

Air Source Heat Pump Summit

Monday, January 30th

1:00 – 5:00 pm

Reception to Follow from 5:00 – 7:00 pm

Air Source Heat Pump Summit

Planning Partners



Air Source Heat Pump Summit

Housekeeping & Logistics

- Restrooms straight out the doors
- Whova: Search "Midwest Energy Solutions Conference"
- Conference registration on floor 7, opens at 11 tomorrow
- Welcome & opening remarks Tuesday at 1, exhibit hall opens at noon

Conference App



Network: MES2023
Password: MEEA2023

Air Source Heat Pump Summit

Agenda

Welcome & Introductions

1 – 1:05

Molly Graham, MEEA

Regional Context

Midwest Workforce Landscape
Rate Design & Optimization
Midwest ASHP Collaborative

1:05 – 1:30

Justin Margolies, Slipstream
Carl Nelson, CEE
Emily McPherson, CEE

National Context

Federal Funding Updates
National Field Validation Partnership
Heat Pump Manufacturer Panel

1:30 – 3:15

Antonio Bouza, DOE BTO
Fredericka Brown, PNNL
James Momperousse, Carrier; Jonathan Moscatello,
Daikin; Kevin DeMaster, Mitsubishi

Break

3:15 – 3:35

Foyer

Breakout Discussions

3:35 – 4:35

Marisa Bayer, CEE

Wrap-up & Next Steps

4:35 – 4:55

Molly Garcia, CEE; Justin Margolies, Slipstream

Air Source Heat Pump Summit

Goals for Today

01

Ways to leverage national ASHP initiatives

02

Gain manufacturer perspectives

03

Learn from each other on approaches

04

Set the stage for ongoing regional collaboration

Air Source Heat Pump Summit

Workshop Focus

- Electric Air Source Heat Pumps
 - Residential technology available in today's market
 - Qualifies for federal energy efficiency dollars
- Many alternative technologies finding their niche in today's space heating market
- This is the **first**, not the last meeting to convene on this topic
- MEEA will introduce topics on other applications for heat pumps in future forums

Air Source Heat Pump Summit

Reception

- Reception immediately following the workshop from 5:00 – 7:00
- Crushed by Giants Brewery on Ohio and Rush
- Let us know if your plans changed and you're no longer coming
- Currently at capacity. First-come, first-served
- Thank you to our reception sponsors!



**Emily McPherson, Justin
Margolies, Carl Nelson
Center for Energy & Environment;
Slipstream**

*ASHP Technology & Midwest
Potential*



Center for Energy and Environment



Research



Programs



Planning & Consulting



Financing

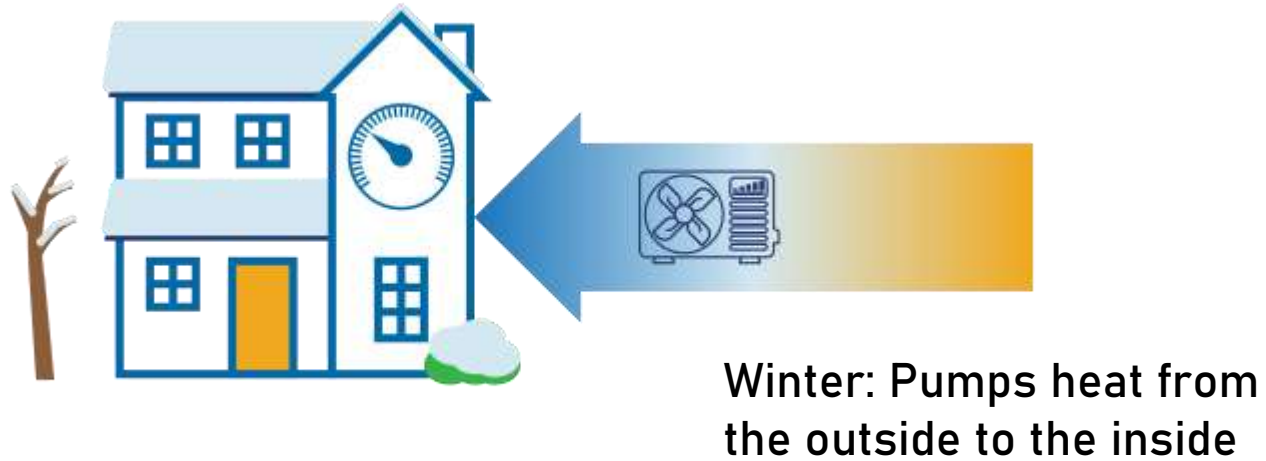
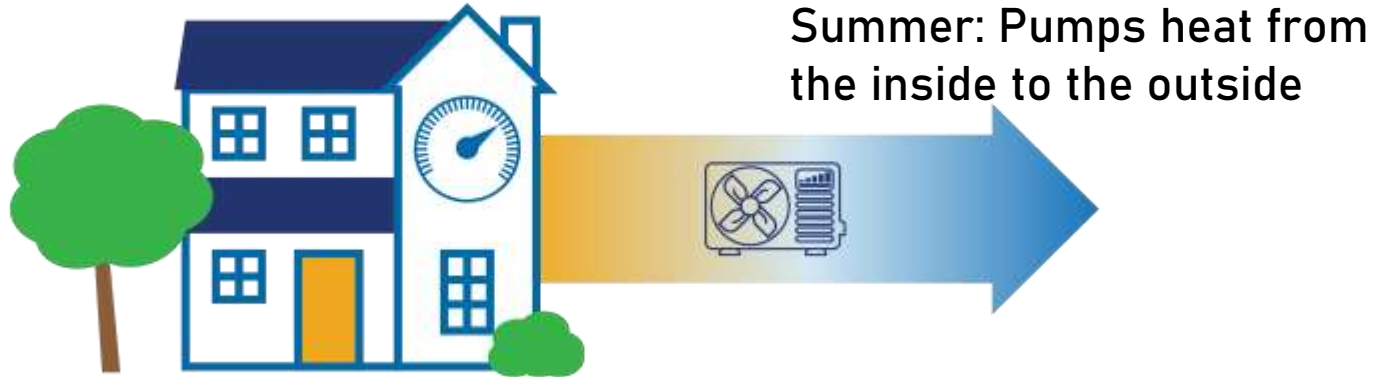


Policy





What is a Heat Pump



Same technology as:



Air Conditioner



Refrigerator

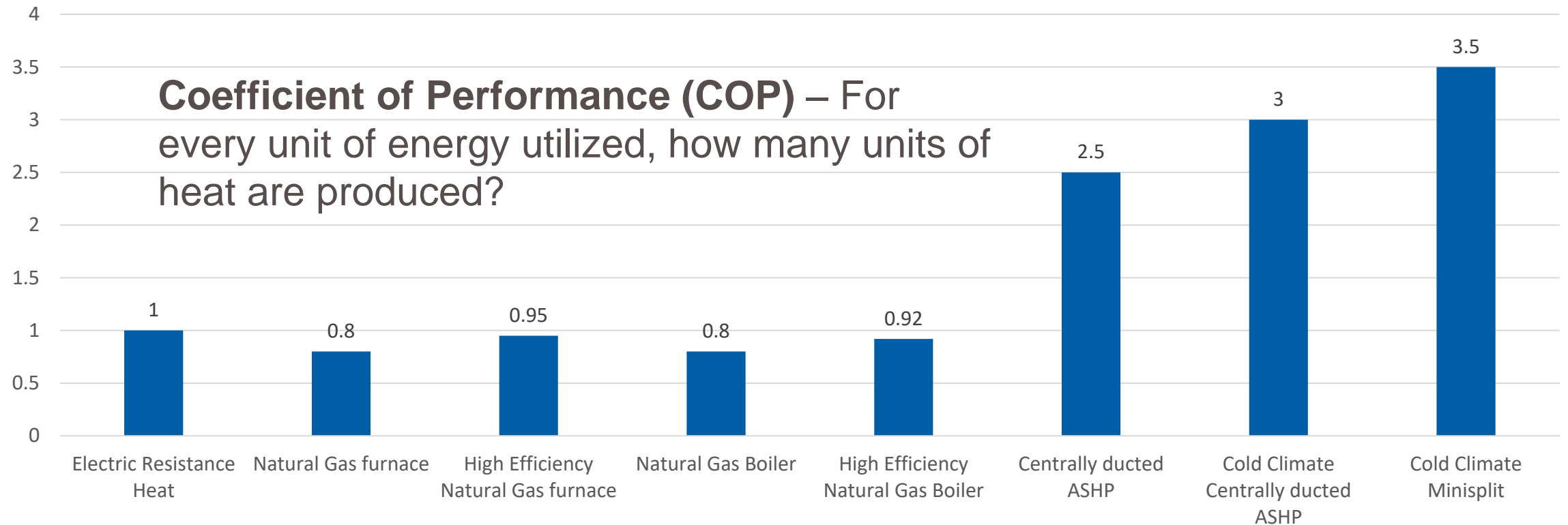




Why ASHPs?

Immense fuel efficiency and carbon reduction

Approximate COP





What's in focus for today?

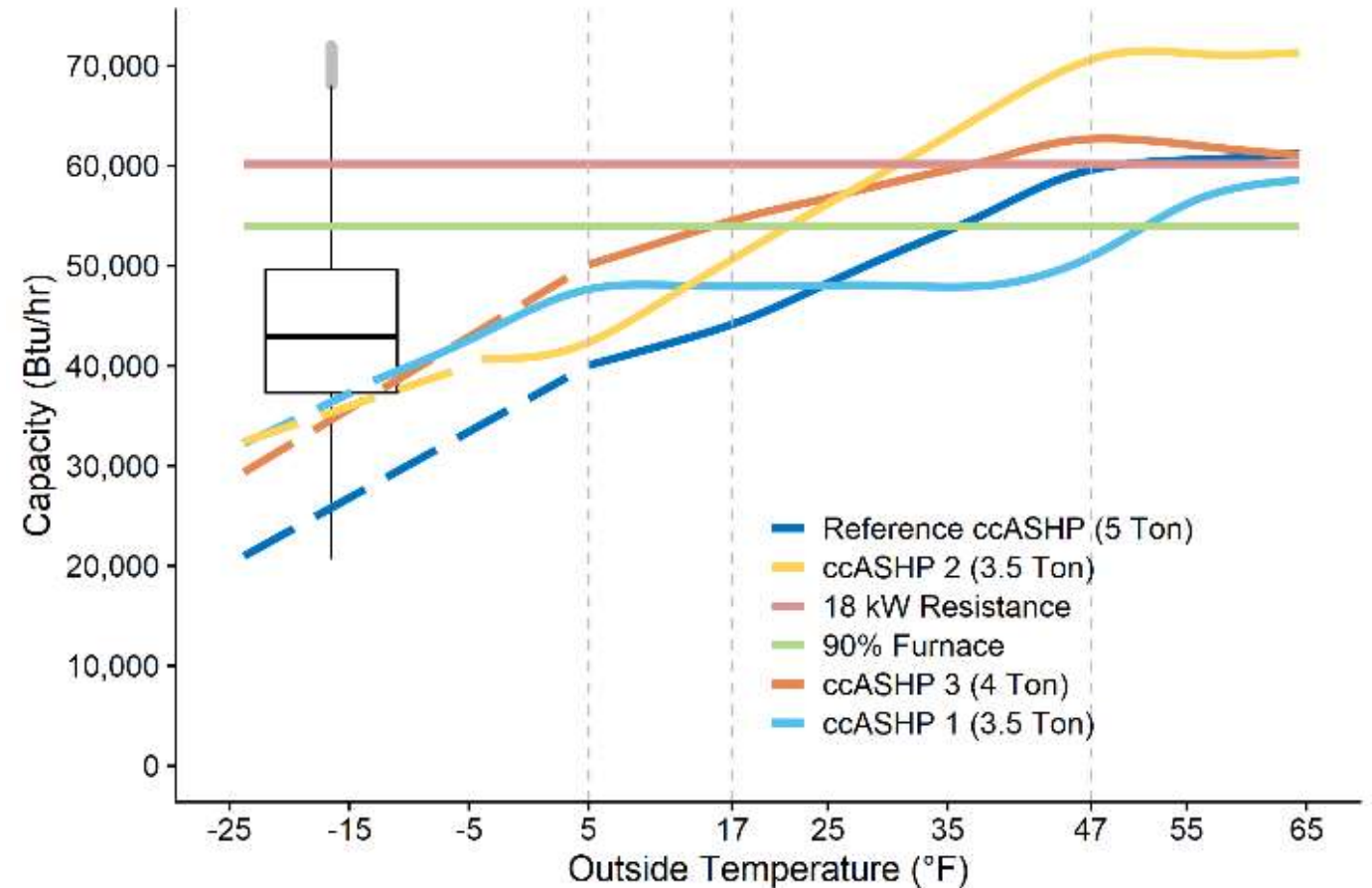
- **Residential Heat Pumps**
 - Minisplit heat pumps
 - Centrally ducted heat pumps
 - Dual-fuel heat pumps
 - Air-to-water heat pumps
 - Ground source heat pumps
 - Gas fired heat pumps
- **Commercial Heat Pumps**
 - VRF heat pumps
 - RTU heat pumps
- **Industrial heat pumps**





ASHPs in cold and very cold climates

- ccASHPs offer promise for large site energy savings and emissions reductions
- And many models do work at these very cold design temperatures!
- But they still have significant capacity limitations compared to space heating needs





Low hanging fruit opportunities

Electric resistance heated homes

- 2X - 3X customer bill reduction and emissions reductions
- Addresses customer comfort issues

