



State of Building Electrification Technologies

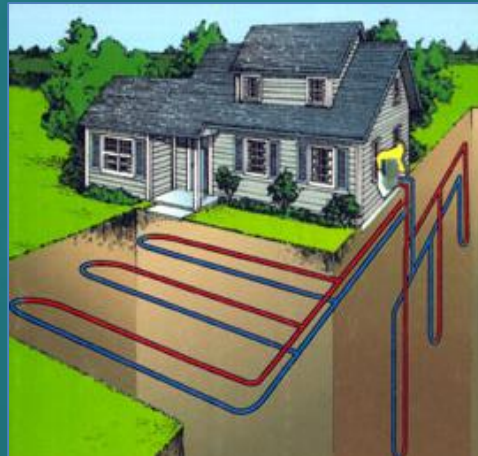
- Dave Lis, Director, Technology and Market Solutions
- NESCAUM Building Electrification Task Force: Building Inventory



Residential Heating Electrification Technologies

Technologies

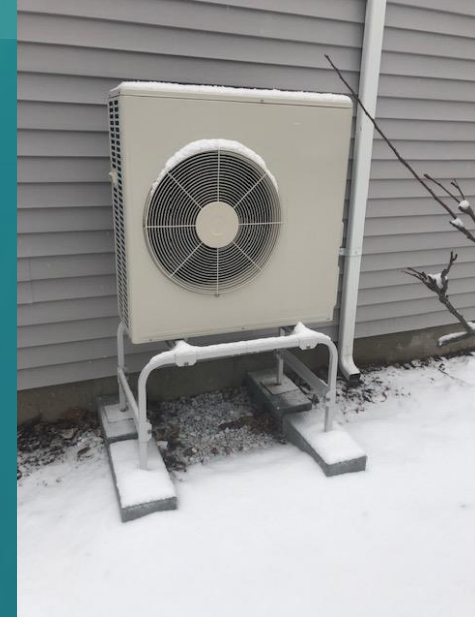
- Air-Source Heat Pumps
- Ground-Source Heat Pumps



