Welcome

Conservation Applied Research & Development (CARD) Webinar

April 1, 2020
Understanding the Market Barriers & Opportunities for Cold Climate Air Source Heat Pumps in Minnesota Residential Households
Market Barriers & Opportunities for Cold Climate Air Source Heat Pumps in Minnesota

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Webinar Basics

- Attendees in listen-only mode
- Type questions into Q&A box
- Send to “All Panelists”
- Questions addressed at end
- Webinar recorded & archived
- Slide set will also be available

Q&A on right side of WebEx panel

Type Questions in Q&A box

Send Questions to All Panelists

Additional WebEx Controls at Bottom of Your Screen
• Purpose to help Minnesota utilities achieve 1.5% energy savings goal by:
  • Identifying new technologies or strategies to maximize energy savings;
  • Improving effectiveness of energy conservation programs;
  • Documenting CO₂ reductions from energy conservation programs.

  - Minnesota Statutes §216B.241, Subd. 1e

• Utility may reach its energy savings goal
  • Directly through its Conservation Improvement Program (CIP)
  • Indirectly through energy codes, appliance standards, behavior, and other market transformation programs
CARD RFP Spending by Sector thru FY2019

RFP Summary
- 10 Funding Cycles
- 472 proposals
- 121 projects funded
- $27.4 million in research
Agenda

• Research Objectives and Research Activities
• Air Source Heat Pump Overview
• Key Findings
• Conclusions and Recommendations
Research Objectives
Purpose

Moving **cold climate ASHPs** from an emerging technology to a leading technology in Minnesota energy-efficiency, **market barriers and opportunities must be understood**
Objective:

Conduct a market research study to assess the following:

- Awareness of and attitudes toward ccASHPs
- Perceived benefits that resonate with consumers
- Consumer willingness to purchase ASHPs and contractors willingness to recommend
- Challenges and opportunities for manufacturers, distributors, and installers for promoting and installing ccASHPs
Market research included four activities:

- Literature review (11 programs)
- In depth interviews with market actors (n=11)
- Online surveys with residential homeowners (n=942)
- In depth interviews with trade allies (n=33)
Contractor and Builder Interviews

- 9 high-volume contractors
- 5 low-volume contractors
- 8 high-volume builders
- 3 low-volume builders
Online Residential Surveys

- Learn about attitudes toward ASHP technologies
- 942 eligible online residential surveys
- Stratified random sample design, based on urban and rural geographic identities
ASHP Overview
Air Source Heat Pumps (ASHPs)

ASHP’s move heat around rather than generate heat
Key Findings
### Cold-Climate Specifications

NEEP and NEEA publish specifications for cold-climate ASHPs

<table>
<thead>
<tr>
<th>Similarities</th>
<th>Differences</th>
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<tbody>
<tr>
<td>• Both organizations use the same heating seasonal performance factor for ductless equipment</td>
<td>• NEEA specifications do not include ductless systems</td>
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<tr>
<td>• Indoor and outdoor units must be part of an AHRI matched system</td>
<td>• NEEA states that equipment must maintain 80% of the load it was designed to carry at 5°F without backup heating</td>
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</table>
Most ccASHP rebate programs meet or exceed NEEP’s cold-climate specifications.

Incentive levels vary from $150 to $2,000.

Most are downstream programs.

Installations of ductless systems are more common than ducted systems.
# Trade Ally Awareness and Promotion

<table>
<thead>
<tr>
<th>Awareness and Promotion of ccASHPs</th>
<th>Concerns</th>
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<tbody>
<tr>
<td>High-volume installers are aware Low-volume are not</td>
<td>Contractors may not understand the technology</td>
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<tr>
<td>High-volume installers are promoting but not installing often</td>
<td>Contractors may not trust the technology works in cold climates</td>
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<tr>
<td>Distributors and manufacturers are aware of and promoting ccASHPs</td>
<td>No industry standards about performance standards</td>
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Consumer Awareness

Fewer than half of consumers are aware of air source heat pumps.
ASHP-aware respondents generally agreed that ASHPs can keep their homes comfortable.