Propane heated homes

- ~40% customer bill reduction and ~35% - 70% emissions reductions
- Addresses customer comfort issues
- Hedges against fuel price volatility





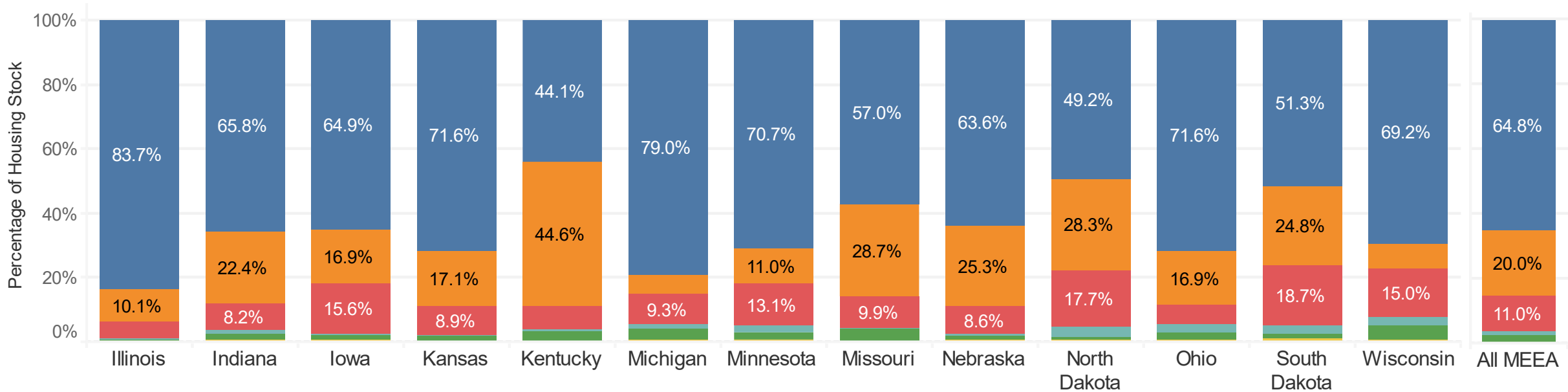
Midwest single family heating fuel mix

- 2,000,000 SF homes with propane heat
- 3,500,000 SF homes with electric heat
- 14,800,000 SF homes with natural gas heat

Heating Fuel

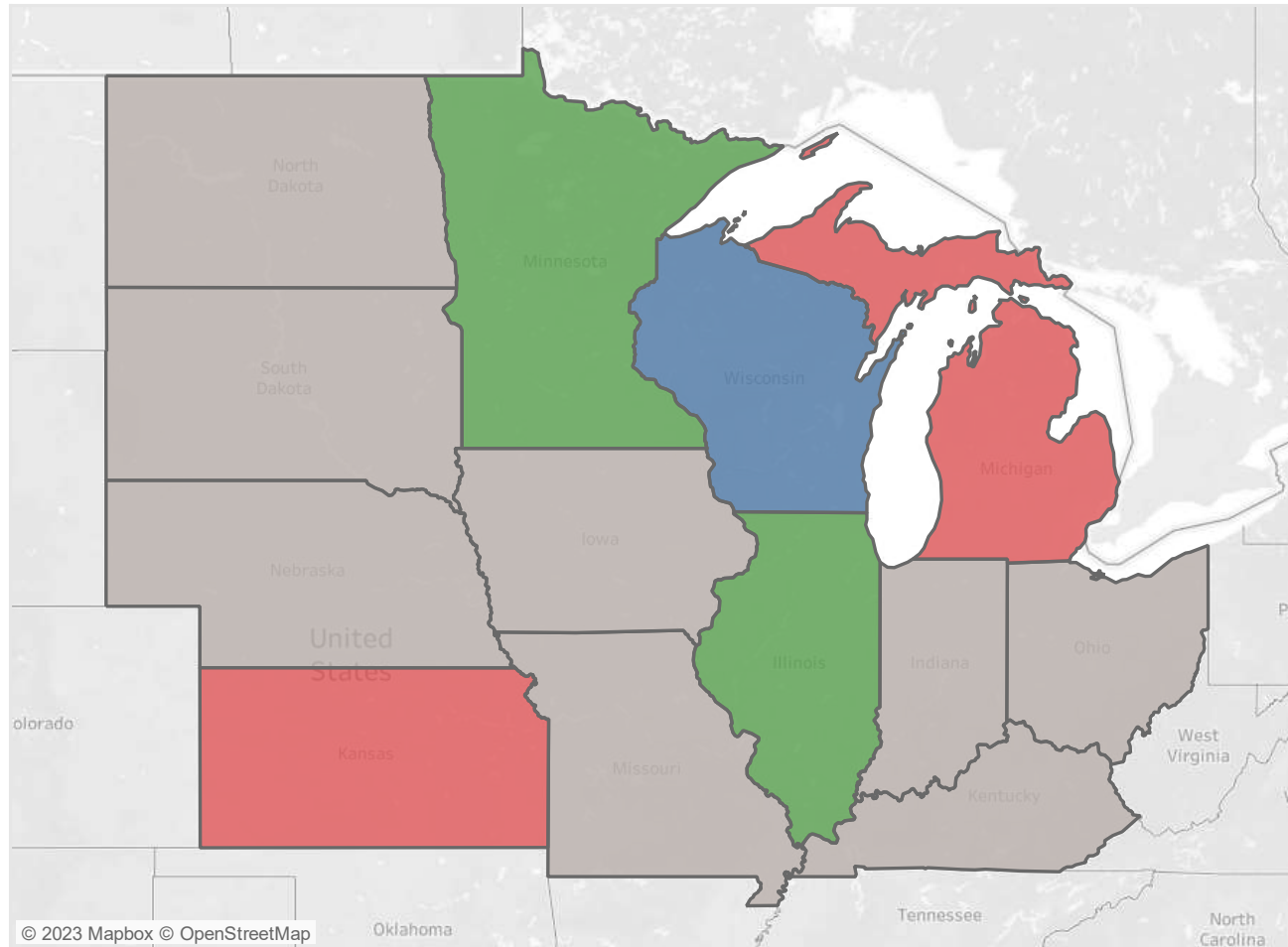
- Natural Gas
- Electricity
- Bottled, tank, LP gas
- Fuel oil, kerosene, liquid fuels
- Wood
- Other fuels

Fuel Mixes per State





Midwest Policy Landscape



Fuel Switching Policy

- Allowed for regulated and unregulated fuels
- No fuel switching allowed at all
- Allowed for regulated but not unregulated fuels
- None established





Why do we need to act now?

“The mission of DOE’s Office of Energy Efficiency and Renewable Energy is to accelerate the research, development, demonstration, and deployment of technologies and solutions to equitably **transition America to net zero greenhouse gas emissions economy-wide by no later than 2050**”

Vision: The Future of Home Heating is Heat Pumps

By 2030 air source heat pumps (ASHPs) are the first choice for contractors and homeowners replacing heating systems or air conditioners, optimized to provide heating as well as cooling.

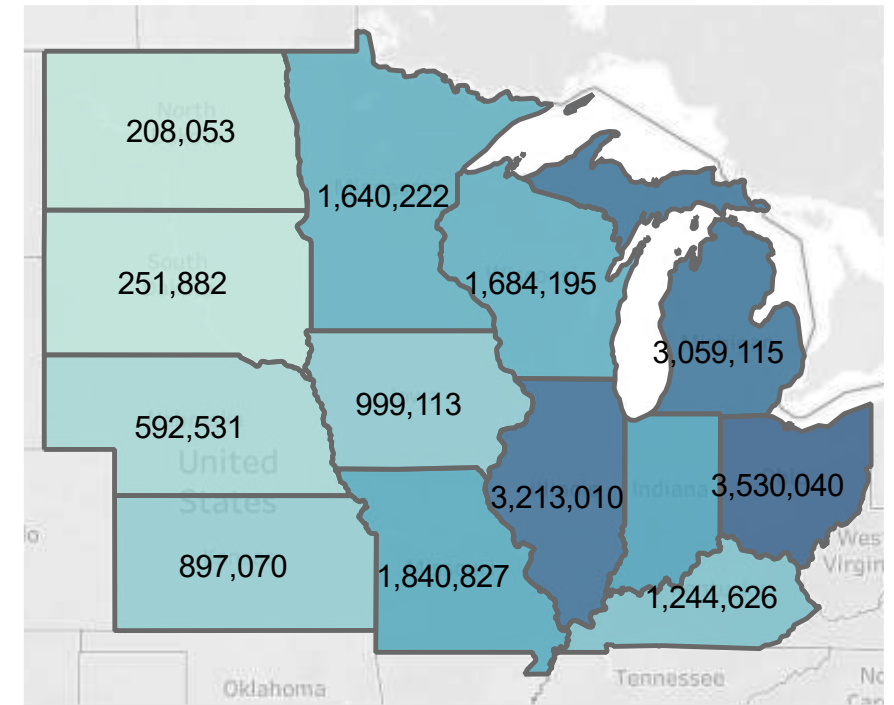




Midwest ASHP Collaborative

Accelerating ASHP adoption faster and better, together

- Funded by Pacific Northwest National Laboratory (PNNL)
- Delivered by **CEE** and **Slipstream**
 - In partnership with **MEEA** and **Elevate**
- Objectives:
 - Cross pollinating program best practices
 - Rate design for heat pumps
 - Workforce development
 - Regional market transformation strategy



Number of SFH per state





About Slipstream

Climate + Clean Energy Solutions
for everyone.

**The knowledge, people, and resources to solve
our biggest energy challenges.**



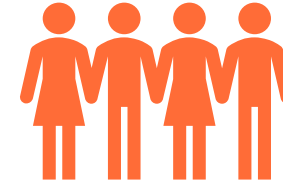


Needs Assessment: what stands in our way?



Home, Equipment, and Cost Challenges

- Cold climate zones add extra considerations
- High heating loads (envelope upgrades needed)
- High first cost
- Complex and nuanced applications
- Product ratings not reflecting real-world performance
- Operational cost barriers in homes with natural gas



People Challenges

- Lack of faith in the product and skepticism of efficacy in extreme cold
- Lack of customer and contractor awareness
- Workforce constraints
- Equitable adoption





Needs Assessment: what's in our favor?

Big benefits for customers with electric and propane heated homes

Proven and advanced product with more advancements on the way

Great start to programs and market support

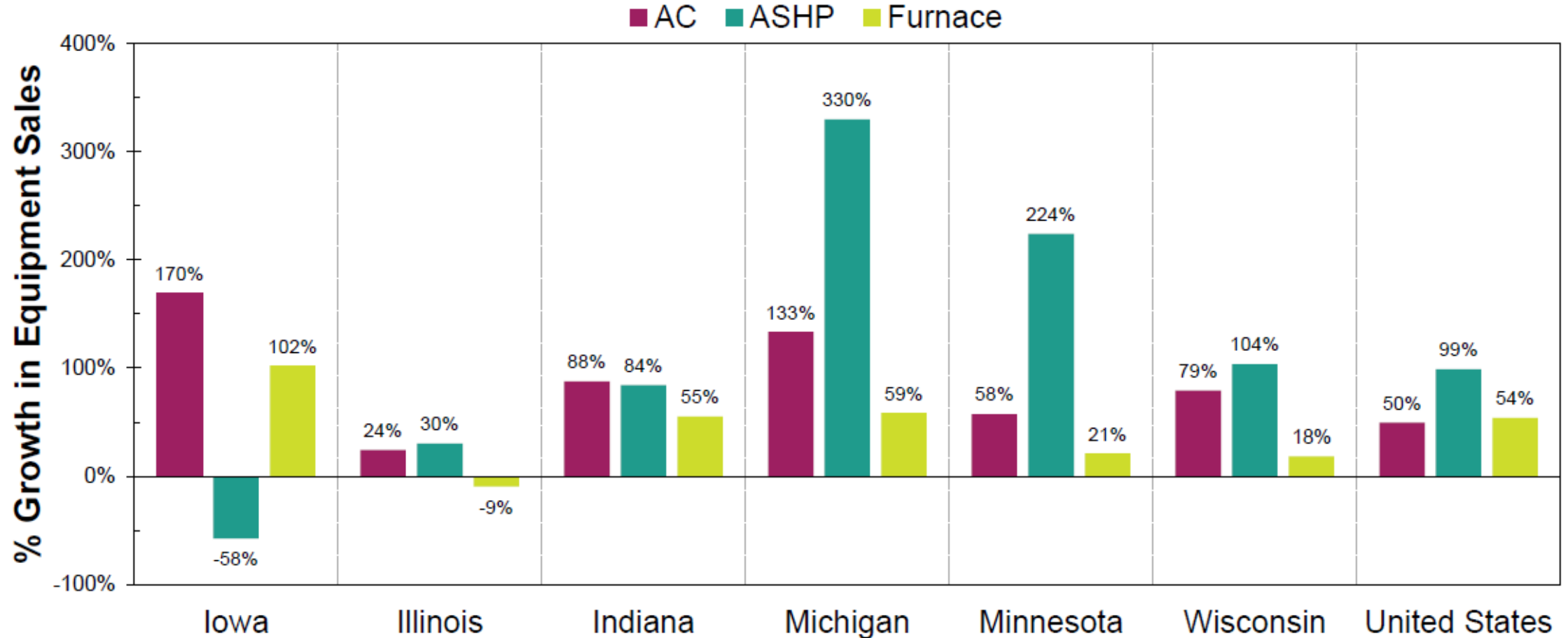
Federal attention and dollars

Growing customer, contractor and industry awareness and attention





Needs Assessment: sales trends



Data Source: State data obtained from Unity Market Report (2022) prepared by HARDI under data license by HARDI. Reuse is prohibited without permission. All rights reserved
U.S. data is AHRI reported manufactured shipments





Needs assessment: what's happening regionally



- Wisconsin ASHP market transformation planning
- DTE propane conversions in a cold-climate (non-efficiency approach)
- Minnesota ASHP Collaborative
- Michigan ASHP Collaborative





Contractor training: ComEd example



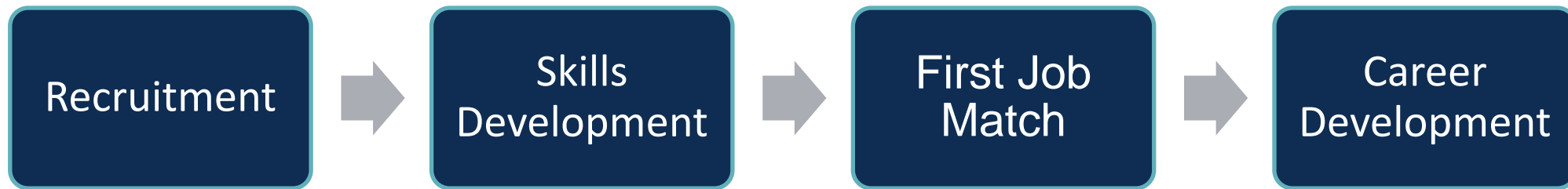
 Barriers identified by the needs assessment
 Training interventions from our plan to address barriers





ASHP Workforce Development

How can we equitably empower individuals to enter the HVAC field and develop career quickly and inexpensively to serve growing demand for qualified ASHP installers?



