

# MINNESOTA HEAT PUMPS



**A Cold-Climate Test Bed**

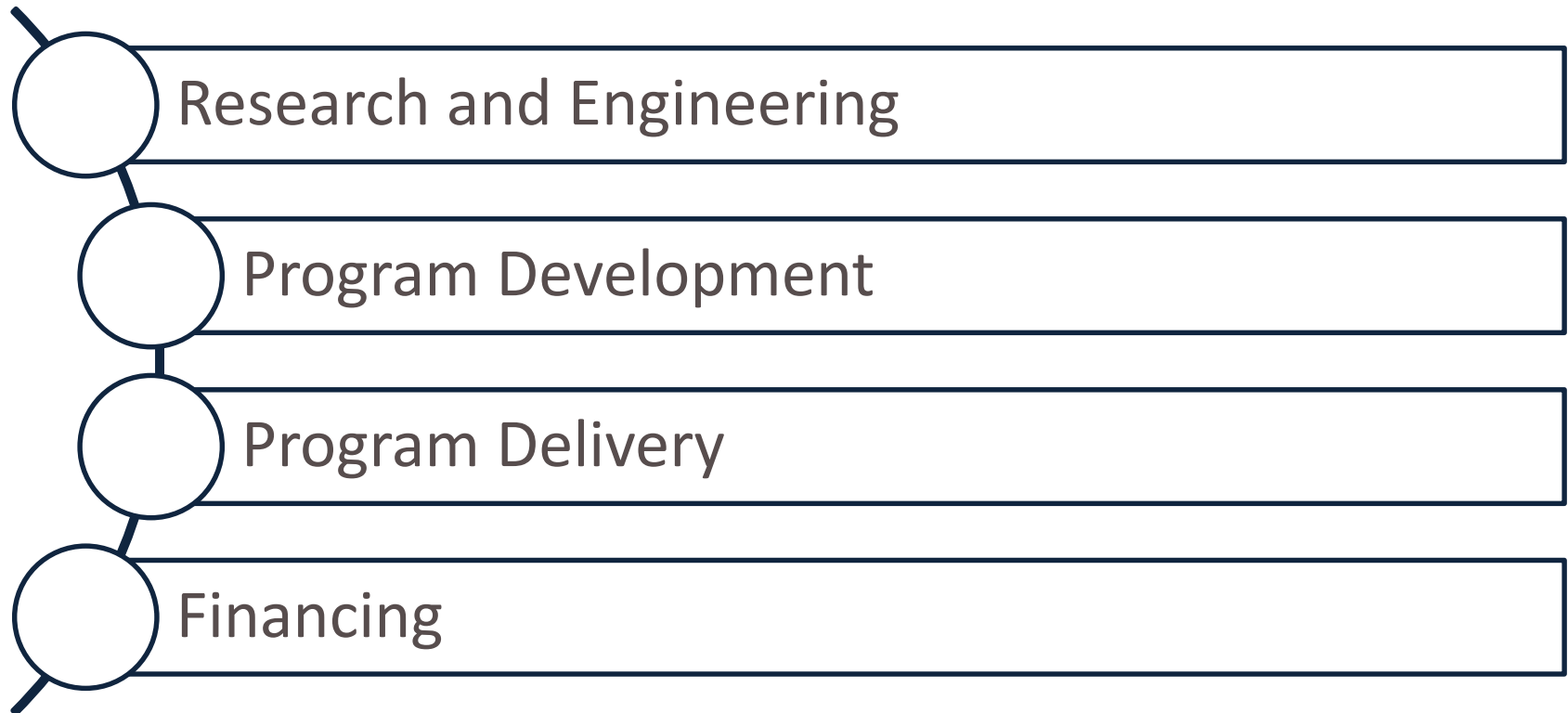
**Isaac Smith**

**Residential Program Development Manager**



# Center for Energy and Environment

40 years of energy efficiency services



# MN Policy

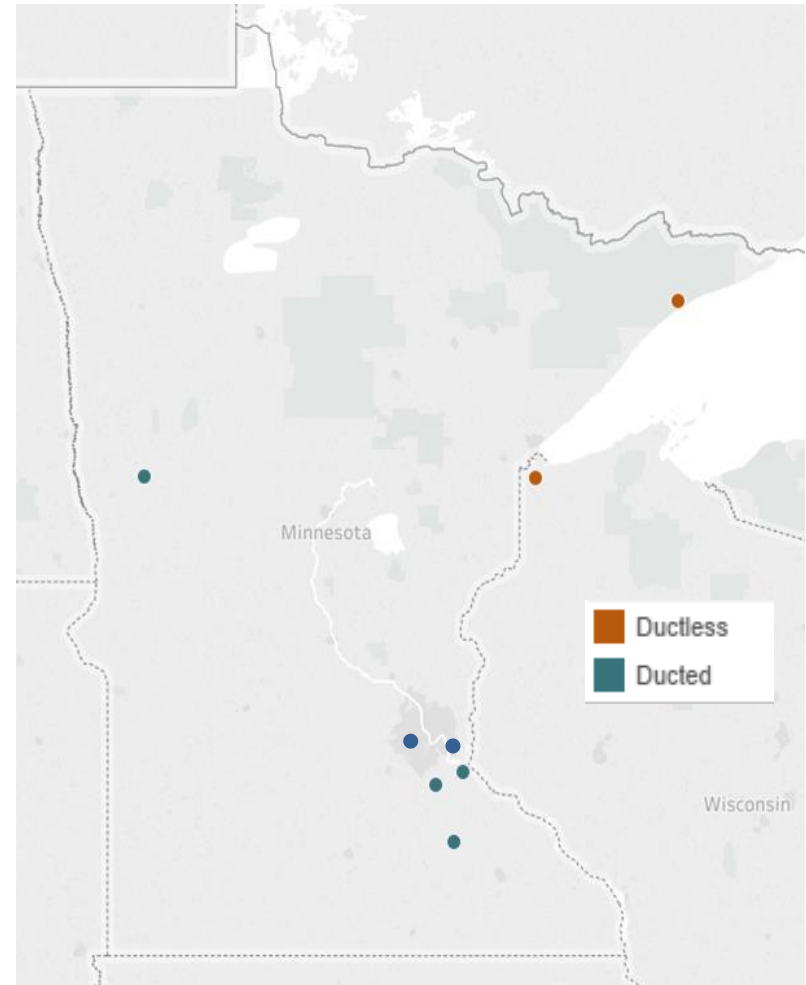
- Conservation Improvement Program (CIP)
  - Energy efficiency required of utilities since early 1980's
  - 1.5% of retail sales savings requirement since 2010
  - Investor-owned electric utility achievements in 2018 were 2.3% (Xcel Energy), 2.6% (Minnesota Power) and 4.2% (Otter Tail Power)
- Fuel switching is not currently allowed in CIP by agency guideline
- MN is exploring legislative and regulatory options to include beneficial electrification in CIP



# CEE's ccASHP field research

## Study Overview: 2015 – 2018

- 8 ccASHP in a variety of MN residences
  - 6 ducted whole house system
  - 2 ductless mini-split systems
- Climate zones 6 & 7
- Monitor installed field performance of ASHP & backup
- Develop performance curves