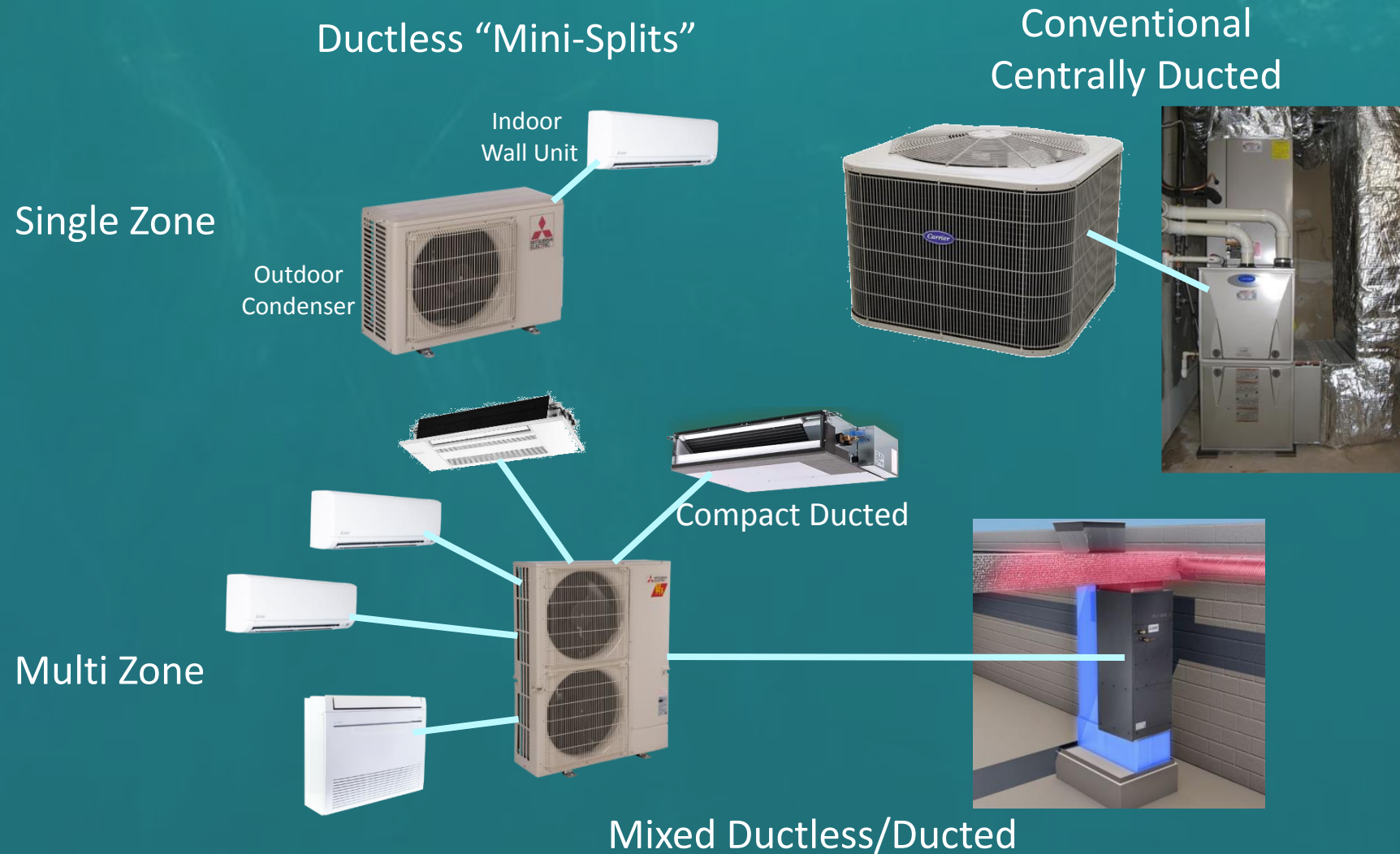
Air-Source Heat Pump Technology (R)Evolution