The importance of electric rates in achieving widespread ASHP adoption



Center for Energy and Environment



Why electric rates for ASHPs are important

Very little electrification is economic for the customer at current electric rates



Yet, lower electric rates are justified, particularly for hybrid systems



This is because standard rates typically overcharge ASHP customers



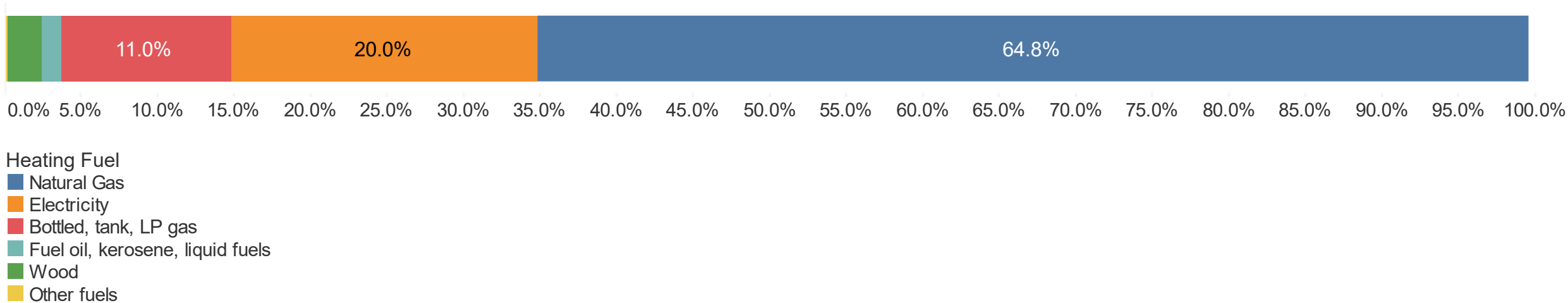
Solving this issue is important for achieving equitable electrification



Natural gas is fuel of choice for heating in Midwest

In Midwest, nearly 2/3 of single-family households heat with natural gas

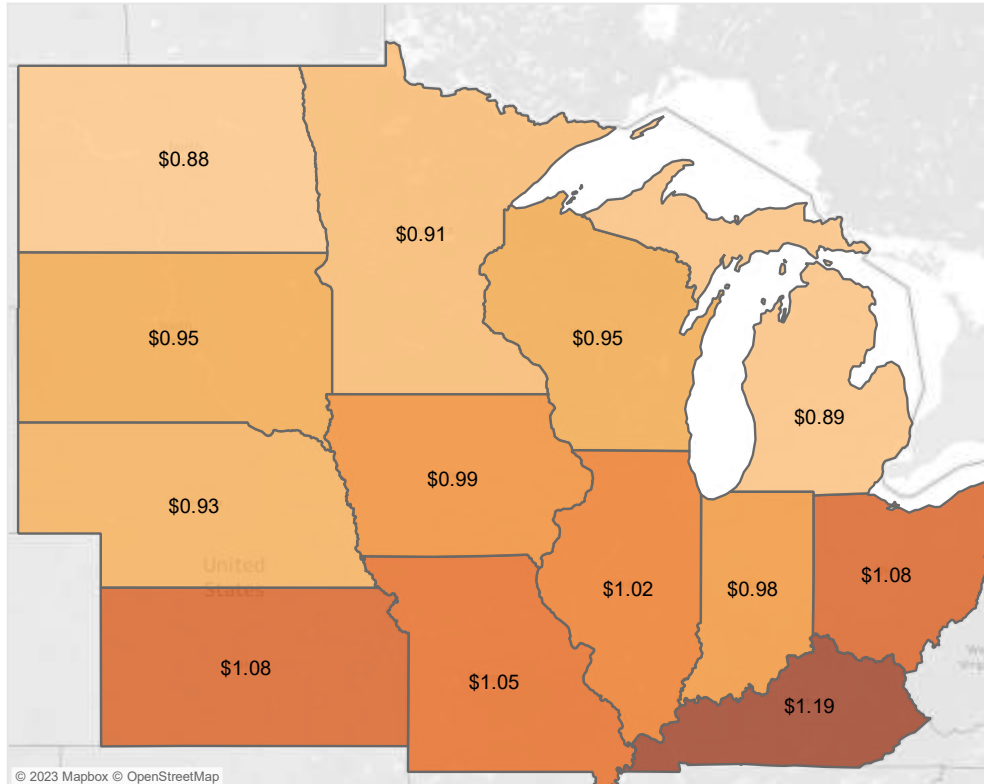
Heating Fuel Mix for Single Family Homes in MEEA States



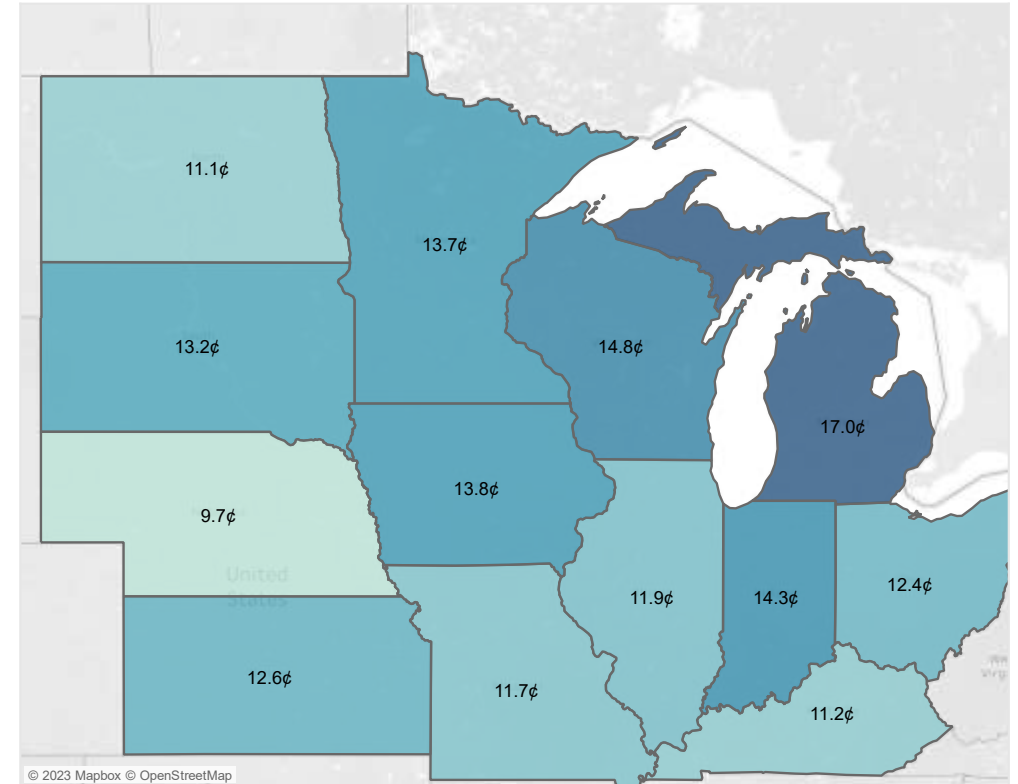


Natural gas remains affordable fuel in Midwest

Gas costs (\$0.88 - \$1.19/therm)



Electric rates (9.7 – 17.0 ¢/kWh)



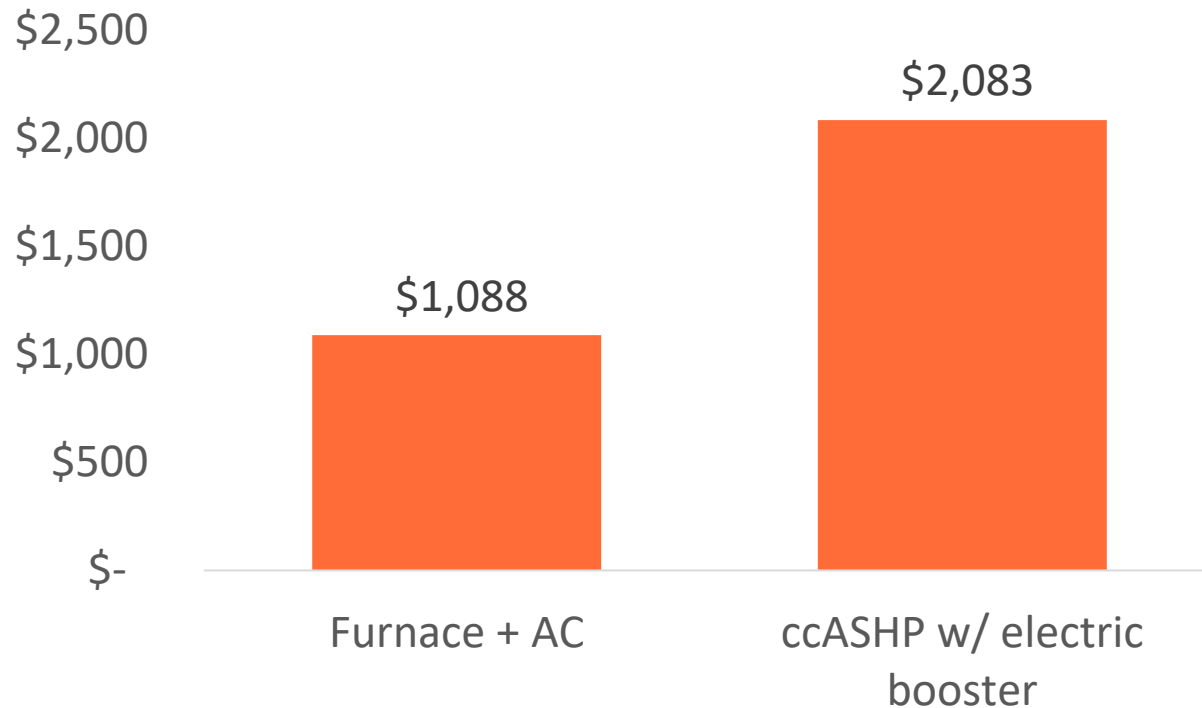
EIA, 2021 statewide averages

Full electrification will result in bill increases for the vast majority of customers