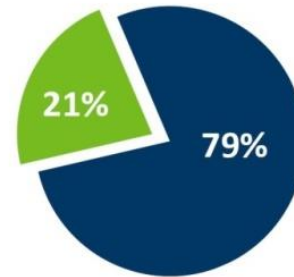
# CEE's ccASHP field research

- Significant savings for replacing propane and electric resistance

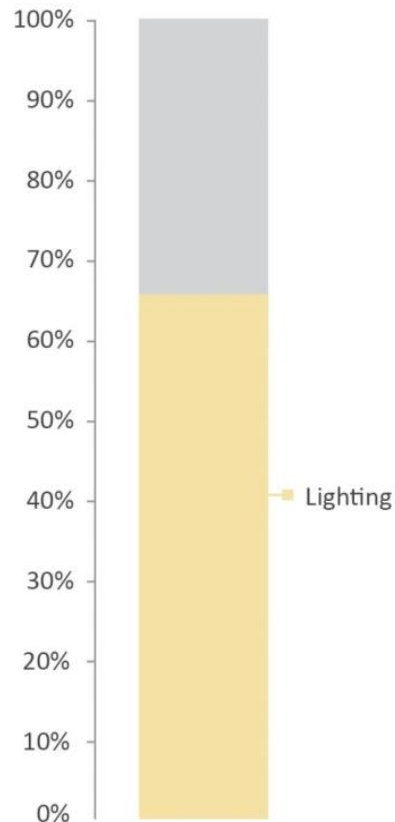
PERCENTAGE REDUCTIONS FOR CCASHPS				
	Site Energy	Source Energy	Homeowner Cost	Emissions
Dual fuel ASHP vs Prop. Furn.	40%	10%	30%	5%
All elect. ducted & ductless vs elect. resistance	55%	55%	55%	55%

- Systems delivered heat at as low as  $-20^{\circ}$ 
  - Technology continues to improve
- Savings can be difficult to achieve – sizing, design, etc.