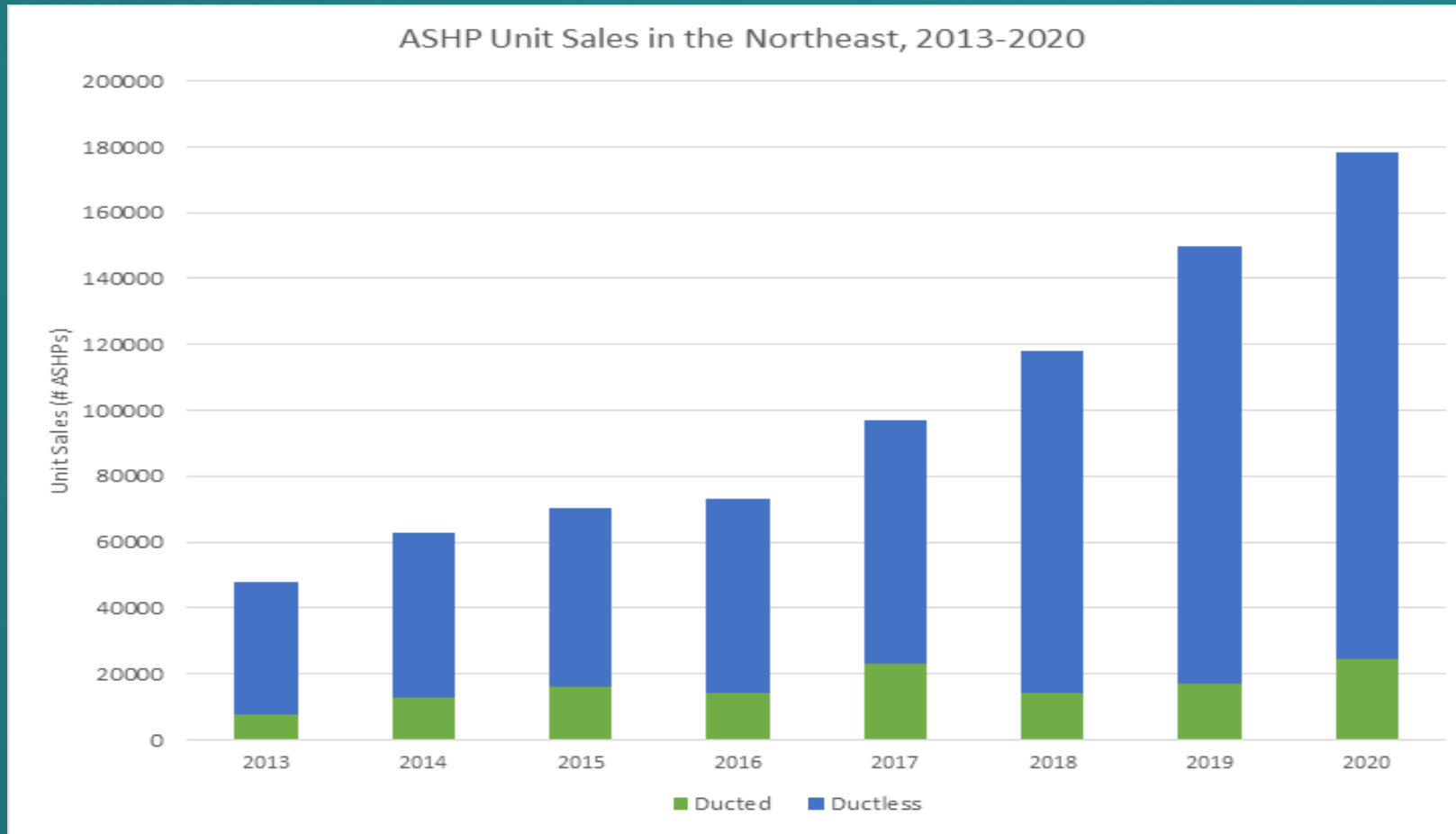
- Not your grandparents ASHP
 - Variable capacity compressors (inverter driven)
 - Sophisticated controls
 - Flash injection
- Delivering capacity and efficiency at low outdoor temperatures
- Air-to-Air- ducted, ductless and everything in between
- Air-to-Water – Variety of distribution options



Air Source Heat Pump Configurations



Market Momentum Building



Sales in context

- Furnaces (235k)
- Boilers (160k)
- Central AC (220k)