- Effectively cool a home in hot weather (n=407): 26% strongly agree, 56% somewhat agree, 13% neither, 5% somewhat disagree, 5% strongly disagree.
- Provide energy efficient heating in cold weather (n=392): 19% strongly agree, 55% somewhat agree, 18% neither, 7% somewhat disagree, 7% strongly disagree.
- Keep home warm and comfortable in cold weather (n=405): 20% strongly agree, 54% somewhat agree, 18% neither, 7% somewhat disagree, 7% strongly disagree.
- Improve home comfort (n=405): 21% strongly agree, 52% somewhat agree, 23% neither, 7% somewhat disagree, 7% strongly disagree.
Customer Awareness and Familiarity with ccASHPs

Only 22% of respondents aware of ccASHPs describe themselves as familiar with the technology.
Most ccASHP-aware respondents agreed that ccASHPs could provide energy-efficient heating in cold weather and keep homes warm and comfortable during the same period.

- Provide energy efficient heating in cold weather (n=146):
  - Strongly agree: 23%
  - Somewhat agree: 49%
  - Neither: 15%
  - Somewhat disagree: 8%
  - Strongly disagree: 4%

- Keep home warm and comfortable in cold weather (n=145):
  - Strongly agree: 24%
  - Somewhat agree: 47%
  - Neither: 17%
  - Somewhat disagree: 8%
  - Strongly disagree: 4%
ASHP Benefits

**Ductless model**

**Highly energy efficient electric heating & cooling**

**Zones the home**
- Reduces greenhouse gas emissions
- Even heating, cooling, & dehumidification on mild days
- Doesn’t require duct installation for cooling
- Includes built-in air filters
- Certified to provide efficient heating down to 5°F
- Provides cooling
- Supplements existing heating equipment
- Even heating compared to baseboard or wall heaters
- Adjustable via remote control/app
- Reduces the risk of fire and burns relative to [other ductless options]
- Quieter than window AC or furnace
- Variety of configurations

**Ducted model**

** Supplements existing furnace, using smart controls**
- Reuses existing ductwork
- Even heating, cooling, and dehumidification
- Can extend the life of your furnace/existing equipment
- Provides central cooling (as well as heating)
- Reduces greenhouse gas emissions
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CADMUS
ASHP Benefits

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Trade allies and program administrators cited upfront costs and the cost of natural gas as barriers.

- **Upfront Costs**
  - Contractors and builders cited incremental costs.
  - Manufacturers recognized that ccASHPs tend to be priced higher than standard ASHPs.

- **Cost of Natural Gas**
  - Natural gas and propane prices influence whether contractors promote ASHPs or ccASHPs.
Willingness to Purchase Ductless ASHPs
Messaging and Willingness to Pay (Ductless ASHPs)

Attitudes towards the equipment correlated with interest in installing a ductless ASHP

- Likely to install a ductless ASHP for $1,000 incentive: 55%
- Not likely to install a ductless ASHP for $1,000 incentive: 45%

- 61% agreed that an ASHP can keep a home warm and comfortable in cold weather.
- 39% did not agree that an ASHP can keep a home warm and comfortable in cold weather.
Willingness to Purchase Ducted ASHPs

![Graph showing willingness to purchase ducted ASHPs with varying incentives.](image-url)
Messing and Willingness to Pay (Ducted ASHPs)

Attitudes about ducted ASHPs influenced respondents willingness to install the equipment.

- 50% likely to install a ducted ASHP for a $250 incentive.
- 50% not likely to install a ducted ASHP for a $250 incentive.