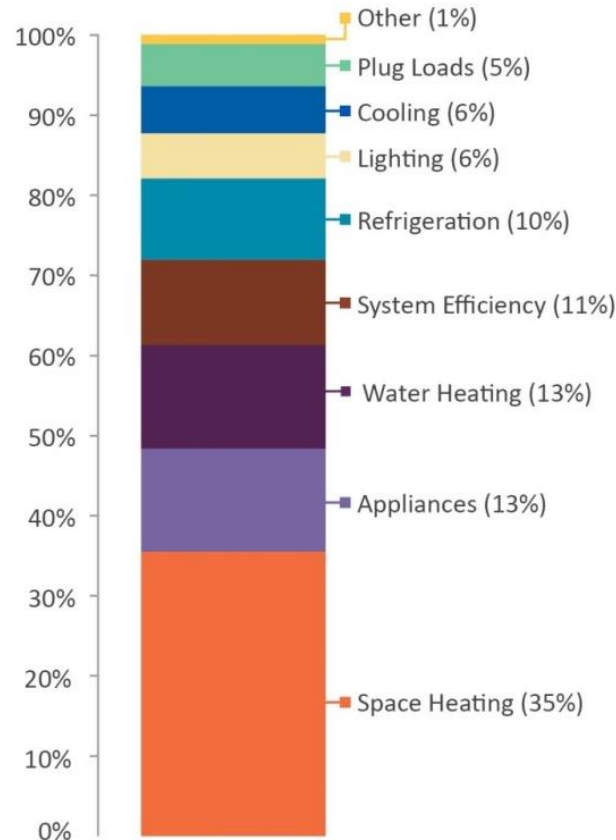
# Minnesota Statewide Potential Study



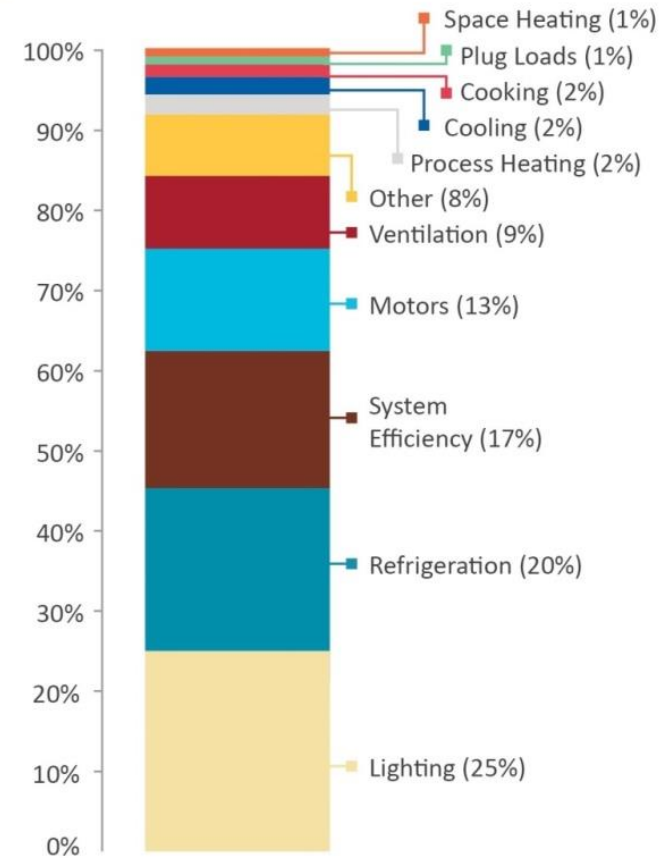
All Sectors



Residential

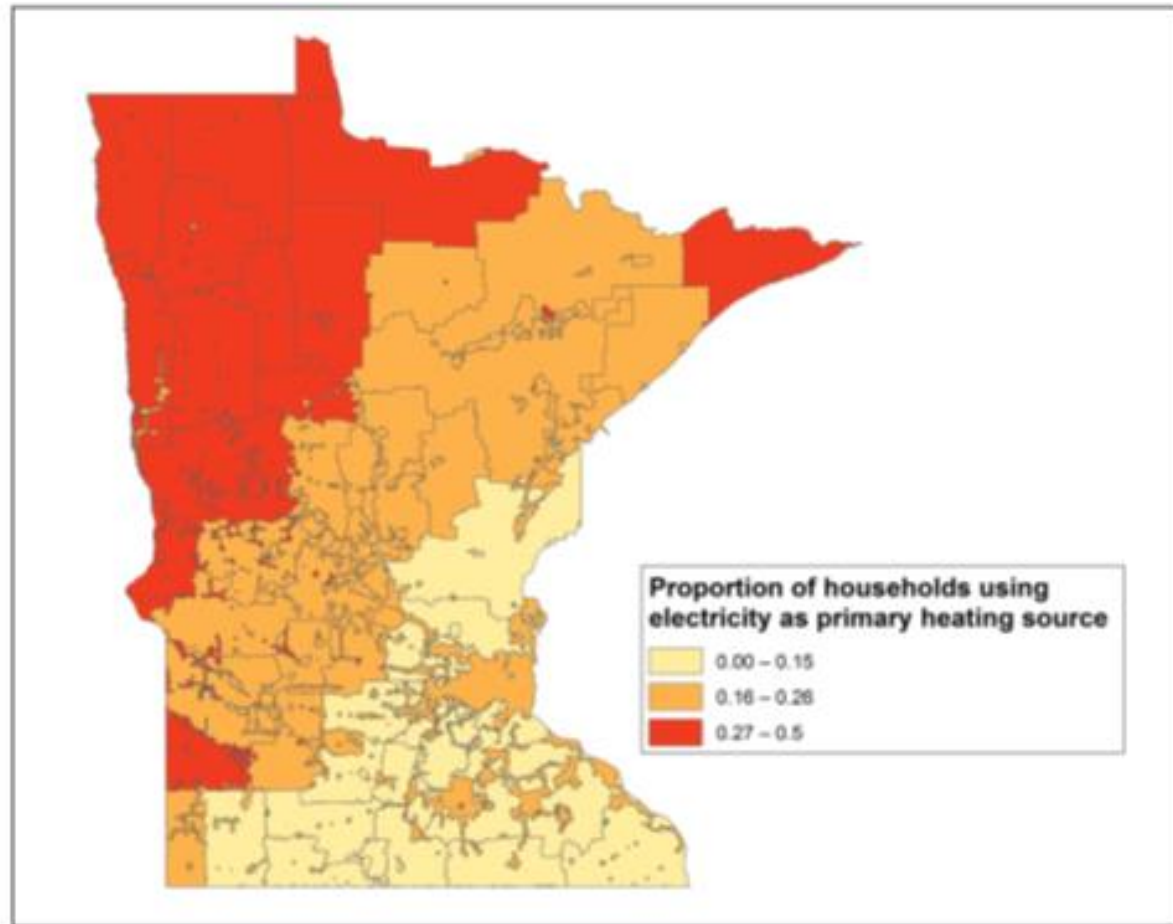
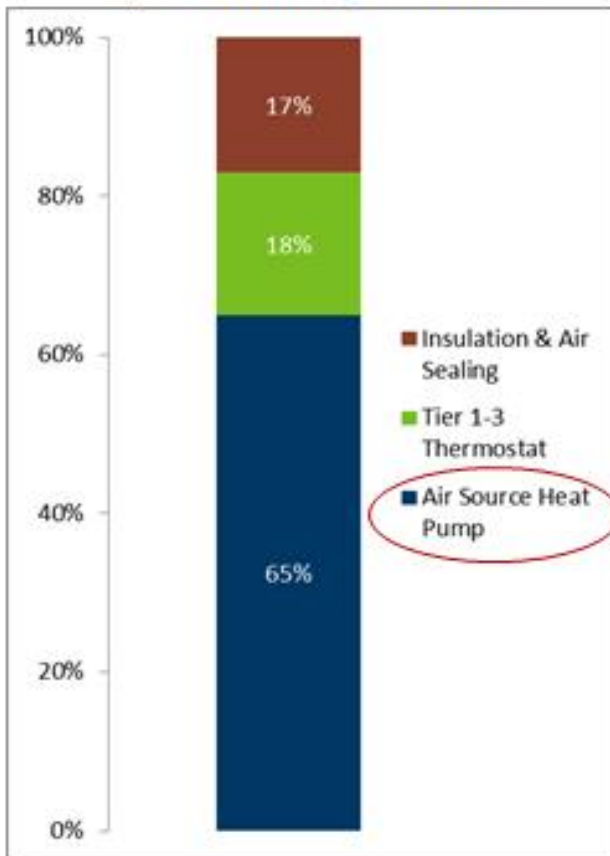


Commercial & Industrial



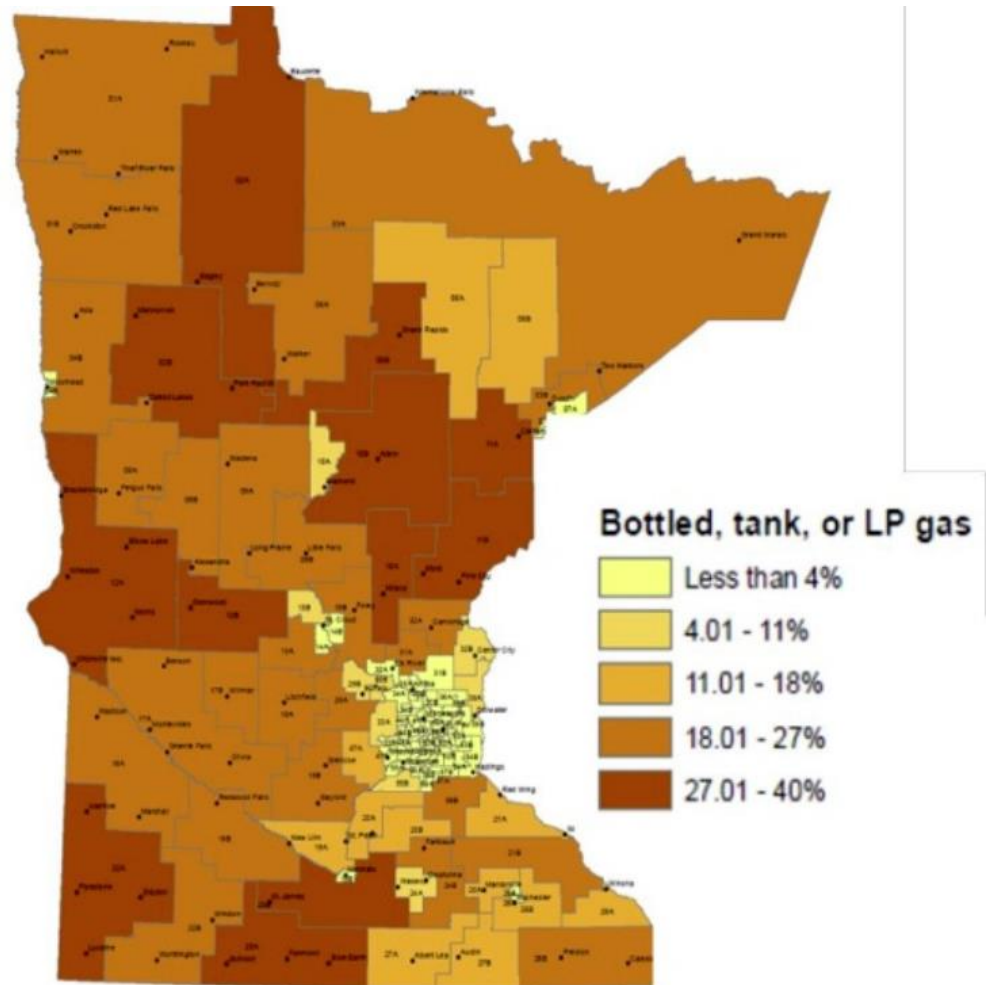
# Minnesota Statewide Potential Study

Measures within residential space heating end use



# Delivered Fuels

- 16% of MN homes are heated with delivered fuels
- Together this equals approx. 547,000 homes







# Minnesota Market - ASHPs

## **Status – immature market**

- Historically centered around AC
  - Typically lower HSPF - rarely used for heating
- Cold-climate market is beginning to grow

## **Barriers**

- Limited contractor knowledge or awareness
  - System options, sizing, and change-over temp
  - Inflated price
- Lack of consumer awareness
  - Don't understand heating potential
  - Difficulty with controls

# ASHP Rebate Programs



**Rebate amounts vary widely throughout state**

\$200 - \$2,000



**Utility rebate requirements also vary**

From 14+ SEER to 18+ SEER, HSPF > 10, and an inverter driven



**Need guidance on product specification and quality installations**



# Breadth of Upcoming Research

- Looking to incorporate a variety of systems
  - Single-family and Multi-family
  - Ducted and Ductless
  - Single head and multi-head
- Validating protocols and verifying performance of optimized ccASHPs and controls
  - Completing over 20 installations in MN
- Developing design, installation and operational protocols for contractors
  - Focus on reducing barriers

# **Market Engagement**



- **Contractor education**

- System and install options
- Setting change-over temperature
- Presenting value proposition



- **Quality installation program**

- Product specifications
- Quality installation guidelines and requirements
- Field verification



# Opportunities for Collaboration

- Joint cold climate product specifications
  - Incorporation of new test methods
  - Uniform cold climate definitions, terminology and requirements
  - Setting stretch goals and targets for new performance and controls
- Coordinating our efforts
  - Sharing case studies, marketing materials and messages, and training materials
  - Utilities, manufacturers, contractors, and homeowners need to see results and momentum from around the country



THANK  
*you!*

Questions?

Isaac Smith – [ismith@mncee.org](mailto:ismith@mncee.org)