Demonstrated Performance



Efficiency- ASHP Field Studies demonstrate efficiencies ranging from 200-300%

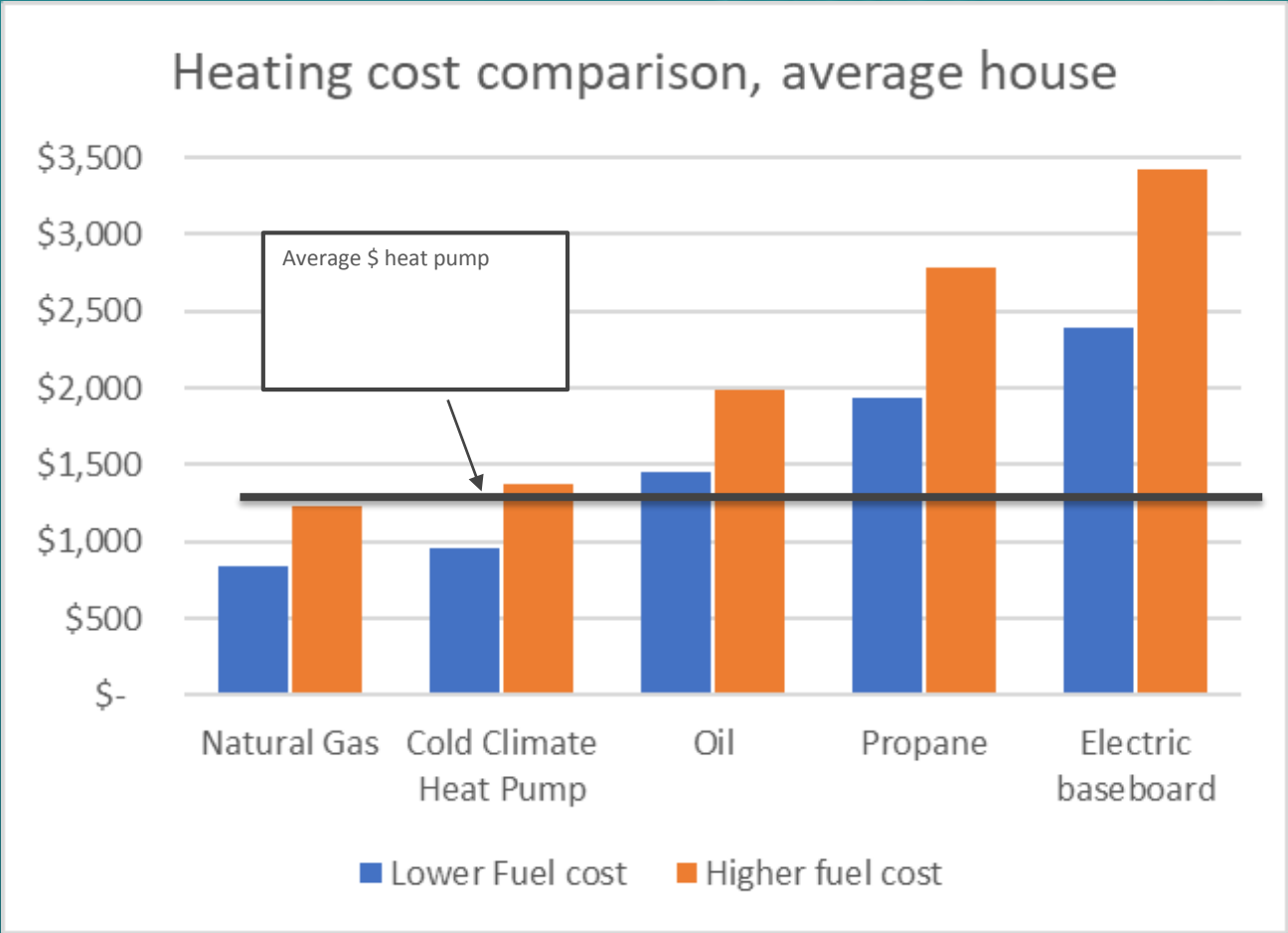


Comfort- Nine out of 10 consumers were extremely likely to recommend heat pumps in whole-house applications where the heat pump is the only heating source.

Costs



Heating System	Equipment & Installation Costs
Ducted air source heat pump	\$8,900 to \$14,800
Ductless air source heat pump	\$14,400 to \$19,400
Ductless air source heat pump (supplemental)	\$11,500 to \$15,500
Ground source (geothermal) heat pump	\$49,400 to \$91,700
New gas furnace, 97% AFUE	\$6,000 to \$7,300
New oil boiler	\$7,100 to \$8,600
Central Air Conditioner	\$3,000-\$5,000



Program/Policy Landscape

- States setting aggressive adoption goals
- Customer incentives commonly offered through EE programs
- Workforce Initiatives growing
- Alternative Portfolio standards (APS), Clean Heat standard being considered
- New Construction building codes
- Federal policy and programs adding support to electrification

NEEP's Cold-Climate ASHP Product List

ashp.neep.org



One-stop-shop for cold-climate qualified air source heat pumps

Brand

All Brands

Model #, AHRI #, Unit#

AHRI, Model or Ur

Ducting Configuration

All Configuratic

Heating Capacity (Rated Btu/hr @47°F)