Circle chart:
- 57% agreed that an ASHP can keep a home warm and comfortable in cold weather (n=97).
- 34% did not agree that an ASHP can keep a home warm and comfortable in cold weather (n=38).
Program Delivery and Promotion

Manufacturers provide equipment to distributors or wholesalers and contractors purchase and install equipment.
Barriers to ASHP adoption can be divided into several main areas:

- Awareness, education, and engagement
- Technology and Performance
- Cost considerations
- Fuel switching
Awareness, Education, and Engagement

- Residential customers lack awareness of ccASHPs
- Some market actors are aware of ccASHPs but their awareness about benefits is lacking
- Some contractors do not feel comfortable sizing or installing ccASHPs
Technology and Performance

• Negative perceptions of heat pumps exist

• Some trade allies and residential households are not sure the equipment will perform in cold weather

• Programs do not widely agree on best-practice guidelines for sizing, selecting, and installing equipment

• No industry-standard test procedure exists for ASHPs below 17 degrees
Cost Considerations

- Contractors, builders, and distributors said high upfront costs hindered greater ccASHP adoption.
- Contractors, manufacturers, and distributors said low natural gas and/or propane prices hinder ccASHP adoption.
- Incentives are necessary for adoption.
Fuel Switching

- Regulations against fuel switching poses a primary barrier for ccASHP adoption according to program administrators
Conclusions and Recommendations
Utilities play an important role in growing contractor and consumer awareness of ASHPs and ccASHPs

**High priority:** Directly market ccASHPs to customers; outreach should be educational and emphasize non-energy benefits

**Medium priority:** Tailor marketing and messaging to customers based on existing heating system types and fuel types

**Medium priority:** Consider a community-based outreach campaign, with messages focusing on cooling benefits to serve as a gateway to technology adoption
Mixed perceptions of ccASHP capabilities indicate a need for additional education and training

- **High priority**: Partner with manufacturers and local training institutes to offer ccASHP-specific training for Minnesota's contractors

- **High priority**: Provide multiple opportunities by combining webinars and in-person training

- **High priority**: Offer in-person training at multiple locations and provide reimbursement when needed

- **Medium priority**: Establish a standard installation process and include contractors in this discussion

- **Low priority**: Promote training as a way to gain continuing education credits
State and regional entities can advance the market through knowledge-sharing, offering technical guidance, and facilitating collaboration

**Medium priority**: Identify a state or regional entity that can champion ccASHP technology and create working groups for ccASHPs stakeholders

**Medium Priority**: Participate in established regional heat pump working groups to stay abreast of current issues and innovations in the heat pump market
Standardized use of and messaging about climate-appropriate technology is needed

- **High-priority:** Establish a consistent message regarding the technology’s cold-climate performance among all Minnesota program administrators

- **High-priority:** Offer tiered incentives for ASHPs and ccASHPs

- **High-priority:** Establish common cold-climate specifications for ASHPs

- **Medium-priority:** Engage manufacturers and distributors early when making efforts to increase ccASHP adoption
Varying operating costs can make it difficult to justify the higher upfront equipment costs for ccASHPs over other heating equipment options

**High-priority:** Encourage similar requirements for off-peak demand response programs statewide

**Medium-priority:** Train contractors and builders to promote equipment benefits other than cost savings for non-electrically heated households,
Decarbonization goals may offer the best way to overcome perceived barriers set by fuel-switching standards

Medium-priority: Incorporate ccASHPs into an action plan designed to illustrate how to achieve goals set by the Next Generate Act.
Questions?

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Send us your questions using WebEx Q&A box
CARD Project Resources

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For Webinars use CARD Webinars & Videos Quick Link

For Other research documents use CARD Fact Sheets, Guidelines & Tools Quick Link

Webinar Recording available in couple weeks

White Paper available in couple months

R&D Web Page (https://mn.gov/commerce/industries/energy/utilities/cip/applied-research-development/)
Thanks for Participating!

**Upcoming CARD Webinars:**
- **May 27** – Economic Impact of CIP
- **TBD** - Reconsidering Cooling Loads in Minnesota
- **TBD** – Residential Energy Baseline and Market Characterization Study
- **TBD** – Commercial Energy Baseline and Market Study Characterization Study

[Commerce Division of Energy Resources e-mail list sign-up](#)

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