Energy bill illustration: Potential for 2x increase in heating/cooling costs

Annual heating and cooling costs



Assumptions

Rates (MN – EIA) -

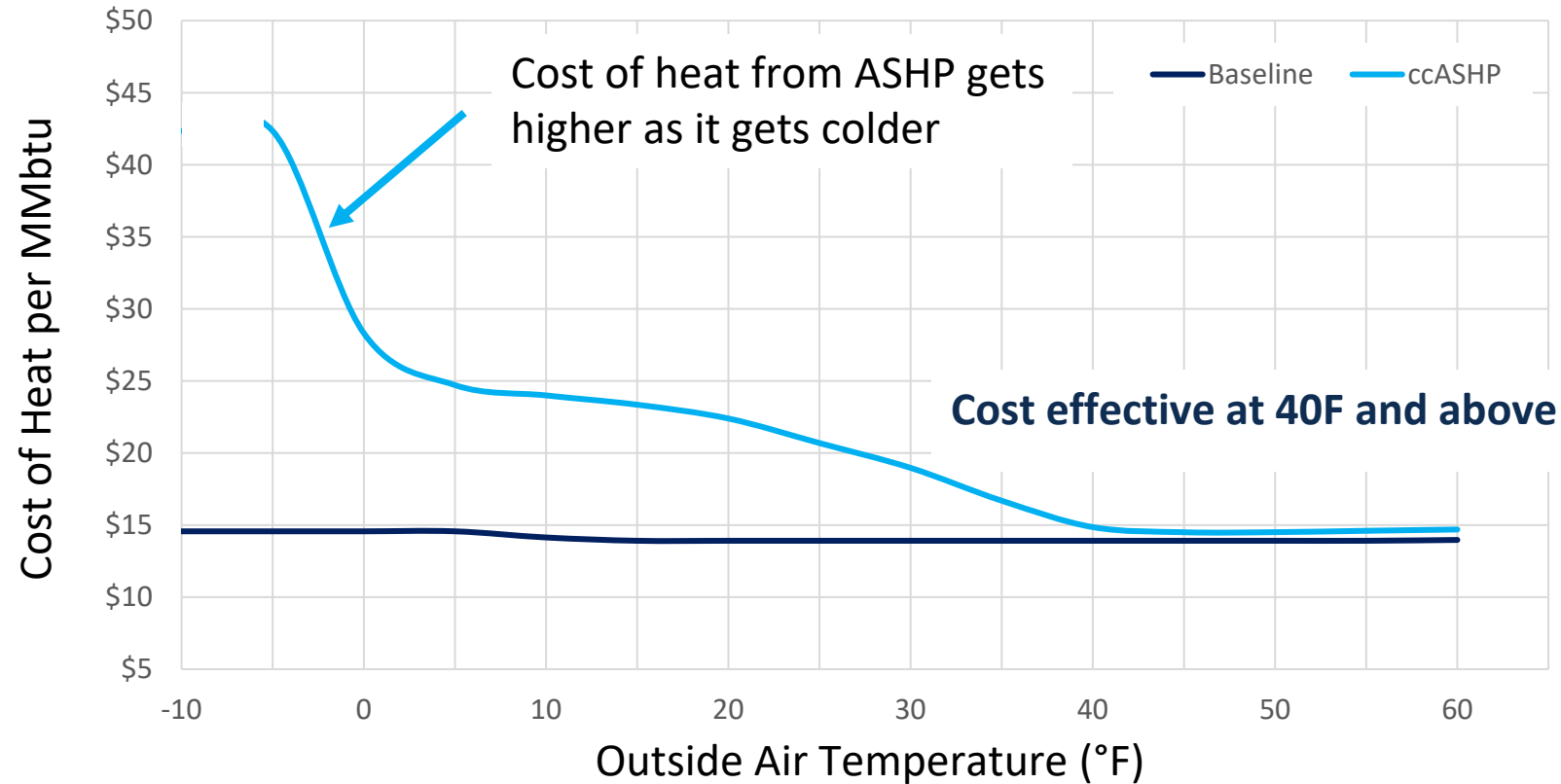
- Electricity – 13.7 ¢/kWh
- Gas – 91 ¢/therm

Home -

- Single-Family Detached
- Two-story
- Built in the 1970s
- 2,200 square feet
- Condensing Furnace and SEER 14 AC
- ccASHP – SEER 18, HSPF 11



Even at high gas prices, electrification is only cost-effective at moderate temps at current rates



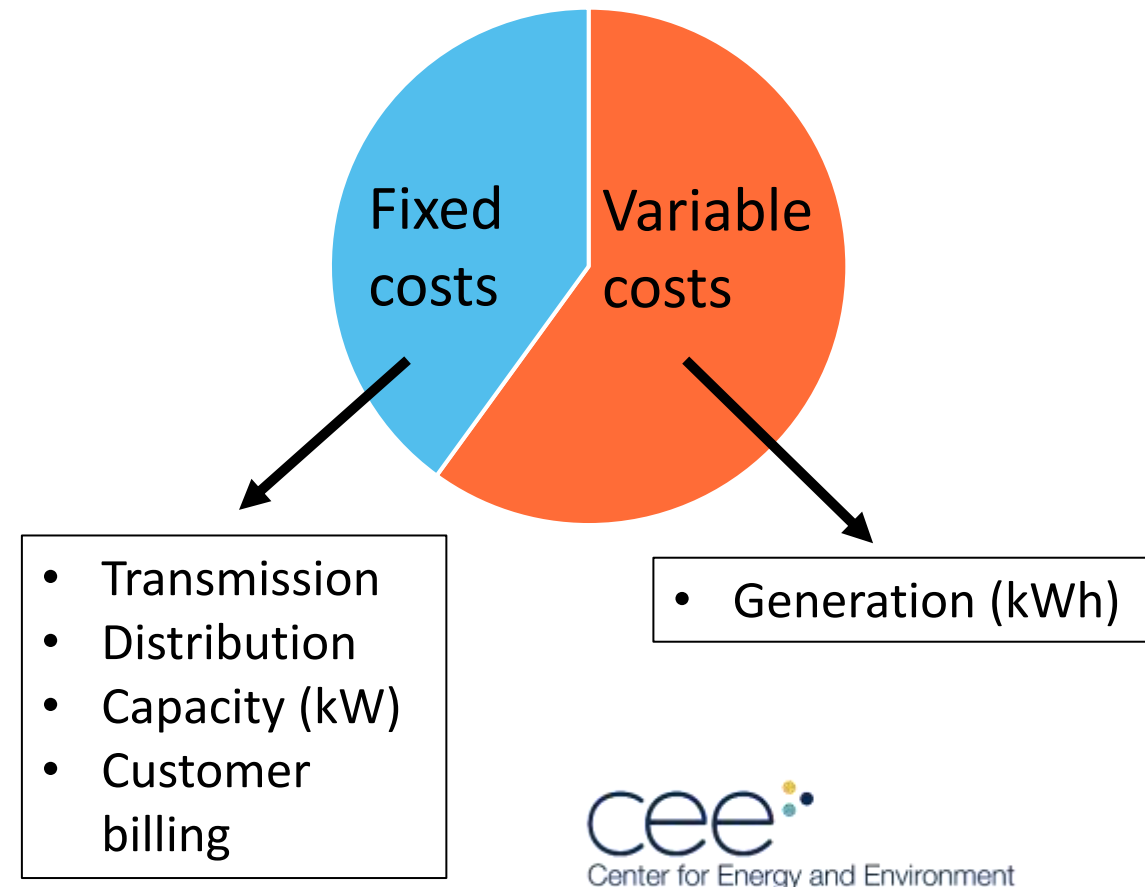
- Elec - \$0.137/kWh
- **Gas - \$1.23/therm**



Residential rates composed of fixed and variable costs

- Rates seek to recover costs for variable and fixed costs to serve the customer
- ASHPs do not increase (or only moderately increase) fixed costs on the system
- Only variable costs increase, compared to typical residential customer

Cost components of residential electric rates

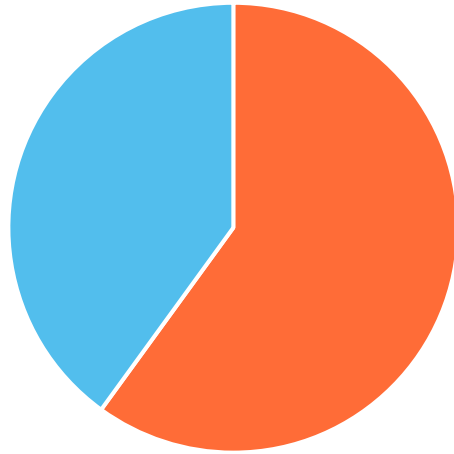




ASHP customers overpay at standard rates

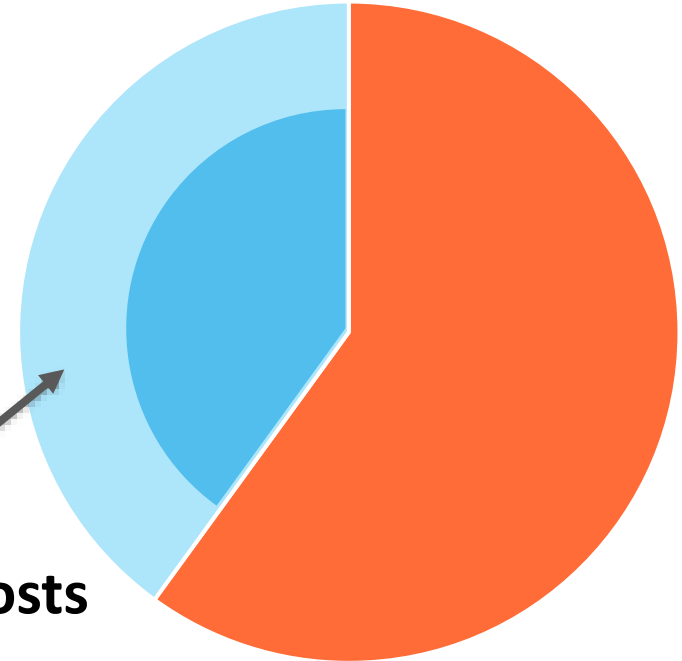
Average residential customer

10,000 kWh usage
\$1370 annual bill



ASHP customer

20,000 kWh usage
\$2740 annual bill



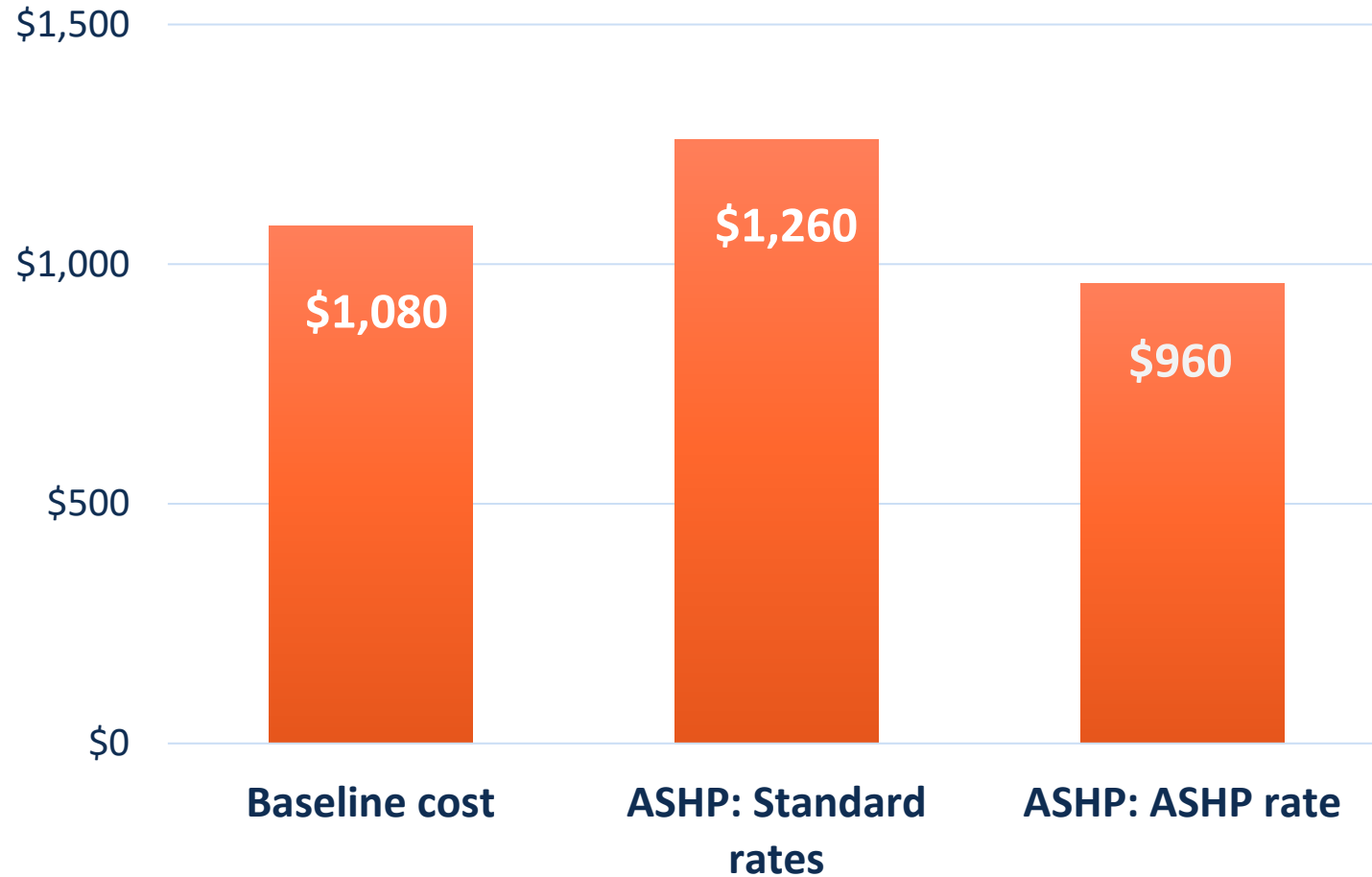
Excess payment above costs

\$548/yr

Figure is illustrative only of magnitude of costs based on a 60/40 split between variable and fixed costs; not based on actual rate analysis or ASHP performance



MN example: Impact of proposed ASHP rate



Customer pays \$300/yr less with ASHP rates

Assumptions:
Hybrid cc-ASHP system
25 degree switchover
12.4 ¢/kWh standard rate
6.6 ¢/kWh ASHP rate
Includes fuel cost charge



But don't we already have electric space-heating rates?