080000

Heating Capacity (Max Btu/hr @5°F)


080000

10 > (5067 Heat Pumps)

Grid View


List View

Download Product List




TRANE
XV20i
AHRI #: 8935201
Outdoor Unit #: 4TWV0024A1
Indoor Unit #: 4PX*BD36BS3
Singlezone Ducted, Centrally Ducted
🔥 12,880 Max Btu/hr @5°F
🔥 22,200 Rated Btu/hr @47°F
❄️ 24,400 Rated Btu/hr @95°F
COP @5°F: 1.91
HSPF: 10

VIEW DETAIL




TRANE
XV19
AHRI #: 201923126
Outdoor Unit #: 4TWL9024A1
Indoor Unit #: 4PX*CU60BS3
Singlezone Ducted, Centrally Ducted
🔥 10,520 Max Btu/hr @5°F
🔥 20,400 Rated Btu/hr @47°F
❄️ 25,000 Rated Btu/hr @95°F
COP @5°F: 2.49
HSPF: 11

VIEW DETAIL




TRANE
XV19
AHRI #: 201922963
Outdoor Unit #: 4TWL9024A1
Indoor Unit #: 4PX*CU48BS3
Singlezone Ducted, Centrally Ducted
🔥 10,680 Max Btu/hr @5°F
🔥 20,400 Rated Btu/hr @47°F
❄️ 24,400 Rated Btu/hr @95°F
COP @5°F: 2.52
HSPF: 11.5


VIEW DETAIL



TRANE



TRANE



TRANE

Now 30,000+ systems from over 100 major brands

DAIKIN MXS Series
Multizone All Non-ducted
AHRI Cert #: 201851579
Outdoor Unit #: 4MXS36RMVJU
Indoor Unit #:
🔥 Maximum Heating Capacity (Btu/hr) @5°F: 22,610
🔥 Rated Heating Capacity (Btu/hr) @47°F: 36,000
❄️ Rated Cooling Capacity (Btu/hr) @95°F: 36,000

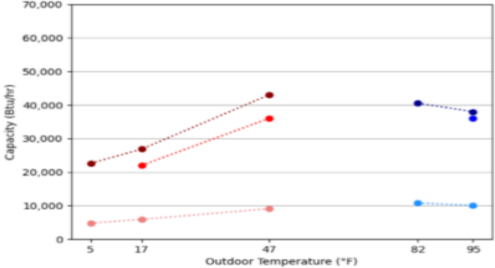
Information Tables

Brand	DAIKIN
Series	MXS Series
Ducting Configuration	Multizone All Non-ducted
AHRI Certificate No.	201851579
Outdoor Unit #	4MXS36RMVJU
Indoor Unit Type	Non-Ducted Indoor Units
Indoor Unit #	
Furnace Unit #	
SEER	17.7
EER	9.2
HSPF Region IV	12.2
Energy Star	
Variable Capacity	✓
Turndown Ratio (Max 5°F/Min 47°F)	2.48
Capacity Maintenance (Max 5°F/Max 47°F)	52%
Capacity Maintenance (Rated 17°F/Rated 47°F)	61%
Capacity Maintenance (Max 5°F/Rated 47°F)	62%
Integration	
Connectivity	
Operational Diagnostics	
Refrigerant(s)	

Performance Specs

	Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Heating	5°F	70°F	Btu/h	4,780	-	22,610	
			kW	0.4	-	2.68	
			COP	3.5	-	2.47	
Heating	17°F	70°F	Btu/h	5,920	22,000	26,840	
			kW	0.42	2.7	3.75	
			COP	4.13	2.39	2.1	
Heating	47°F	70°F	Btu/h	9,100	36,000	43,000	
			kW	0.43	2.34	3.24	
			COP	6.2	4.51	3.89	
Cooling	82°F	80°F	Btu/h	10,770	-	40,540	
			kW	0.55	-	3.63	
			COP	5.74	-	3.27	
Cooling	95°F	80°F	Btu/h	10,100	36,000	38,000	
			kW	0.59	3.91	3.94	
			COP	5.02	2.7	2.83	

