to fuel price volatility
- **Enable achieving zero emissions over time**
  - Electrifying heating systems enables solar or other renewable energy sources to power heating

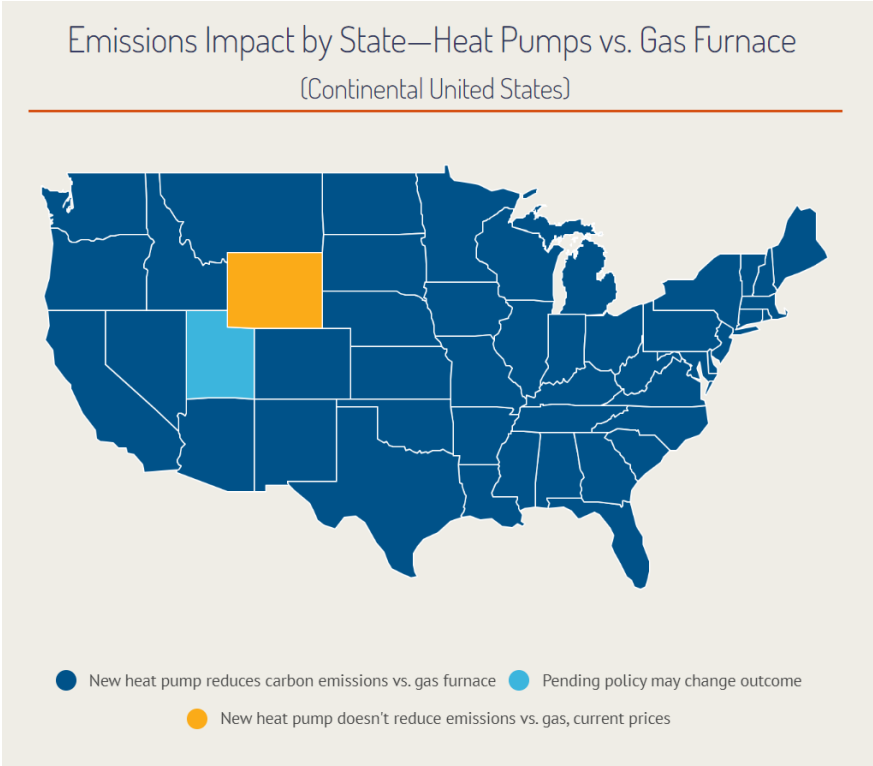

Image source: RMI

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Improve Indoor Air Quality and Safety

- **Improve indoor air quality and comfort**
  - ASHPs may offer both air filtration and dehumidification
  - ASHPs may improve comfort by through longer run times and efficient operation
- **Improve safety**
  - Removes combustion equipment
  - In cases where cooling is added, improves health and safety during periods of extreme heat

Technology Considerations

Cold Climate ASHPs (ccASHPs)

- Readily available ccASHPs are on the market, engineered to efficiently heat homes in extremely cold conditions, typically at or below 5°F
- NEEP maintains a list of ccASHPs that meet specific performance criteria
- The Department of Energy's Cold Climate Heat Pump Technology Challenge is accelerating the development and market for cold climate heat pumps.
- **In the Midwest, cold-climate heat pumps are recommended for most applications**

Image source: Energy News Network

Hybrid ASHPs

- Hybrid heat pumps (also referred to as “dual-fuel” heat pumps) use an electric heat pump *and* fossil-fuel heating to warm a home
- Offers the resident flexibility to tailor energy usage and operational expenses to their preferences and respond to fuel rate fluctuations
- Watch a short video from Focus on Energy to learn how dual-fuel heat pump systems work
- **In the Midwest, hybrid systems will likely be optimal where the existing heating fuel is natural gas**