- Many utilities do, but these were largely designed for heating with 100% electric resistance
- Often don't apply to hybrid systems
- Often require an extra meter be installed, at a cost of thousands of dollars
- However, in some cases these rates will work for hybrid ASHP systems



Key Take-aways

- Developing the right electric rates for ASHPs, particularly hybrid systems, will be essential to reaching full potential of the technology
- It is also important for equity
 - Avoid un-intended consequences of increased energy burden on low-income populations
- More engagement needed with public utilities commissions and utility rates folks
- More analysis and data needed
 - CEE is working on white paper to be released later this year



Zooming out: realizing potential



Utility program design



Workforce expansion and contractor engagement



Customer engagement



Optimizing electric rates

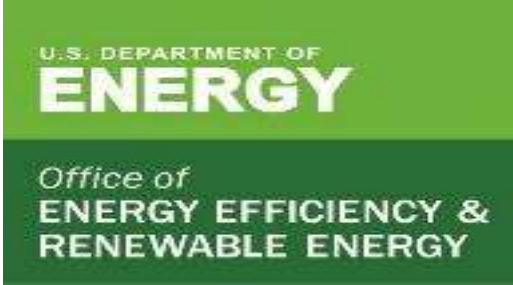


Low-income programming



Antonio Bouza
Department of Energy
Building Technologies Office

Federal Funding Updates



HEAT PUMP SUMMIT

Midwest Energy Solutions Pre-Conference Workshop

Federal Funding Updates on BIL and the IRA

Antonio M Bouza

Technology Manager

U.S. DOE Building Technologies Office

January 30, 2023



DOE Goals and Research Strategy

We Have a Clear Directive: Put the U.S. on an irreversible pathway to achieve a carbon-free electricity sector by 2035 and a 100% clean energy economy by 2050

At the same time, we will:

- Improve affordability, resilience and performance of buildings
- Provide workforce training and support creation of good-paying, quality clean energy jobs
- Advance diversity, equity, and inclusion in STEM
- Ensure overall benefits of investments are delivered to disadvantaged communities



Outline

- Introduction
- Heat Pump Sales Data
- Bipartisan Infrastructure Law (BIL)
- Inflation Reduction Act (IRA)
- Defense Production Act (DPA), initial funding coming from IRA
- Other Funding Opportunities
- Cold Climate HP Technology Challenge... *field validations*

Introduction

- **Bipartisan Infrastructure Law (BIL)**, also referred to as the Infrastructure Investment and Jobs Act (IIJA)
- **Inflation Reduction Act (IRA)**
- **Defense Production Act (DPA)** to accelerate domestic manufacturing of clean energy technologies, includes heat pumps

Part of the Biden-Harris Administration's plan to lower energy costs for families, strengthen national security, and achieve lasting American energy independence that reduces demand for fossil fuels and bolsters our clean energy economy.

Heat Pump Sales, *building on momentum*

Product Type	2017	2018	2019	2020	2021	Last 5 Years % CHG
Gas Warm Air Furnaces	3,133,768	3,416,571	3,441,872	3,351,176	4,008,894	27.93%
Oil Warm Air Furnaces	37,268	38,429	40,692	36,505	39,548	6.12%
Unitary Air Conditioning	5,185,747	5,399,760	5,359,775	5,910,284	6,282,285	21.15%
Unitary Heat Pump	2,619,782	2,940,502	3,109,840	3,418,478	3,916,766	49.51%

Technology central to our decarbonization strategy, moving away from the fossil energy.

Sales data from Air-Conditioning, Heating, & Refrigeration Inst., Monthly Shipments, <https://ahrinet.org/statistics>

History

- **Bipartisan Infrastructure Bill**
 - Pub. L. 117-58
 - Signed into law by President Biden on **November 15, 2021**
- **Defense Production Act (DPA) to Accelerate Domestic Manufacturing of Clean Energy**
 - President Biden Invokes Defense Production Act on ***June 6, 2022***
 - Accelerate domestic production of five key energy technologies including heat pumps
- **Inflation Reduction Act (IRA) of 2022**
 - Pub. L. 117-169
 - Signed into law by President Biden on ***August 16, 2022***

The infrastructure deal includes more than **\$62 billion for the U.S. Department of Energy (DOE)** to deliver a more equitable clean energy future for the American people by doing the following:

- Investing in American manufacturing and workers.
- Expanding access to energy efficiency and clean energy for families, communities and businesses.
- Delivering reliable, clean, and affordable power to more Americans.
- Building the technologies of tomorrow through clean energy demonstrations.

Source: <https://www.energy.gov/articles/doe-fact-sheet-bipartisan-infrastructure-deal-will-deliver-american-workers-families-and-0>

For the next five years, the BIL will stand up

- 60 new DOE programs,
- 16 demonstration and 32 deployment programs, and
- Expands funding for 12 existing Research, Development, Demonstration, and Deployment (RDD&D) programs.

Source: <https://www.energy.gov/clean-energy-infrastructure/bipartisan-infrastructure-law-programs>

BIL and Heat Pumps (HVAC)... additional funding

Section:	Additional funding to	DOE Funding
40551	Expand the Weatherization Assistance Program (WAP), which provides grants for weatherization retrofits that increase the energy efficiency of dwellings owned or occupied by low-income persons	\$3.5 Billion
40552	For the Energy Efficiency and Conservation Block Grant Program, which provides grants to assist states, local governments, and Tribes in implementing strategies—including district heating and cooling and a broad range of building efficiency initiatives—to reduce energy use, reduce fossil fuel emissions, and improve energy efficiency.	\$550 Million
40554	Assisting Federal Facilities with Conservation Technologies Program, which provides grants to federal agencies that they can leverage with private capital to make energy and water efficiency upgrades to federal buildings.	\$250 Million

BIL and Heat Pumps (HVAC)

Section:		DOE Funding (Million)
40502	Establishes the Energy Efficiency Revolving Loan Fund Capitalization Grant Program, which will provide capitalization grants to States to establish revolving loan funds that provide loans and grants for energy efficiency audits, upgrades, and retrofits	\$250
40511	Building Codes Implementation for Efficiency and Resilience Program, a five-year competitive grant program to help states and local governments cost-effectively implement updated building energy codes, which set minimum energy efficiency standards for new residential and commercial buildings, additions, and major renovations.	\$225
40541	Fund grants for energy improvements at public school facilities, including but not limited to energy-saving improvements to schools' building envelopes, controls, water-heating systems, and heating, ventilation, and air conditioning (HVAC) systems.	\$500

Inflation Reduction Act of 2022 represents a historic, **\$369 billion** investment in the modernization of the American energy system

- Clean energy technologies that will lower energy costs for families and businesses while helping drive ***2030 economy-wide greenhouse gas (GHG) emissions to 40% below 2005 levels***
- Bolster domestic manufacturing and provide direct investments for overburdened and underserved communities across America
- Act will lower energy costs for working families with rebates and tax incentives for home energy improvements (heat pumps), solar energy, and electric vehicles

Source: https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf

Inflation Reduction Act (IRA) of 2022: *Heat Pumps*

Tax incentives for more efficient homes and commercial buildings, rebate programs for home efficiency and electrification, and funding to assist with state and local building-code adoption and compliance are key Inflation Reduction Act measures that will reduce direct emissions from buildings.

Together with the Bipartisan Infrastructure Law will help position the U.S. to reach ***President Biden's goal of reducing greenhouse gas emissions 50-52% in 2030.***

IRA and Heat Pumps (HVAC)

Section:	
13301	Increases and extends through 2032, the 25C energy efficient home improvement credit, a tax credit subsidizing consumer expenditures on certain residential building envelope and heating and cooling equipment improvements. Eligible uses for the tax credits include but are not limited to air-source and geothermal heat pumps, heat pump water heaters, and biomass stoves, along with air conditioners, space heating equipment, and water heating equipment that meet or exceed efficiency tiers established by the Consortium for Energy Efficiency.
13303	Increases and extends through 2032 the 179D energy efficient commercial buildings deduction, a tax credit for commercial buildings with lighting, building envelope, or heating, cooling, ventilation, and hot water systems, that meet or exceed a 25% energy-savings threshold relative to standards set by ASHRAE.
13304	Increases and extends through 2032 the 45L new energy efficient home credit, a tax credit for eligible new or substantially reconstructed homes that meet applicable ENERGY STAR home program or DOE Zero Energy Ready Home program requirements.

IRA and Heat Pumps (HVAC)

Section:	
13501	Extends and provides up to \$10 billion for the 48C advanced energy project credit, a tax credit of up to 30% for manufacturing facilities for production of clean energy, including energy conservation technologies with residential, commercial, and industrial applications.
30001	Provides \$500 million in funding for the Defense Production Act . DOE has issued a Notice of Intent indicating that it will use \$250 million of this funding to support domestic manufacturing and deployment of electric heat pumps.
50121	Provides DOE \$4.3 billion to establish a state-administered Home Energy Performance-Based Whole-House Rebates (HOMES Rebate) program, which provides rebates for energy efficiency retrofits to individual households and multifamily buildings. The magnitude of these rebates depends on the extent to which the retrofits reduce household-level energy use, and rebate limits are higher for low- and moderate-income households.

IRA and Heat Pumps (HVAC)

Section:	
50122	Provides DOE \$4.5 billion to establish a state- and Tribe-administered High-Efficiency Electric Home Rebate Program, with \$225 million allocated for Tribes. This program will provide low- and moderate-income households point-of-sale rebates for qualified electrification projects, including certain building envelope upgrades and purchase of high-efficiency electric appliances (e.g., heat pumps and heat pump water heaters).
50123	Provides DOE \$200 million to assist states in developing and implementing state-based home energy efficiency contractor training grant programs to train and educate contractors involved in the installation of home energy efficiency and electrification improvements, including improvements for rebates under the HOMES Rebate program (§50121) or high-efficiency electric home rebate program (§50122).
50131	Provides DOE \$1 billion to assist states and local governments in adopting and enforcing improved building energy codes (i.e., equivalent to ANSI/ASHRAE/IES Standard 90.1–2019, the 2021 International Energy Conservation Code [IECC], or the zero-energy provisions in the 2021 IECC) for new and renovated residential and commercial buildings.

BIL/IRA Current RFIs

- **DE-FOA-0002981: INFLATION REDUCTION ACT (IRA) REQUEST FOR INFORMATION (RFI): HOME EFFICIENCY & ELECTRIFICATION REBATE PROGRAMS:** This is a Request for Information (RFI) issued by the U.S. Department of Energy's (DOE) Office of State and Community Energy Programs. The intent of this request is to inform DOE on best practices for the Home Energy Rebate programs to support durable market demand for installations that improve housing energy performance nationwide. The Home Energy Rebate programs are comprised of two provisions authorizing \$8.8 billion in spending from the Inflation Reduction Act of 2022 (Sec. 50121 and Sec. 50122 of Pub. L. 117-169). Responses to this RFI will be used to create program guidance that will assist states, territories, and Indian Tribes in designing, managing, and improving Home Energy Rebate programs. The goal is to collect information that will ultimately support states, territories, and Indian Tribes in creating Home Energy Rebate programs that effectively serve U.S. households with technology products and services that reduce energy bills, increase home comfort, improve indoor air quality, and reduce greenhouse gas emissions. (<https://eere-exchange.energy.gov/FileContent.aspx?FileID=15a41dae-bbe2-44fd-adfb-e8dae24c3ff5>) **Submission Deadline: 3/3/2023 8:00 PM ET**, Contact: IRAHomeRebates@hq.doe.gov
- **DE-FOA-0002883: BI-PARTISAN INFRASTRUCTURE LAW (BIL) REQUEST FOR INFORMATION ON ENERGY EFFICIENCY CONSERVATION BLOCK GRANT (EECBG) COMPETITIVE PROGRAM.** This is a Request for Information (RFI) issued by the U.S. Department of Energy's (DOE) Office of State and Community Energy Programs (SCEP). The intent of this RFI is to obtain public input regarding the solicitation process and structure of a DOE Funding Opportunity Announcement (FOA) to fund Sec. 40552, the Energy Efficiency and Conservation Block Grant (EECGB) Competitive Program, which aims to support units of local government including Indian Tribes ineligible for direct formula grants from DOE under the EECGB program to lower fossil fuel emissions and energy use in their jurisdictions, in accordance with the Program's authorizing legislation, Title V, Subtitle E of the Energy Independence and Security Act of 2007. (<https://eere-exchange.energy.gov/FileContent.aspx?FileID=f1c4bd4c-53e0-4ea9-9e9d-966ddce8182f>), **Submission Deadline: TBD**, Contact: EECBG_RFI_Competitive@hq.doe.gov

BIL/IRA Current RFIs (just closed last Thursday)

- **DE-FOA-0002885: BIPARTISAN INFRASTRUCTURE LAW (BIL): REQUEST FOR INFORMATION (RFI) PREPARING WORKERS AND BUSINESSES TO DELIVER ENERGY EFFICIENCY AND BUILDING ELECTRIFICATION MEASURES:** This is a Request for Information (RFI) issued by the U.S. Department of Energy's (DOE) Office of State and Community Energy Programs (SCEP). The intent of this RFI is to obtain public input regarding the solicitation process and structure of future DOE Funding Opportunity Announcements (FOA) to fund the Energy Auditor and Career Skills Training programs, in accordance with the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law (BIL). This RFI also seeks public input on the State-Based Home Energy Efficiency Contractor Training program, as set forth in the Inflation Reduction Act (IRA). (<https://eere-exchange.energy.gov/FileContent.aspx?FileID=daa7fb62-d30e-4581-bbdc-35cbf4ac0a30>), *Submission Deadline: 1/26/2023 5:00 PM ET*, contact: eworkforceprograms@hq.doe.gov

Defense Production Act (DPA) funding IRA: *Heat Pumps*

Defense Production Act (DPA) of 1950 to Accelerate Domestic Manufacturing of Clean Energy

- President Biden Invokes Defense Production Act on June 6, 2022, to accelerate the production and adoption of five areas of clean energy technologies: solar; transformers and grid components; ***heat pumps***; insulation; and electrolyzers, platinum group metals, and fuel cells for clean hydrogen
- Unlocking new powers to meet this moment and authorized the DOE to use the DPA to rapidly expand American manufacturing and adoption of critical clean energy technologies
- DPA would allow, among other things, guaranteed government support of domestic manufacturing and sales, thus providing market certainty.