Heating/Cooling Capacity Graph



Consumer Resources – NEEP Air Source Heat Pump Buying Guide



- Good resource for all audiences
- Especially for consumers who are looking to learn more about heat pumps
- Check out the O&M guide and Case Studies too

Air Source Heat Pump Buying Guide

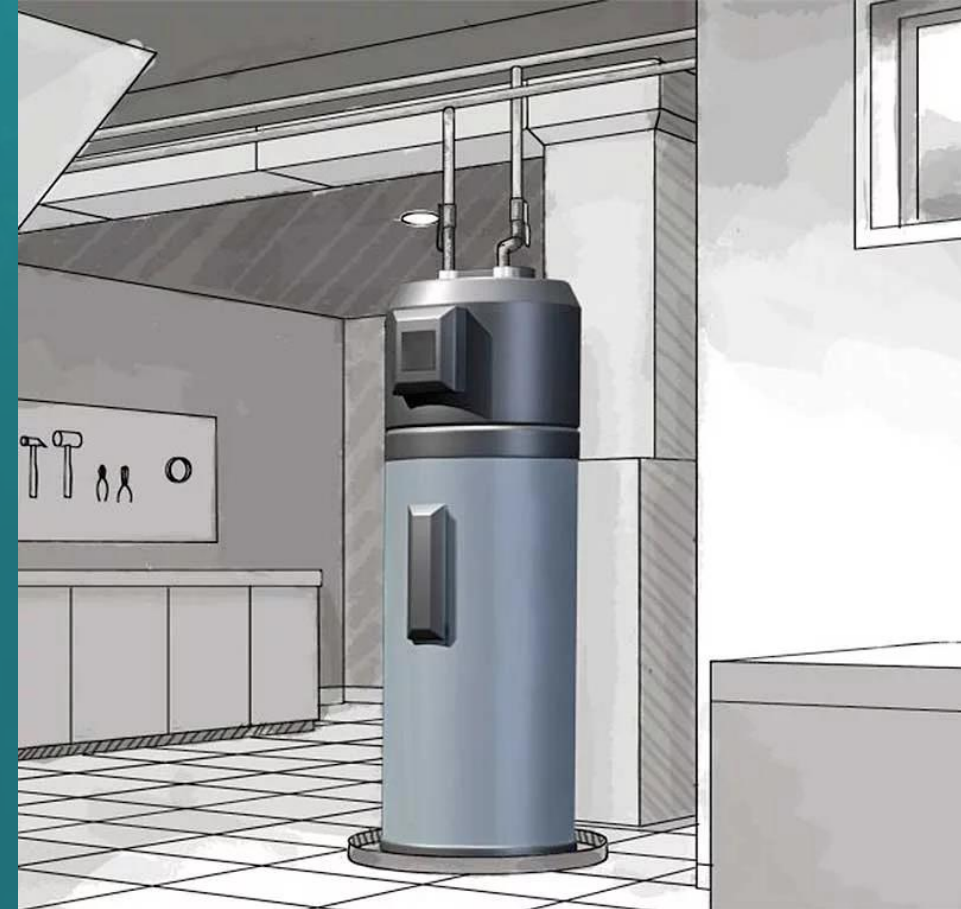
Design and Installation Resources



neep.org/ASHPInstallerResources

Water Heating

- “Integrated” Heat pump water heaters (HPWH) widely available
- Recent Michigan study showed efficiency ranged from 200-300%
- Market’s generally been slow to scale, even with program incentives
- Emergency replacement challenge
- Some states have seen significant uptake