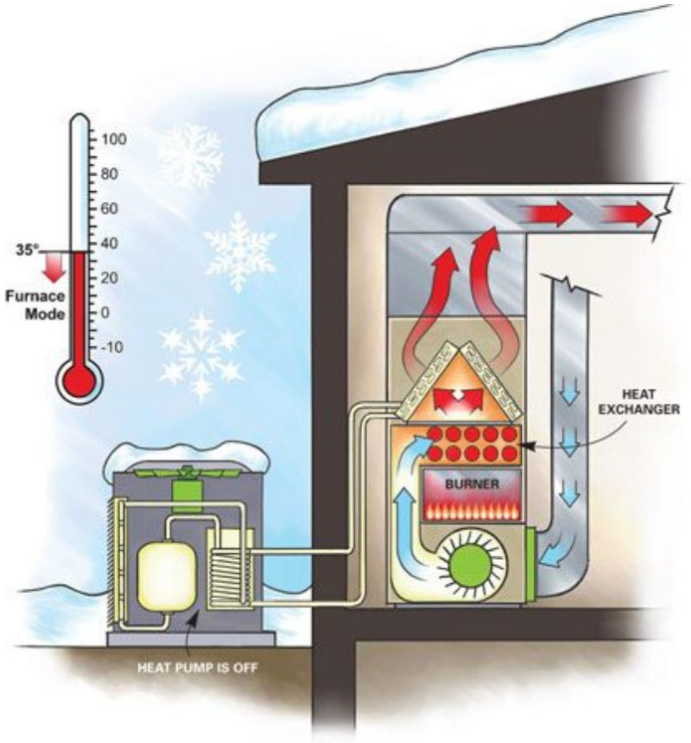

Image source: Family Handyman

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Preparing for Installation: Weatherization

- **Weatherization is a commonly recommended first step, especially in the Midwest**
  - Weatherization should be done prior to installation of the ASHP, to ensure the ASHP is correctly sized
  - Results in improved comfort and reduced energy bills
- Common weatherization measures include air sealing and adding insulation
- An energy audit can determine necessary weatherization upgrades

Preparing for Installation: Electrical Upgrades

- An upgrade to the electrical service or panel(s) may be required to meet increased electrical needs
- Early on, an electrician should assess the building service size and available space in existing electrical panel(s)
- Panel size requirements will depend on other appliances and loads in the home (typically, between 100 and 200-amp panels are needed)
- The Watt Diet Calculator recommends solutions to reduce or eliminate electrical upgrade requirements.

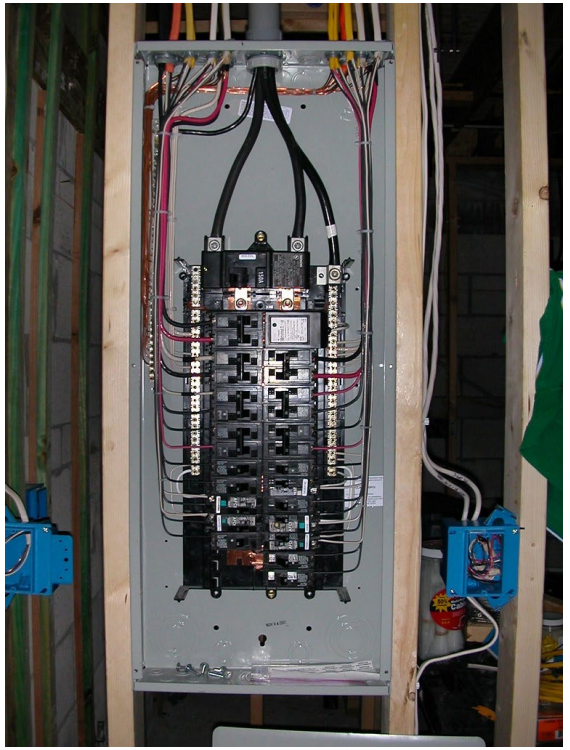
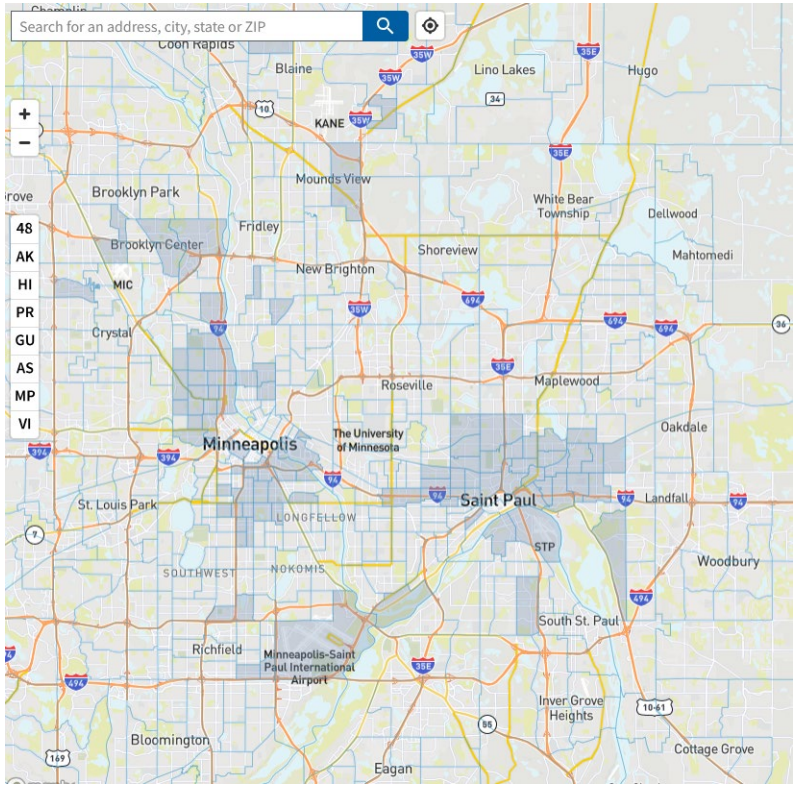


Image source: Flickr

Cost Considerations

Cost Considerations

- Cost-effectiveness depends on **operating costs** and **upfront costs**
- Prioritizing retrofits **in low- and moderate-income households (LMI) is critical**; increased incentives are often available if a property meets geographic location or income criteria, such as (requirement varies by incentive):
  - Climate and Economic Justice Screen Tool (CEJST)designates census tract that are disadvantaged
  - Below 80% Area Median Income (AMI)
- Research has shown that customers are willing to pay up to 20% more for heat pumps when they deliver utility bill cost savings and improve comfort



CEJST census tracts in Minneapolis highlighted in blue

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Operating Costs

- The impact of ASHPs on utility bills is largely dependent on:
  - Existing heating fuel and fuel rate
  - Climate zone
  - Other retrofits completed in combination with the ASHP (e.g., weatherization, solar)
- Online calculators that estimate utility bill impacts of ASHPs:
  - ComEd (Northern Illinois)
  - RMI (National)
- Maintenance is similar to air conditioner maintenance
  - Centrally Ducted: $20-150 per year
  - Mini-Split: $100 per year

Upfront Costs

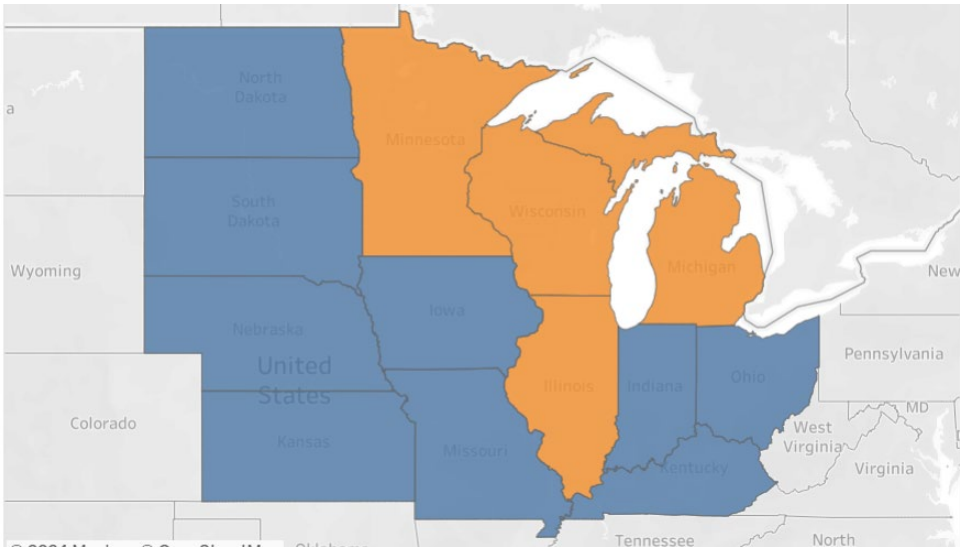
- Upfront costs of an ASHP is largely dependent on:
  - Size, efficiency, and complexity of the ASHP design
  - Additional upgrades required (e.g., weatherization and electrical needs)
- Average upfront costs
  - Centrally ducted system: $10,000-$30,000
  - Ductless system: $5,000-$30,000
    - Due to a wide variety of applications the potential cost of a ductless system can vary significantly
  - Rewiring America has a summary of cost estimates for different US regions
- Incentives are available to offset upfront costs
  - Federal incentives through the **Inflation Reduction Act (IRA)**: tax credits, rebates, and financing
  - State incentives
  - Local incentives

Image source: Efficiency Maine

Program & Policy Design

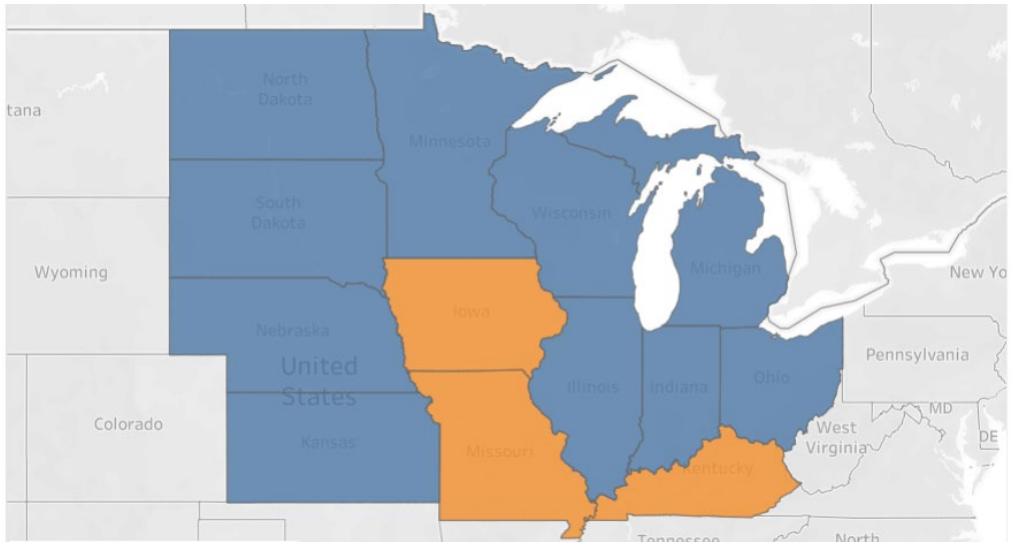
Midwest Policy and Market Condition Trends

States with Favorable ASHP Policy



Examples: Policies enabling fuel switching, statewide utility collaborative program (e.g., Minnesota Air Source Heat Pump Collaborative, or statewide energy efficiency program implementation (e.g., Focus on Energy)

States with Favorable Market Conditions



Examples: Electric-heavy fuel mixes, milder climates, lower blended electric rates, etc. Listed market conditions are in states that have expressed interest and request more information regarding ASHP adoption – other states may have similar opportunities.

Image source: Midwest ASHP Collaborative

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Program & Policy Design

- Local governments in the Midwest can support ASHP adoption through:
  - ASHP programs
  - Workforce development
  - Building codes and standards
  - Internal operations
  - Technical assistance for engineers, builders, general contractors, technicians, etc.

- Rewiring America's Electrification Policy Menu provides local leaders with guidance on policy options to support the adoption of ASHPs, including **local rules**, **financing, electrification**, and **local leadership**

Community-Driven Retrofit Programs

- **Building retrofit programs** support building owners and decision-makers in implementing energy efficiency and electrification upgrades in their buildings
- Community-driven building retrofit programs **prioritize community desires and needs** in the development, delivery, and outcomes of a building retrofit program
  - **Co-creation** between the local government and community can lead to equitable program outcomes.
  - Local governments can use the Guidelines for Creating Community-Driven Retrofit Programs to navigate the creation of these programs.
- A **one-stop shop model** can provide a suite of building retrofit services in one location

Program Example: Madison, WI

- **The Efficiency Navigator**
  - One-stop-shop building retrofit program
  - Focuses on small to medium-sized multifamily affordable housing
  - Provides free technical assistance and building energy efficiency upgrades
  - **When upgrades will reduce overall energy costs and emissions, ASHPs are installed in participating buildings**

Efficiency Navigator

Making multi-family housing affordable and resilient

A partnership with Sustain Dane and Elevate

Financial Assistance & Incentive Programs

- Local governments can establish programs to reduce upfront costs and financial barriers to building upgrades. This may include:
  - Rebates
  - Cost share
  - Free building energy upgrades for income-eligible properties
- A program should:
  - Identify a funding source
  - Set requirements for upgrades covered by the program
  - Create programs that stack with other offerings and incentives to maximize savings

Program Example: Chicago, IL

- **Green Homes Chicago**
  - Provides up to $50k in free energy upgrades to low-income homeowners
  - Eligible properties include 1–4-unit owner-occupied residential buildings
  - Upgrades may include insulation, heat pump HVAC systems, and electric appliances

Workforce Development

- Many HVAC contractors and installers have limited ASHP training
- A skilled workforce is necessary for correct installation and optimal efficiency
  - Partner with unions, trade schools, community colleges, non-traditional career pathways
  - Upskill and reskill workers for good quality jobs
- Policies and programs should include training and opportunities for underrepresented groups and frontline communities to equitably develop the workforce
- Accellerator programs to train local contractors in new technologies is a great way to widen the area in which ASHP programs can be implemented
  - The economic benefits of funding installation work can be better retained by keeping the talent pool of qualified installers within the serviced municipality as opposed to outsourcing

Workforce Development (cont.)

- Landscape analysis of existing workforce should take capacity of weatherization contractors into account in addition to HVAC contractors trained in heat pump installation.
- An adequately trained contractor pool can extend the reach of program marketing
- Helpful Resource: Community Toolkit for Designing and Implementing a Contractor Accelerator Program

Workforce Example: Ann Arbor, MI

- **Electrification Badging**
  - Partnership with the City and local green bank, Michigan Saves
  - Helps homeowners find contractors with electrification, solar, and efficiency experience
  - Contractors complete five training modules and continuing education to earn badge and become eligible to offer exclusive energy financing
  - Provides training and verification of local workforce credentials and financing for customers to make upgrades like ASHPs

Building Codes & Appliance Standards

Example considerations:

- **Heat pump installation requirement for A/C**
  - Requires all air conditioning units be heat pumps
- **Zero-Pollution standards for local appliance sales**
  - Requires new equipment to emit little or no pollution during operation
- **Electric-ready building codes for new buildings**
  - Requires new buildings have electric service and wiring for electric appliances
- **All-electric building codes for new buildings and renovations**
  - Requires buildings to be equipped with electric space heating, water heating, and electric appliances

Local Government Operations

- Permits and Inspections
  - Develop an application or incorporate ASHPs into existing permit applications
  - Establish internal protocols for consistent enforcement
  - Offer incentives for ASHP permit applications
  - Provide engineers and inspectors with training
- Fire & Safety
  - Building awareness of safety benefits when replacing fossil fuel equipment with ASHPs
- Sustainability
  - Community education and engagement on ASHP basics, benefits, and incentives

Community & Stakeholder Engagement

Community & Stakeholder Engagement

- Engage the community to identify needs, address concerns, and build trust
- Prioritize community groups burdened by current and past inequities such as:
  - Historical disinvestment
  - Legacy pollution
  - Environmental hazards
- The People's Justice40+ Community Benefit Playbook offers step-by-step guidance to local governments

Image source: Emerald Cities Collaborative and PODER

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Community & Stakeholder Engagement

- Consider the following when doing engagement with the community and stakeholders
  - Audience's familiarity with technical concepts and language
  - Community's perceptions of new technologies and funding/financing mechanisms
  - Highlight potential benefits (e.g. savings, comfort, air quality)
  - Set expectations appropriately (e.g. equipment costs, utility bill impacts, workforce impacts)
- Types of engagement opportunities
  - Training summits to support local contractors
  - Sharing contractor lists from State Energy Offices and utilities
  - Highlighting positive customer experiences with contractors
  - Host public forums to promote education on viability for residents and business owners.

Case Study: Detroit Design Build Green Hub

- Co-create workshops and training to help small contractors and residents navigate design-build processes
- Develop a skilled workforce and create access to local economic opportunities
- Demonstrate inclusive-design principles while being responsive to community culture

Image source: Detroit Design Build Green Hub

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Next Steps & Resources

Recommendations & Next Steps

Early Stage → Later Stage

- Direct staff to **research** existing air source heat pump policies and programs
- Meet with **community-based organizations** to understand community needs and priorities
- **Develop and implement policy or program** for air source heat pumps
- **Share existing incentive opportunities** with residents and businesses
- Meet with department leadership to understand **training and capacity** needs
- Meet with **local trade and labor organizations** to understand training needs

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Tracking & Measuring Progress

- The RMI Equitable Home Electrification Toolkit Roadmap provides a starting point for tracking progress.

Equitable Home Electrification Toolkit
Roadmap Action Menu
Sources: Alameda, CA; Ann Arbor, MI; Berkeley, CA; Denver, CO; New York, NY; San Francisco, CA (Phase 2); San Francisco, CA (Phase 1); San Jose, CA

This document catalogs the policies and programs identified in existing building electrification/decarbonization roadmaps from several leading cities (linked above).
Communities making their own roadmaps can use this list as inspiration when developing their plans. Note: Most Roadmap Actions are worded identically here and in their respective reports—you can search for them (CTRL+F) in the documents above for additional information.

Municipality	Roadmap Action	Targeted Completion	Upgrade / Technology Mandate	Upgrade / Technology Incentive	Tenant & Resident Protection	Workforce / Contractor Development	Innovation & Market Transformation	Commercial Buildings	Multi-Family Buildings	Taxes, Fee Misc. Reve
			Requirements and triggers to upgrade appliances, weatherization, and BE technologies	Consumer-directed funding, financial, and regulatory incentives for appliances, weatherization, and BE technologies	Efforts to shield tenants and low income homeowners from electrification-induced costs and displacement	Training offered to project designers, engineers, installers, etc. who will be paid to electrify buildings	Industrial and supply chain improvements to produce cheaper, more efficient products	Efforts specifically affecting commercial (i.e., non-residential) buildings	Efforts specifically affecting multi-family buildings	Revenue-raising that may provide support for BE p
Alameda, CA	Explore requiring electrical panel upgrade at sale	Phase 2	X							
Alameda, CA	Emulate the City of Berkeley's earthquake preparedness tax by creating a similar Refundable Electrification Transfer Tax	Phase 2								X
Alameda, CA	Explore requiring electrification or efficiency retrofit at the point of sale	Phase 2	X							
Alameda, CA	Explore requiring both single family and multifamily residences to have a mandatory energy score or energy audit performed at the point of sale or leasing. Consider exemptions for homeowners that score at a certain level.	Phase 2	X						X	
Alameda, CA	Explore requiring an efficiency or electrification retrofit at the point of permit	Phase 2	X							
	Consider requiring the installation of new, future-ready outlets if work is being done									

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Links to Key Resources

- Midwest ASHP Glossary of Terms 2024
- ASHP Basics
  - Midwest ASHP Collaborative
  - DOE Air-Source Heat Pumps
  - DOE Ductless Mini-Split Heat Pumps
  - ENERGY STAR Air-Source Heat Pumps
  - Rewiring American Upgrade Your Heating and Cooling with a Heat Pump
- Technology
  - ENERGY STAR Product Finder
  - Rewiring America Guide to Heat Pump Quotes
  - Focus on Energy How Dual-Fuel Heat Pumps Work
- Policy Considerations
  - Rewiring America Local Government Electrification Policy Menu
  - Rewiring America Electrification Resources for Local Leaders
  - C40, BEI, Elevate Guidelines for Creating Community-Driven Retrofit Programs
  - Shift Zero Policy Toolkit to pursue zero carbon building stock

Links to Key Resources

- Equipment and Maintenance Costs
  - EIA Buildings Sector Appliance and Equipment Costs (ASHP p.39-44)
- Energy Savings Calculators and Reports
  - CEE Developing Electric Rates for Hybrid ASHPs in the Midwest
  - Efficiency Maine Heating Cost Comparison
  - ComEd Savings Calculator
  - ENERGY STAR Life Cycle Cost Estimate
  - RMI GreenUpgrade Calculator
- Incentives
  - DOE Making Our Homes More Efficient: Clean Energy Tax Credits for Consumers
  - ENERGY STAR Federal Tax Credits and Incentives for Energy Efficiency
  - Midwest ASHP Collaborative State Energy Office Incentives List
  - Rewiring America Electrification Incentives Calculator
  - DSIRE USA Database

Links to Key Resources

- Community & Stakeholder Engagement
  - ECC and PODER Climate Equity & Community Engagement in Building Electrification
- Case Studies & Examples
  - Madison, WI: Efficiency Navigator
  - Chicago, IL: Green Homes Chicago
  - Ann Arbor, MI: Electrification Badging
  - Detroit, MI: Design Build Green Hub
- Tracking Tools
  - RMI Equitable Home Electrification Toolkit Roadmap
- Workforce Development
  - NREL Community Toolkit for Designing and Implementing a Contractor Accelerator Program
  - Building Performance Institute Recruitment Toolkit

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