Defense Production Act (DPA): *Heat Pumps...*

Defense Production Act Roundtable for Electric Heat Pumps, August 10, 2022, with the purpose to:

- Gather input and ideas from key stakeholders (industry, unions, trade groups, environmental organizations, and energy justice groups) on how the DPA can best be used to accelerate domestic manufacturing and deployment of electric ***heat pump space and water heaters***.
- Provide opportunities for stakeholders to describe the current situation and express their needs, ideas, and concerns.

Defense Production Act (DPA): *Heat Pumps (\$250M)*

- Initial DPA funding coming from IRA, DOE can leverage this authority to accelerate domestic manufacturing and uptake of key clean energy technologies, including electric heat pumps
- Notice of Intent and Request for Information regarding establishment of a Program to Use Defense Production Act to Support Electric Heat Pump Manufacturing and Deployment was published on November 2, 2022 ([Heat pumps NOI RFI Final Clean FINAL110122_0.pdf \(energy.gov\)](#))
- DOE and the Office of Manufacturing and Energy Supply Chains (MESC) issued the NOI to notify interested parties of its intent to support domestic manufacturing of electric heat pumps
- Feedback from all stakeholders regarding the application process, examples of eligible projects, potential funding sizes required, and criteria for qualification and selection of eligible projects to participate in the electric heat pumps DPA program

R&D Funding Opportunities: BENEFIT 2022/23

- Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) – 2022/23 funding opportunity announcement (FOA)
- FOA will invest up to \$45 million across five topic areas to research and develop high-impact, cost-effective technologies and building retrofit practices that will reduce carbon emissions, improve flexibility and resilience, and lower energy costs.
- BENEFIT 2022/23 will spur innovations in heat pump R&D
- **Topic 1: Heating, Ventilation, and Air Conditioning and Water**
Heating: Technologies with improved materials, components, equipment design and engineering, lower cost manufacturing processes, and easier installation.
- Concept papers are due **by 5 p.m. ET on February 7, 2023**

R&D Funding Opportunities: SBIR apps coming soon

- SBIR Phase I: “C56-10. JOINT TOPIC: DECARBONIZATION OF AGRICULTURE, BUILDINGS, TRANSPORT, INDUSTRY AND THEIR COMMUNITIES”
- FOA was released on Monday, November 7, 2022
- <https://science.osti.gov/-/media/sbir/pdf/TechnicalTopics/FY23-Phase-I-Release-2-Combined-TopicsV412222022.pdf>
- Included two BTO topics areas under Buildings Decarbonization, heat pump related:
 - Decarbonizing Buildings HVAC Direct Air Capture (DAC) systems
 - ***Community-Driven Building Decarbonization for a Just and Equitable Energy Transition***
- Applications are due February 23, 2023

CCHP Technology Challenge Timeline

Specification Development



Product Development & Deployment



Role for State / Utility Partners

Following successful lab testing, prototypes move forward to field testing

Field validation....



Thank You

Antonio M Bouza

Technology Manager, HVAC & Water Heating R&D
U.S. Department of Energy, Energy Efficiency & Renewable Energy
Building Technologies Office
antonio.bouza@ee.doe.gov

Heat Pumps → Happy People → Happy Planet

Backup Slides

Inflation Reduction Act (IRA) of 2022: *Heat Pumps*

“(5) HEAT PUMP AND HEAT PUMP WATER HEATERS; BIOMASS STOVES AND BOILERS.—Notwithstanding paragraphs (1) and (2), the credit allowed under this section by reason of subsection (a)(2) with respect to any taxpayer for any taxable year shall not, in the aggregate, exceed \$2,000 with respect to amounts paid or incurred for property described in clauses (i) and (ii) of subsection (d)(2)(A) and in subsection (d)(2)(B).”.

Sources: <https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf>,
page 125

PART 3—CLEAN ENERGY AND EFFICIENCY INCENTIVES FOR INDIVIDUALS

SEC. 13301. EXTENSION, INCREASE, AND MODIFICATIONS OF NONBUSINESS ENERGY PROPERTY CREDIT.

(a) EXTENSION OF CREDIT.—Section 25C(g)(2) is amended by striking “December 31, 2021” and inserting “December 31, 2032”.

(b) ALLOWANCE OF CREDIT.—Section 25C(a) is amended to read as follows:

“(a) ALLOWANCE OF CREDIT.—In the case of an individual, there shall be allowed as a credit against the tax imposed by this chapter for the taxable year an amount equal to 30 percent of the sum of—

“(1) the amount paid or incurred by the taxpayer for qualified energy efficiency improvements installed during such taxable year, and

“(2) the amount of the residential energy property expenditures paid or incurred by the taxpayer during such taxable year.”.

(c) APPLICATION OF ANNUAL LIMITATION IN LIEU OF LIFETIME LIMITATION.—Section 25C(b) is amended to read as follows:

“(b) LIMITATIONS.—

“(1) IN GENERAL.—The credit allowed under this section with respect to any taxpayer for any taxable year shall not exceed \$1,200.

“(2) ENERGY PROPERTY.—The credit allowed under this section by reason of subsection (a)(2) with respect to any taxpayer for any taxable year shall not exceed, with respect to any item of qualified energy property, \$600.

“(3) WINDOWS.—The credit allowed under this section by reason of subsection (a)(1) with respect to any taxpayer for any taxable year shall not exceed, in the aggregate with respect to all exterior windows and skylights, \$600.

“(4) DOORS.—The credit allowed under this section by reason of subsection (a)(1) with respect to any taxpayer for any taxable year shall not exceed—

“(A) \$250 in the case of any exterior door, and

“(B) \$500 in the aggregate with respect to all exterior doors.

“(5) HEAT PUMP AND HEAT PUMP WATER HEATERS; BIOMASS STOVES AND BOILERS.—Notwithstanding paragraphs (1) and (2), the credit allowed under this section by reason of subsection (a)(2) with respect to any taxpayer for any taxable year shall not, in the aggregate, exceed \$2,000 with respect to amounts paid or incurred for property described in clauses (i) and (ii) of subsection (d)(2)(A) and in subsection (d)(2)(B).”.

Inflation Reduction Act (IRA) of 2022: *Heat Pumps*

“(2) QUALIFIED ENERGY PROPERTY.—The term ‘qualified energy property’ means any of the following:

“(A) Any of the following which meet or exceed the highest efficiency tier (not including any advanced tier) established by the Consortium for Energy Efficiency which is in effect as of the beginning of the calendar year in which the property is placed in service:

“(i) An **electric or natural gas heat pump water heater**.

“(ii) An **electric or natural gas heat pump**.

“(iii) A central air conditioner.

“(iv) A natural gas, propane, or oil water heater.

“(v) A natural gas, propane, or oil furnace or hot water boiler.

Sources: <https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf>,
page 126

(e) MODIFICATION OF RESIDENTIAL ENERGY PROPERTY EXPENDITURES.—Section 25C(d) is amended to read as follows:

“(d) RESIDENTIAL ENERGY PROPERTY EXPENDITURES.—For purposes of this section—

“(1) IN GENERAL.—The term ‘residential energy property expenditures’ means expenditures made by the taxpayer for qualified energy property which is—

“(A) installed on or in connection with a dwelling unit located in the United States and used as a residence by the taxpayer, and

“(B) originally placed in service by the taxpayer.
Such term includes expenditures for labor costs properly allocable to the onsite preparation, assembly, or original installation of the property.

“(2) QUALIFIED ENERGY PROPERTY.—The term ‘qualified energy property’ means any of the following:

“(A) Any of the following which meet or exceed the highest efficiency tier (not including any advanced tier) established by the Consortium for Energy Efficiency which is in effect as of the beginning of the calendar year in which the property is placed in service:

“(i) An electric or natural gas heat pump water heater.

“(ii) An electric or natural gas heat pump.

“(iii) A central air conditioner.

“(iv) A natural gas, propane, or oil water heater.

“(v) A natural gas, propane, or oil furnace or hot water boiler.

Inflation Reduction Act (IRA) of 2022: *Heat Pumps*

“(D) Any improvement to, or replacement of, a panelboard, sub-panelboard, branch circuits, or feeders which—

“(i) is installed in a manner consistent with the National Electric Code,

“(ii) has a load capacity of not less than 200 amps,

“(iii) is installed in conjunction with—

“(I) any qualified energy efficiency improvements, or

“(II) any qualified energy property described in subparagraphs (A) through (C) for which a credit is allowed under this section for expenditures with respect to such property, and

“(iv) enables the installation and use of any property described in subclause (I) or (II) of clause (iii).

“(D) Any improvement to, or replacement of, a panelboard, sub-panelboard, branch circuits, or feeders which—

“(i) is installed in a manner consistent with the National Electric Code,

“(ii) has a load capacity of not less than 200 amps,

“(iii) is installed in conjunction with—

“(I) any qualified energy efficiency improvements, or

“(II) any qualified energy property described in subparagraphs (A) through (C) for which a credit is allowed under this section for expenditures with respect to such property, and

“(iv) enables the installation and use of any property described in subclause (I) or (II) of clause (iii).

Sources: <https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf>,
page 127

Inflation Reduction Act (IRA) of 2022: Heat Pumps

(3) AMOUNT OF REBATE.—

(A) APPLIANCE UPGRADES.—The amount of a rebate provided under a high-efficiency electric home rebate program for the purchase of an appliance under a qualified electrification project shall be—

- (i) not more than \$1,750 for a heat pump water heater;
- (ii) not more than \$8,000 for a heat pump for space heating or cooling; and
- (iii) not more than \$840 for—
 - (I) an electric stove, cooktop, range, or oven; or
 - (II) an electric heat pump clothes dryer.

(B) NONAPPLIANCE UPGRADES.—The amount of a rebate provided under a high-efficiency electric home rebate program for the purchase of a nonappliance upgrade under a qualified electrification project shall be—

- (i) not more than \$4,000 for an electric load service center upgrade;
- (ii) not more than \$1,600 for insulation, air sealing, and ventilation; and
- (iii) not more than \$2,500 for electric wiring.

(c) HIGH-EFFICIENCY ELECTRIC HOME REBATE PROGRAM.—

(1) IN GENERAL.—Under the program, the Secretary shall award grants to State energy offices and Indian Tribes to establish a high-efficiency electric home rebate program under which rebates shall be provided to eligible entities for qualified electrification projects.

(2) GUIDELINES.—The Secretary shall prescribe guidelines for high-efficiency electric home rebate programs, including guidelines for providing point of sale rebates in a manner consistent with the income eligibility requirements under this section.

(3) AMOUNT OF REBATE.—

(A) APPLIANCE UPGRADES.—The amount of a rebate provided under a high-efficiency electric home rebate program for the purchase of an appliance under a qualified electrification project shall be—

- (i) not more than \$1,750 for a heat pump water heater;
- (ii) not more than \$8,000 for a heat pump for space heating or cooling; and
- (iii) not more than \$840 for—
 - (I) an electric stove, cooktop, range, or oven; or
 - (II) an electric heat pump clothes dryer.

(B) NONAPPLIANCE UPGRADES.—The amount of a rebate provided under a high-efficiency electric home rebate program for the purchase of a nonappliance upgrade under a qualified electrification project shall be—

- (i) not more than \$4,000 for an electric load service center upgrade;
- (ii) not more than \$1,600 for insulation, air sealing, and ventilation; and
- (iii) not more than \$2,500 for electric wiring.

(C) MAXIMUM REBATE.—An eligible entity receiving multiple rebates under this section may receive not more than a total of \$14,000 in rebates.

(4) LIMITATIONS.—A rebate provided using funding under this section shall not exceed—

(A) in the case of an eligible entity described in subsection (d)(1)(A)—

- (i) 50 percent of the cost of the qualified electrification project for a household the annual income of which is not less than 80 percent and not greater than 150 percent of the area median income; and
- (ii) 100 percent of the cost of the qualified electrification project for a household the annual income

Inflation Reduction Act (IRA) of 2022: *Heat Pumps*

(5) PROGRAM.—The term “program” means the program carried out by the Secretary under subsection (a)(1).

(6) QUALIFIED ELECTRIFICATION PROJECT.—

(A) IN GENERAL.—The term “qualified electrification project” means a project that—

(i) includes the purchase and installation of—

(I) an electric heat pump water heater;

(II) an electric heat pump for space heating and cooling;

(III) an electric stove, cooktop, range, or oven;

(IV) an electric heat pump clothes dryer;

(V) an electric load service center;

(VI) insulation;

(VII) air sealing and materials to improve ventilation; or

(VIII) electric wiring;

(ii) with respect to any appliance described in clause (i), the purchase of which is carried out—

(I) as part of new construction;

(4) LOW- OR MODERATE-INCOME HOUSEHOLD.—The term “low- or moderate-income household” means an individual or family the total annual income of which is less than 150 percent of the median income of the area in which the individual or family resides, as reported by the Department of Housing and Urban Development, including an individual or family that has demonstrated eligibility for another Federal program with income restrictions equal to or below 150 percent of area median income.

(5) PROGRAM.—The term “program” means the program carried out by the Secretary under subsection (a)(1).