“Other” residential opportunities

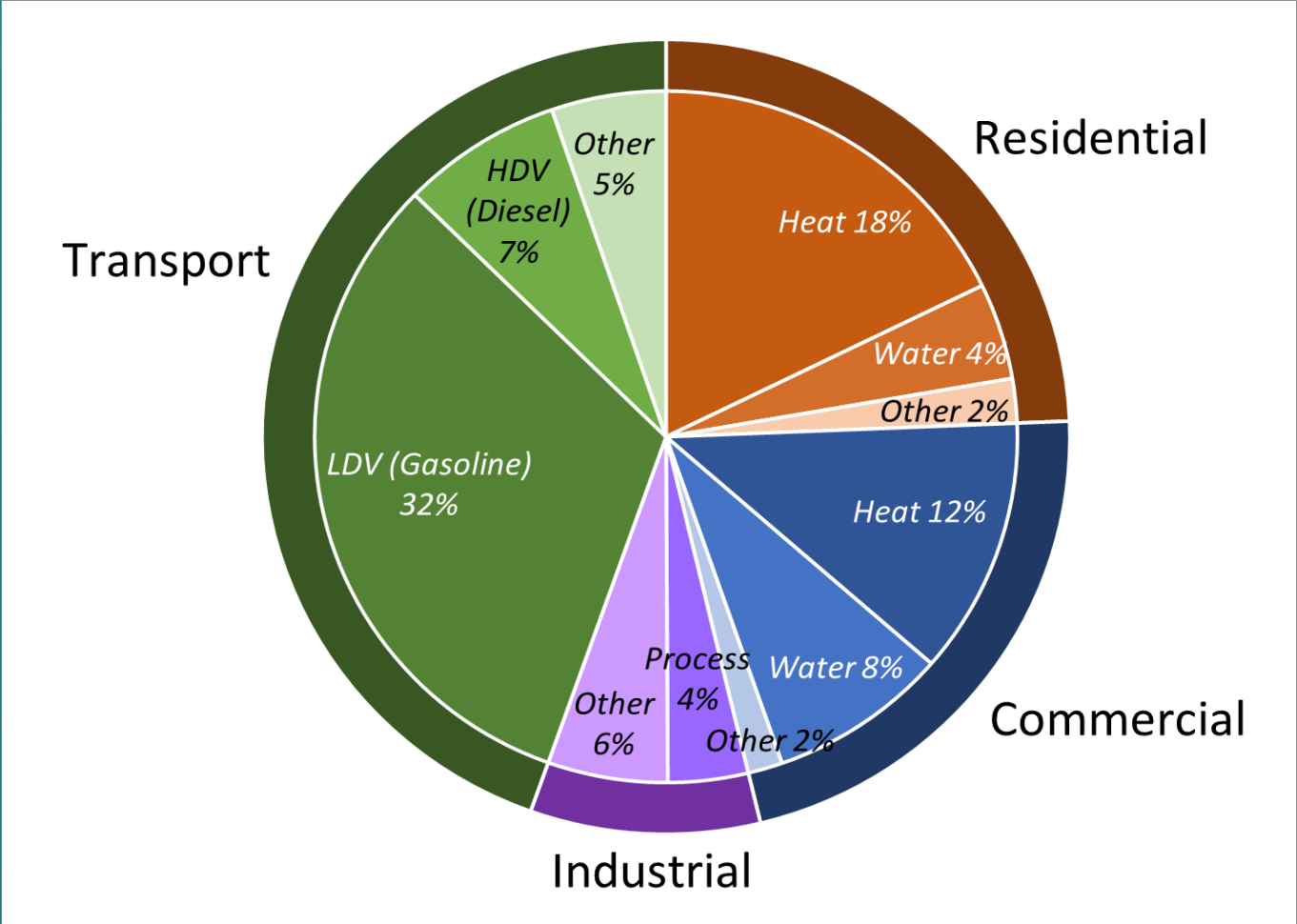


THANK YOU!

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Direct Use of Fossil Fuels (NE/NY Region)



Advanced Electrification Technologies