(6) QUALIFIED ELECTRIFICATION PROJECT.—

(A) IN GENERAL.—The term “qualified electrification project” means a project that—

(i) includes the purchase and installation of—

(I) an electric heat pump water heater;

(II) an electric heat pump for space heating and cooling;

(III) an electric stove, cooktop, range, or oven;

(IV) an electric heat pump clothes dryer;

(V) an electric load service center;

(VI) insulation;

(VII) air sealing and materials to improve ventilation; or

(VIII) electric wiring;

(ii) with respect to any appliance described in clause (i), the purchase of which is carried out—

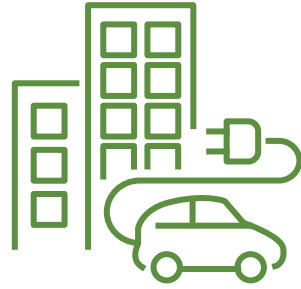
(I) as part of new construction;

Sources: <https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf>,
page 223

Fredericka Brown

PNNL

National Field Validation Partnership Overview



Heat Pump/Heat Pump Water Heater Field Validation Partnership

Fredericka Brown

Midwest Energy Solutions Conference

Heat Pump Pre-Conference

January 30, 2023



PNNL is operated by Battelle for the U.S. Department of Energy



Background and Project Objectives

There is a lot of great work going on related to HP and HPWH research and deployment! Some of it is coordinated, and some it is not. Let's coordinate to:

Establish a Partnership that **helps drive adoption of HPs and HPWHs for both residential and commercial buildings**. The objectives of this three-year project are to:

- Serve as a national clearinghouse for field test information from all relevant stakeholders
- Identify and inform DOE of remaining gaps and research questions associated with field validation
- Develop and coordinate collaborative field test efforts among relevant stakeholders throughout the nation
- Work with manufacturers and trade organizations to collect or develop training materials required for quality heat pump installation and maintenance
- Expand and clarify best practices to achieve market transformation in all regions of the U.S.



Project Outcomes

The outcomes of this project will be:

- 1) A **structured Field Validation Partnership** between DOE, the national labs, research, implementation, and market transformation organizations. This will result in unique way to **coordinate field validation plans** and collect relevant data from around the country into the HP and HPWH Field Validation Database.
- 2) The Field Validation Partnership will result in a continuous stream of information between DOE and the major industry players in the space of HPs and HPWHs. If desired, DOE could use this information to **inform roadmaps related to HP and HPWH market adoption and research** going forward.
- 3) The structure of this Partnership provides a mechanism for sharing lessons learned directly between Late-Stage RD&D, Building Integration Barriers, Regional Market and Policy and Workforce Development efforts. The result will be training content that is well-reviewed by the Partnership which will lead to a **workforce that meets the industry's quality and workforce supply demands**.
- 4) The structure of this Partnership also provides an opportunity for **regions to share lessons learned on policy and market transformation** with each other through the Market and Policy core committee

PNNL TEAM

PNNL is the lead organization for this project. PNNL will manage most subcontracts, organize “all hands” meetings and provide updates to DOE on all activities.



Cheryn Metzger
Project Manager



Fredericka Brown
Deputy Project Manager



Kieren McCord
Project Analyst



Joshua Butzbaugh



Vrushali Mendon



Christian Kaltreider



Christian Valoria



Travis Ashley



Alek Parsons



Field Validation Partnership Team

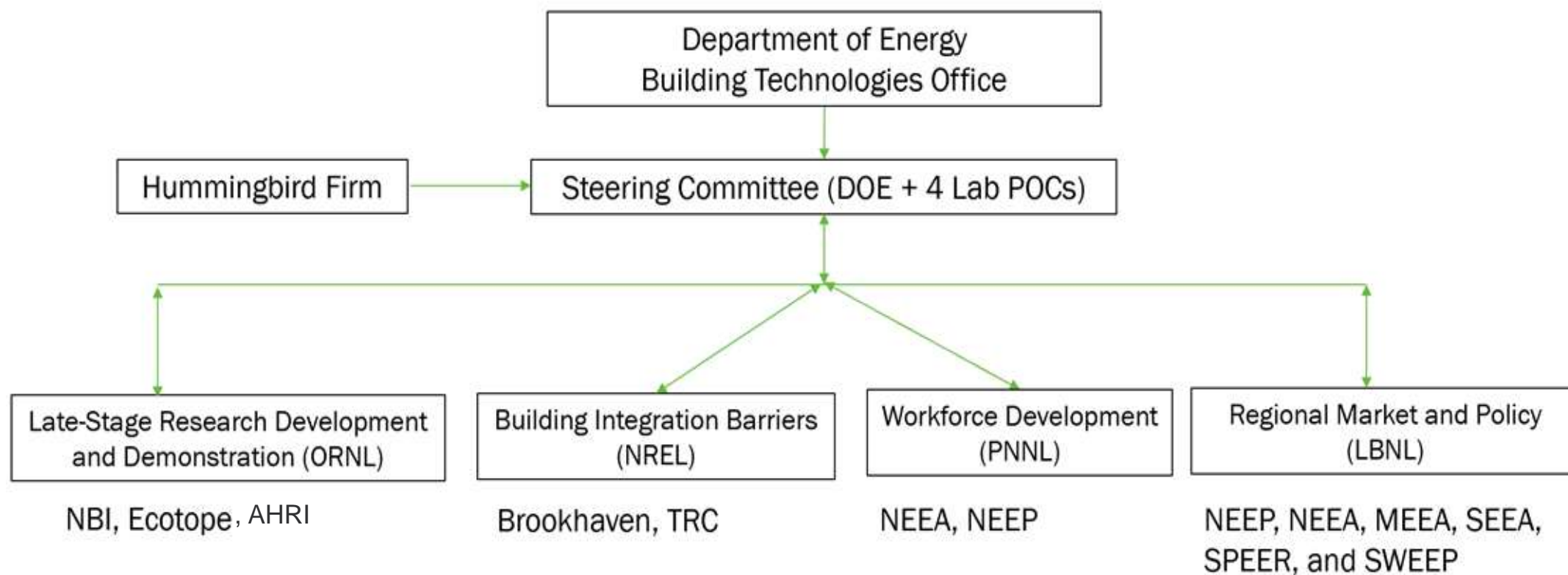


Energy Efficiency &
Renewable Energy



Northeast Energy Efficiency Partnerships

Project Team Structure



Midwest Energy Efficiency Alliance Team

The Midwest Energy Efficiency Alliance (MEEA) is a collaborative network, promoting energy efficiency to optimize energy generation, reduce consumption, create jobs and decrease carbon emissions in all Midwest communities.

MEEA is a non-profit membership organization with 160+ members, including the following: State and Local Governments | Academic and Research Institutions | Electric and Gas Utilities | Energy Service Companies and Contractors | Community-based Organizations

Project Role: Serve as two-way information conduit on heat pump adoption, barriers, and opportunities in the Midwest and identify strategies to support and transform the market. MEEA will participate in the Building Integration Barriers, Workforce Development, and Regional Market & Policy committees



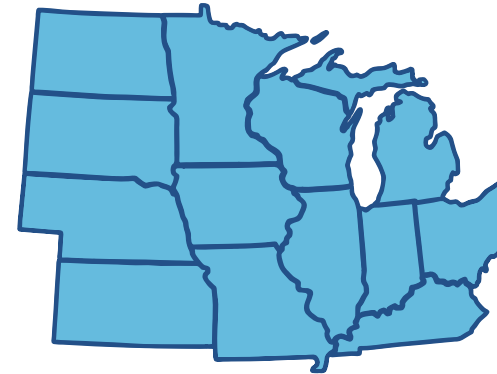
Stacey Paradis
Executive
Director



Molly Graham
Market Solutions &
Education Director



Joe Ricchiuto
Technical
Manager



How Can You Get Involved?

- Work with MEEA to provide feedback on our current HP and HPWH Market Transformation Gaps Spreadsheet (will be distributed by MEEA)
- Let MEEA know if you are interested in participating in a subcommittee in the future and they will send your information to us

Other Related Work at PNNL



Building Science Education

Building science is the study of how buildings are designed, maintained and built or retrofit as a system of components that interact with each other and the outdoor environment. A fundamental understanding of building science and its applications in the workforce helps makes more comfortable, resilient, and efficient buildings a reality. The **Building Science Education (BSE) Solution Center** provides curated and free-to-use training materials on the fundamentals of building science.



Explore Content By

Technology Area

Find educational resources on many building science topics, including high performance heat pumps, efficient windows, and disaster resilience. Training modules consist of lecture notes, presentations, problem sets, videos, and references.



[View All Training Modules](#)

Green Buildings 101

Find basic, entry-level content for training programs.



Occupation

Explore collections of building science training materials that have been tailored to specific job types. These materials, free to use and download, currently target HVAC professionals, with more job types to come.



[View Programs](#)

Resource Library

Visit our entire collection of building science



EERE » Building Science Education » BSESC » Training Modules by Occupation

Training Modules by Occupation

Explore building science resources needed to train various building professionals. These curated programs provide a centralized list of all training materials recommended for a specific occupation. Lecture notes, problem sets, and teaching materials from the recommended proficiency levels are shown together for easy access and curriculum planning.

The training modules, found individually in [Training Modules by Technology Area](#), are a collection of the latest technologies, research findings, and best practices in building science. The content can be downloaded and used freely by educators as they create or update their curriculum.

Showing results 1 - 3 of 3

HVAC Ready-to-Work

For junior HVAC technicians, whose main role is that of support. Under this occupation, the junior technician will learn the basics of installation, maintenance, and repair procedures for HVAC while adhering to proper safety requirements. Role Objective: To help and learn from experienced HVAC...

HVAC Support Technician

For full HVAC technicians, whose main role is that working on HVAC. Under this occupation the technician will focus on performing HVAC installation or maintenance. This includes installing equipment and ductwork, charging refrigerant, checking airflow, and understanding controls. Role Objective: To...

Senior HVAC Technician

For senior HVAC technicians with years of experience. Under this occupation, the HVAC technician will focus on the design and installation of HVAC systems for residential homes. Capable of troubleshooting problems in HVAC systems without a clear solution. Role Objective: Take the leadership role in...

HVAC - Cold Climate Heat Pump Sizing

This module goes over the specifics that make air source heat pumps considered suitable for cold climate regions, how these heat pumps have been sized traditionally, and how these heat pumps are currently sized and selected.



Curriculum

1. Remember



- ✓ Why do some heat pumps need to be made specifically suitable for cold climates?
- ✓ What qualifies a heat pump as a cold climate heat pump?
- ✓ Define key terms for cold climate heat pumps.

 Lecture Note: [Cold Climate Heat Pump Sizing - Remember](#)

 Problem Set: [Cold Climate Heat Pumps Sizing - Problem Set 1.1](#)

 Problem Set: [Cold Climate Heat Pumps Sizing - Problem Set 1.2](#)

 Problem Set: [Cold Climate Heat Pumps Sizing - Problem Set 1.3](#)

2. Understand



- ✓ Understand the traditional approach to sizing heat pumps.
- ✓ Understand the approaches to sizing heat pumps in cool and cold climates.

 Lecture Note: [Cold Climate Heat Pump Sizing - Understand](#)

 Problem Set: [Cold Climate Heat Pumps Sizing - Problem Set 2.1](#)

 Problem Set: [Cold Climate Heat Pumps Sizing - Problem Set 2.2](#)

3. Apply



- ✓ Understand the steps used to size a cold climate heat pump.

 Lecture Note: [Cold Climate Heat Pump Sizing - Apply](#)

 Problem Set: [Cold Climate Heat Pumps Sizing - Problem Set 3.1](#)

Teaching Materials

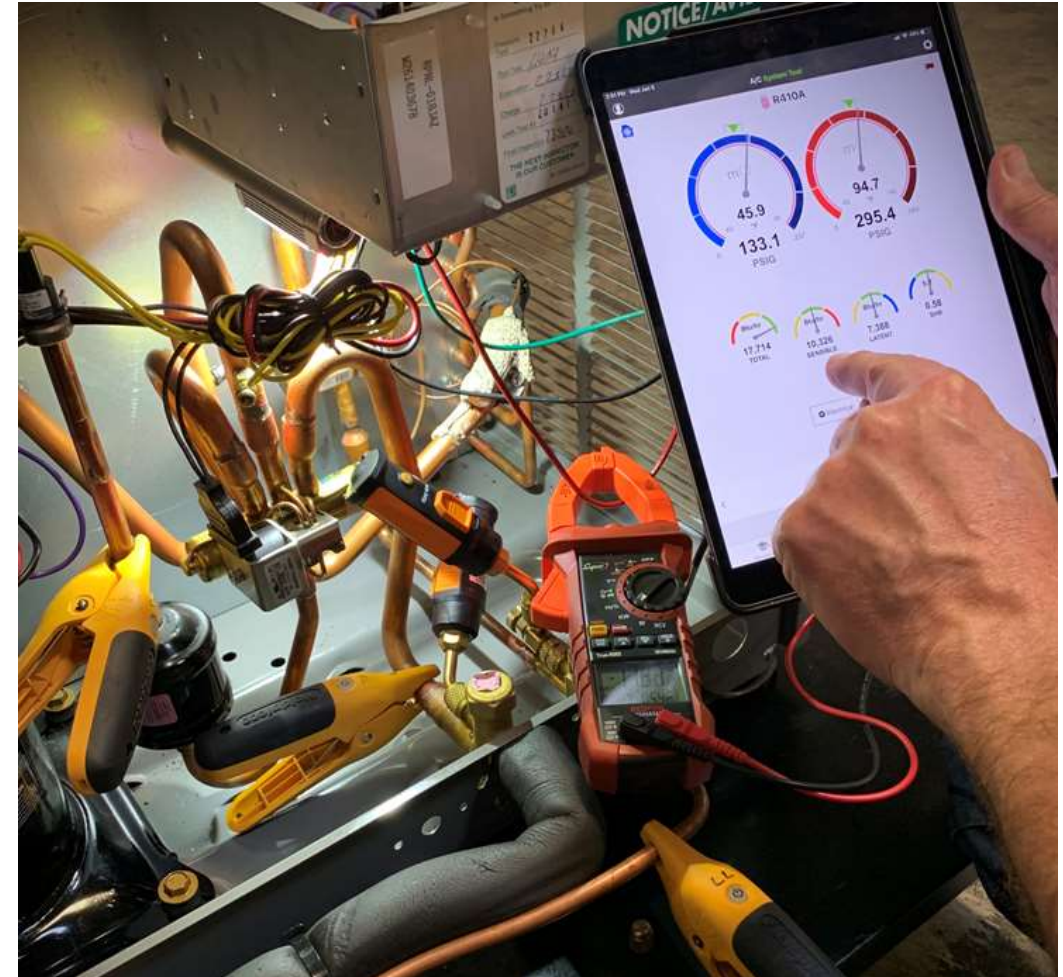
 Presentation: [Cold Climate Heat Pump Sizing - Presentation](#)



Website: [NYSERDA - Cold Climate Air Source Heat Pump Sizing and Design Training](#)

Proper install & commissioning is essential

Improve efficiency and reduce callbacks.



STEP Campaign:

<https://www.energy.gov/eere/buildings/smart-tools-efficient-hvac-performance-campaign>

Thank you



Relevant PNNL References

- Building Science Education Solution Center, 2021. <https://bsesc.energy.gov/>
- Manasseh O., C.E. Metzger, E.T. Mayhorn, T.D. Ashley, and W.E. Hunt. 2021. "Nontargeted vs. Targeted vs. Smart Load Shifting Using Heat Pump Water Heaters." *Energies* 14, no. 22:Art. No. 7574. PNNL-SA-156587. doi:10.3390/en14227574
- Rosenberg S.I., W.E. Hunt, and T.D. Ashley. 2021. *Winter Load Shifting Field Study of Residential Multi-Split Heat Pumps*. Presented by S.I. Rosenberg, W.E. Hunt at PLMA - Load Management Leadership, Online Conference, Oregon. PNNL-SA-161687.
- Valoria C.R., and W.E. Hunt. 2021. *HVAC Fault Detection and Diagnostics - Options for Offering Homeowners Worry-Free Heating and Cooling*. Presented by W.E. Hunt, C.R. Valoria at 2021 EEBA Summit, Online Conference, Colorado. PNNL-SA-166576.
- Butzbaugh J.B., and D.W. Winiarski. 2020. *We Just Want to Pump You Up! Forecasting Grid-Connected Heat Pump Water Heater Energy Savings and Load Shifting Potential for the Southeast U.S.* In 2020 ACEEE Summer Study on Energy Efficiency in Buildings, 1-17 - 1-31. Dc, Washington: American Council for an Energy Efficient Economy. PNNL-SA-152203.
- Hunt W.E., T.D. Ashley, and C.E. Metzger. 2020. *Identifying Field-Representative Hot Water Draw Profiles of Heat Pump Water Heaters in the Pacific Northwest*. Presented by T.D. Ashley at 2020 Virtual Hot Water Forum, Online, United States. PNNL-SA-154512.
- Hunt W.E., E.T. Mayhorn, T.D. Ashley, and C.E. Metzger. 2021. *Factors Influencing Electrical Load Shape of Heat Pump Water Heaters*. *ASHRAE Journal* 63. PNNL-SA-155197.
- Butzbaugh J.B. 07/29/2020. *Grid-connected Heat Pump Water Heaters: Method to Forecast Energy Use and Extrapolate Load Shifting*. Presented by J.B. Butzbaugh at ACEEE Hot Water Forum, Online Conference, United States. PNNL-SA-154373.
- Ashley T.D., C.E. Metzger, J.T. Kolln, and G.P. Sullivan. 2020. Maximizing the Use of Ductless Mini-Splits in the PNNL Lab Homes. PNNL-29531. Richland, WA: Pacific Northwest National Laboratory. [Maximizing the Use of Ductless Mini-Splits in the PNNL Lab Homes](#)
- Butzbaugh J.B., L.J. Sandahl, and M.C. Baechler. 2018. *US HPWH Market Transformation: Where We've Been and Where to Go Next*. In Proceedings of the 9th International Conference on Energy Efficiency in Domestic Appliances and Lighting (EEDAL 2017), , September 13-15, 2017, Irvine, California, 3, 922-941. Brussels: European Union. PNNL-SA-124638. doi:10.2760/113534
- Metzger C.E., J. Zhang, J. Winkler and J. Maguire. 2018. "Are Ducted Mini-Splits Worth It?." *ASHRAE Journal* 60, no. 2:22-31. PNNL-26834.
- Metzger C.E., S. Rashkin, and A.W. Wagner. 2018. "At the Core: Fundamental Building Science Education Matters More Than Building Type." In 4th Residential Building Design Construction Conference, February 28-March 1, 2018, State College, PA, edited by AM Memari and SK Lowe, 96-102. State College, Pennsylvania: Pennsylvania Housing Research Center (PHRC). PNNL-SA-129292.
- Butzbaugh J.B. 2017. *Assessment of National & Regional Market Opportunities for Heat Pump Water Heaters*. Presented by Joshua Butzbaugh at Northwest Regional Heat Pump Hot Water Heater Market Adoption Workshop, Portland, Oregon. PNNL-SA-124087.
- Metzger C.E., P. Huelman, S. Rashkin, and A.W. Wagner. 2017. Guidelines for Building Science Education. PNNL-24143 Rev 2. Richland, WA: Pacific Northwest National Laboratory. [Guidelines for Building Science Education](#)
- Metzger C.E., S. Goyal, and M.C. Baechler. 2017. Review of Residential Comfort Control Products and Opportunities. PNNL-27141. Richland, WA: Pacific Northwest National Laboratory. [Review of Residential Comfort Control Products and Opportunities](#)
- Widder S.H., C.E. Metzger, J.M. Petersen and J.A. McIntosh. 2017. *Interaction between Heat Pump Water Heaters and Other Internal Point Source Loads and a Central Heating System*. PNNL-26447. Richland, WA: Pacific Northwest National Laboratory. [Interaction between Heat Pump Water Heaters and Other Internal Point Source Loads and a Central Heating System](#).

James Momperousse, Carrier
Jonathan Moscatello, Daikin
Kevin DeMaster, Mitsubishi
Moderated by Justin Margolies

*Heat Pump Manufacturer
Discussion Panel*



Air source Heat Pump Manufacturer Panel



James Momperousse
Carrier
Utility Rebates Program Manager



Jonathan Moscatello
Daikin
Utility Relations Manager

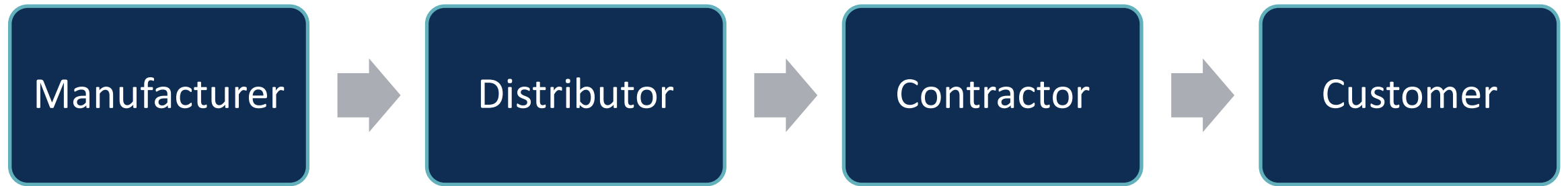


Kevin DeMaster
Mitsubishi Electric
Sr. Manager: Utilities & Electrification





Residential HVAC Supply Chain





Air Source Heat Pump Brand Relationships

Carrier



Daikin Comfort Technologies



Mitsubishi

Trane



State of Play in the Industry

An Evolving Kitchen Table Conversation



Current State

Regulatory

- New regulatory minimum efficiencies
- Refrigerant changes
- Changing metric of standards, switching from M to M1 ratings
- New tax code

Electrification

- Electrification coinciding with a changing labor workforce
- Acquisition costs of higher energy efficient equipment

Challenges

- Addressing the unique needs of each region we support
- Anticipating the changing dynamics of the market
- Training and supporting customers

How Carrier Can Support

Product Portfolio

Distribution Channel Access

- Collaboration between Manufacturer, Distribution and Program Implementors

Training

- Supporting efforts in electrification through enhancing our training portals (MyLearning Center)
- Providing additional resources and training touchpoints such as dealer conventions, IRA webinars, contractor trainings



Manufacturer Needs

What does Carrier need from the energy efficiency industry?

Program Transparency and uniformity

- Incentive Program methodologies and metrics
- Qualifying Product lists

Collaboration

- Distributor Trainings and Events
- Ongoing Contractor support and access to resources



What is the STATE OF PLAY in the HVAC Industry?

DAIKIN believes the North American market is currently entering a period of intense change.

REGULATIONS

- Efficiency standards for equipment...2023 through 2025.
- AIM Act refrigerant draw downs starting 2023
- New refrigerant...2024 through 2026.
- New Efficiency standards again in 2030.

The # of regulations is distracting and a bit overwhelming.

ELECTRIFICATION

- Inflation Reduction Act
- There is a diversity of approaches by states and cities.
- There is a lot of money flying around; meanwhile there isn't a clear notion of how heat pump technology adoption can or should work.

Yet, it feels good; encouraging for both the environment and business.

PEOPLE

- Contractors—need more people to join the trade!
- Homeowners need education from their contractors (who also need education).
- Energy Efficiency professionals want a lot from heat pumps.

People are all not talking to each other nor working together. An opportunity!

What can Daikin do to support utility energy efficiency programs?

- 1 Daikin is staffing energy efficiency program business development professionals, region by region.
- 2 These relationships give us the ability to collaborate, to help utilities gain greater program participation.
- 3 Ideally, we can find ways to cooperate to overcome barriers and find new ways to increase adoption.



What does DAIKIN need?

We believe there are three important time-frames to consider.

1

NOW:

Daikin would like to talk to utilities and see if common ground exists on several key issues facing heat pump adoption.

- Efficiency ratings
- Refrigerants
- Demand response

2

1—3 YEARS:

Daikin sees a window of opportunity; we want to collaborate to drive heat pump adoption.

- Technology
- Training
- Awareness
- Data

3

3—10 YEARS:

Daikin is already working to develop the next generation of heat pumps; these will launch in 2030. We need utility input.

- Power resources
- Time of use
- Demand response
- Data

State of the Market



Heat Pump Market
Strong



Supply Chain
Recovering



IRA & AHRI
Disruptive

Mitsubishi Industry Support



Accurate
information

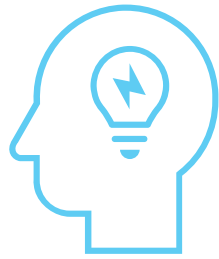


Training resources

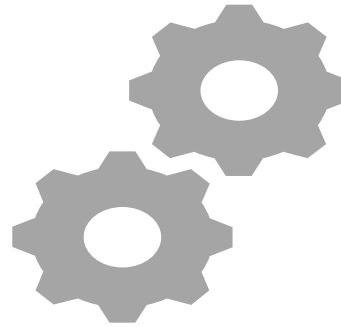


Collaboration
distributors and
contractors

Manufacturer Needs from Industry



SIMPLE Programs -
Clear Information



Program
Designed for
Product /
Application



Early Retirement
Emphasis



Discussion



Please enjoy a break

3:15 PM – 3:35 PM

Breakout Sessions

Facilitated by Marisa Bayer, CEE

3:35 PM – 4:35 PM



Small Group Discussions

- **Objective**

- Hear wide range of perspectives
- Feedback and input will inform Midwest ASHP Collaborative work

- **How**

- Dedicated table topics
- 1-hour facilitated discussion with introductions, time for self-reflection, and guiding questions

Table Topics

Customer engagement

Workforce development
and training

Electric rates
optimization

Heat pump
program design

Low-income
program design





Your Role in Small Groups

- **Contribute your perspective.** Whether you're an expert or not, we want to hear from you.
- **Be respectful.** Take turns speaking and give others an opportunity to speak.
- **Stay engaged.** Contribute to the discussion and avoid distractions. Save other discussions and topics for another time.

Table Topics

Customer engagement

Workforce development
and training

Electric rates
optimization

Heat pump
program design

Low-income
program design





Summary of Themes

Wrap-up and Next Steps

4:35 PM – 4:55 PM



Next Steps and Looking Ahead

Post-workshop Survey

Participate in Midwest ASHP Collaborative

Upcoming resources

Respond to the Request for Information on the Inflation Reduction Act
Home Efficiency and Electrification Rebate Programs (HOMES/HEEHRA)



Contact Information



Carl Nelson
Sr. Director of Market Transformation
cnelson@mncee.org



Emily McPherson
Sr. Manager of Market Development
emcpherson@mncee.org



Molly Garcia
Program Development Manager
mgarcia@mncee.org



Molly Graham
Market Solutions and Education Director
mgraham@mwalliance.org



Justin Margolies
Senior Product Developer
jmargolies@slipstreaminc.org



**THANK
YOU!**

We hope you can join us for the Heat Pump Happy Hour starting at 5PM at Crushed by Giants Brewing.

Advance registration is required as space is limited.

Sponsored by:

