

Welcome

Conservation Applied Research & Development (CARD) Webinar

September 10, 2020

Energy Savings Opportunities in New and Renovated Minnesota Homes

Energy Savings Opportunities in New and Renovated Minnesota Homes

COMMERCE DEPARTMENT
ENERGY RESOURCES

slipstream



Mary Sue Lobenstein
R&D Program Administrator
MN Department of Commerce
marysue.Lobenstein@state.mn.us



Lindsay Anderson
State Program Administrator
MN Department of Commerce
lindsay.anderson@state.mn.us



Scott Pigg
Principal Researcher
Slipstream
spigg@slipstreaminc.org

Webinar Basics

Open or close your control panel

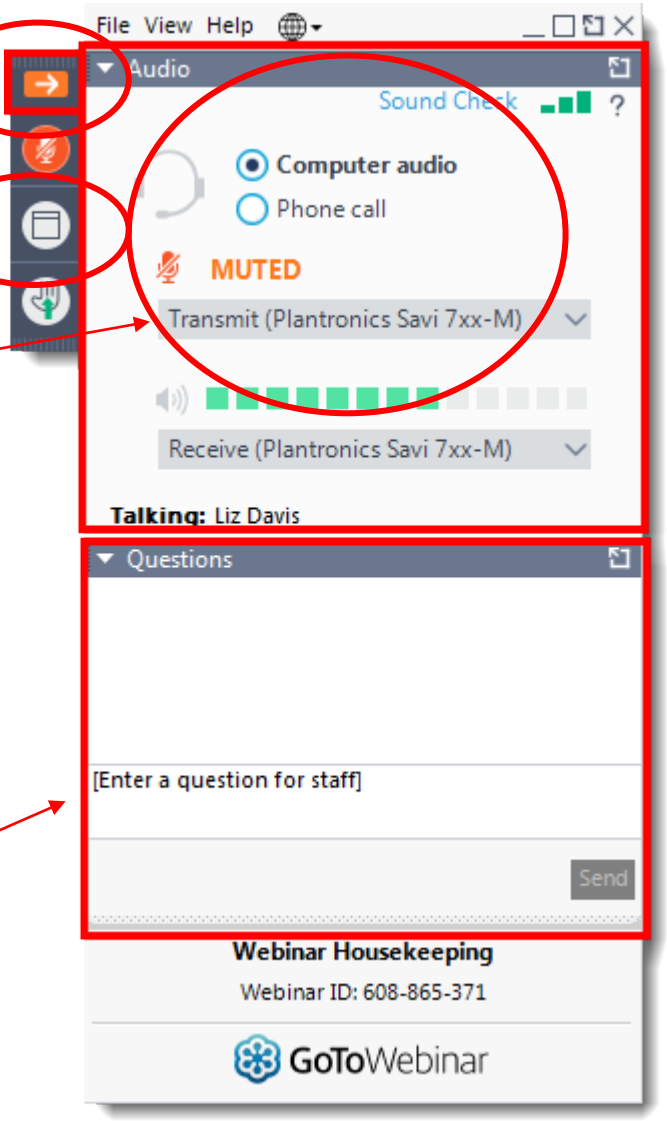
Screen
Maximize screen for better view.

Audio options
Select either the Computer audio or a Phone call.

- If you are using your telephone:
  - Select the “Phone call” button
  - Dial in and enter your access code
  - Enter your audio pin and press #

You will be joined into the webinar on mute.

Participation
Type in a question and hit “send” to ask a question.



Minnesota Applied Research & Development Fund

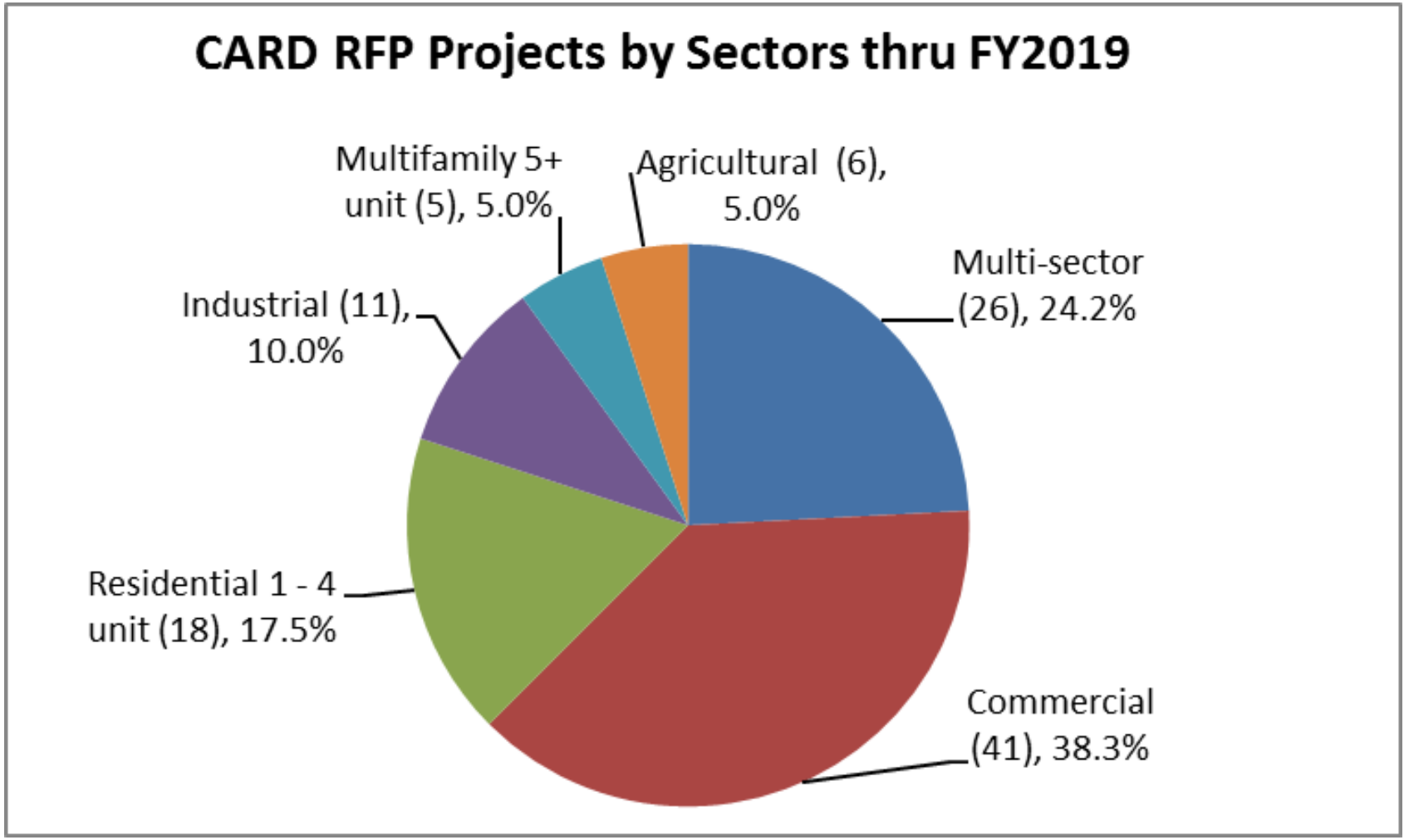
- **Purpose to help Minnesota utilities achieve 1.5% energy savings goal by:**
  - ***Identifying new technologies or strategies to maximize energy savings;***
  - ***Improving effectiveness of energy conservation programs;***
  - ***Documenting CO_2 reductions from energy conservation programs.***

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**

State Capitol Image: Courtesy Minnesota Department of Administration

CARD RFP Spending by Sector thru FY2019



RFP Summary

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

Residential New Construction and Renovation Study

- Two CARD-funded studies of Minnesota new construction and renovation, distinguished by the applicable energy code
  - **Residential – today's topic**
  - Commercial – webinar on September 22
- What kinds of buildings are covered by Residential code?
  - Single-family, detached homes
  - Townhomes (aka single-family, attached)
  - Duplexes
  - Multifamily (3+ unit) buildings that are three stories or less in height



Study Goals

1. **Characterize current construction practices** for new and renovated homes
2. **Quantify "lost" savings** from homes that are below prescriptive code
3. **Identify beyond-prescriptive-code measures** and energy savings potential
4. **Provide guidance** to Minnesota utilities for their new-construction and renovation programs

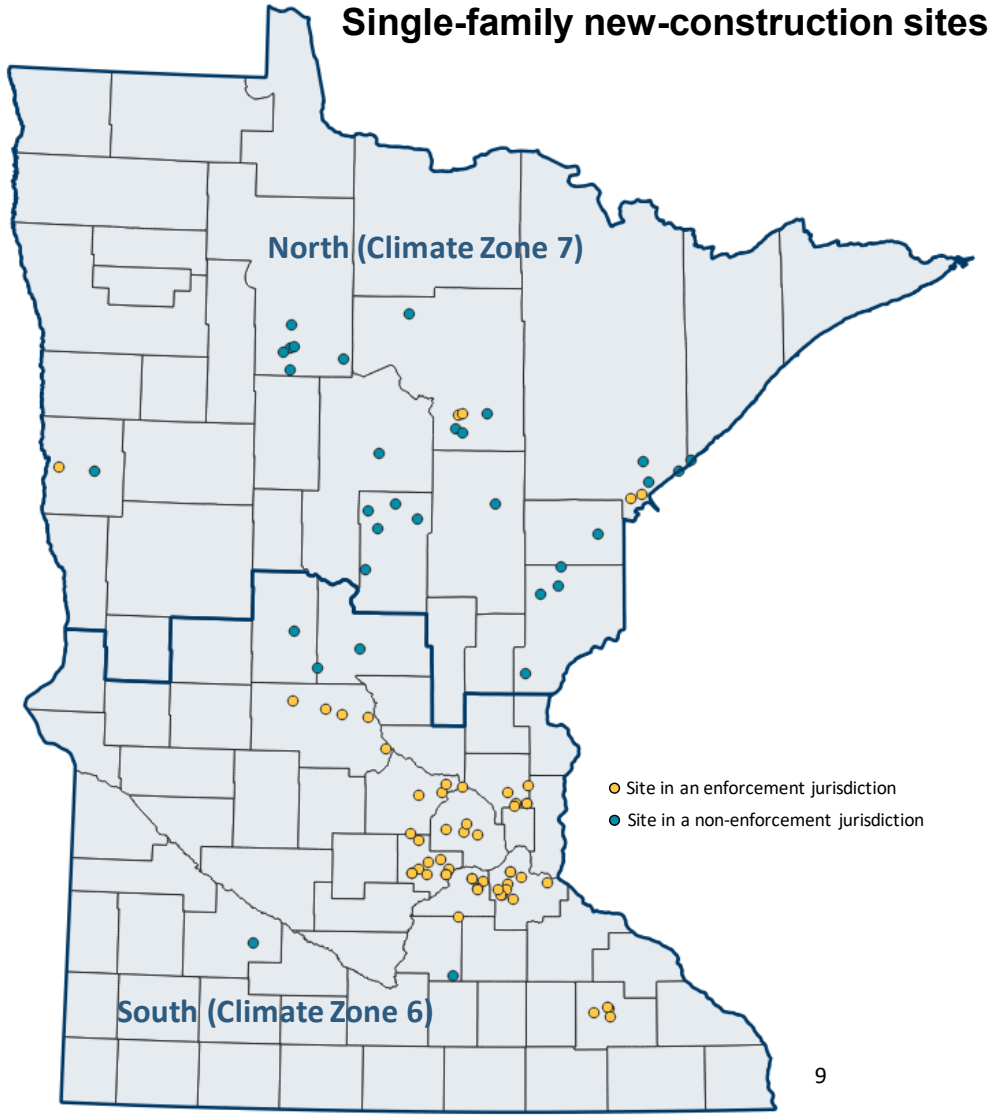
NOT a Formal Code Compliance Study

- Multiple available paths for compliance
  - Prescriptive
  - U-factor alternative
  - Total UA
  - Performance
- Study gauges energy consumption relative to the prescriptive requirements only
- Study data were collected after the homes were occupied
  - owners could have changed some things (e.g. lighting)
- Some characteristics of interest to utility programs are not subject to state code requirements
  - E.g. equipment efficiency

Approach

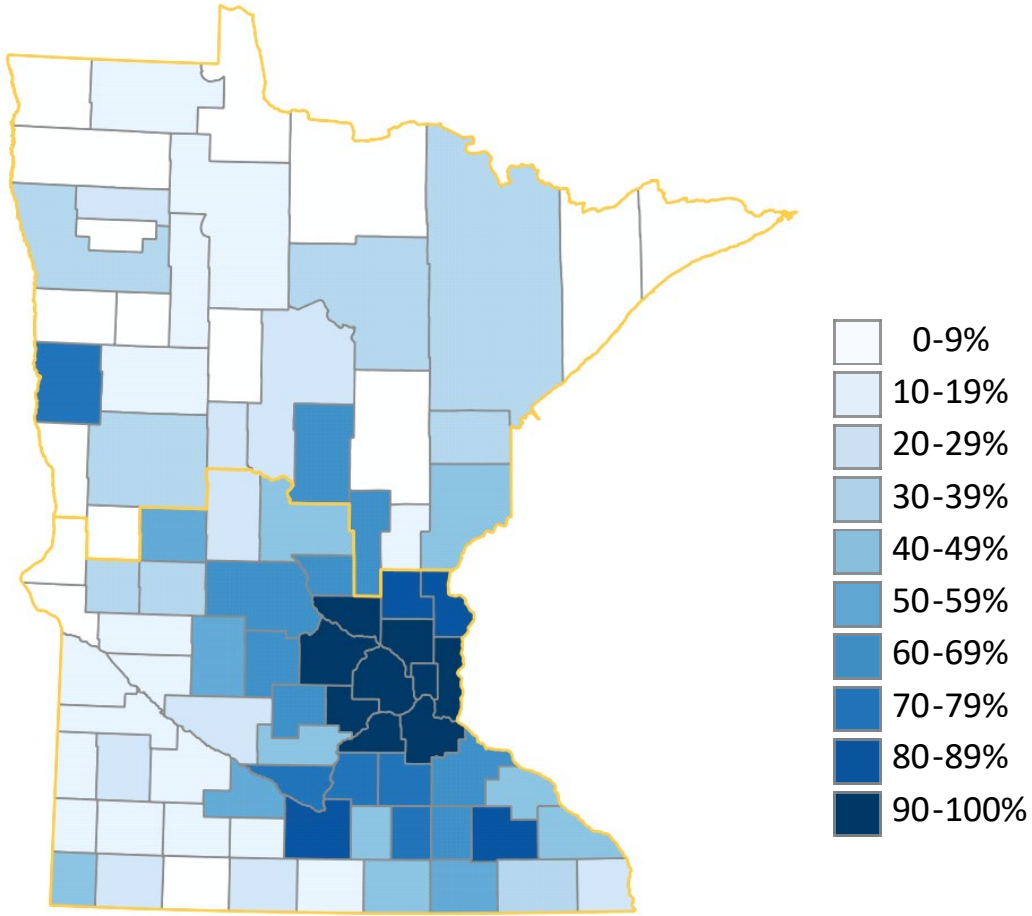
- **Single family new construction**
  - Recruited and visited 87 single-family homes
  - Collected data on:
    - Basic home characteristics (geometry, foundation types, etc.)
    - Insulation levels and infrared scans
    - Windows
    - Air leakage and duct leakage
    - Equipment characteristics and efficiency ratings
    - Lighting
    - Utility program participation
  - Developed REM/Rate energy models for each home
- **Single family renovation** (13 homes)
- **Low-rise multifamily** (25 properties from separate DOE study)

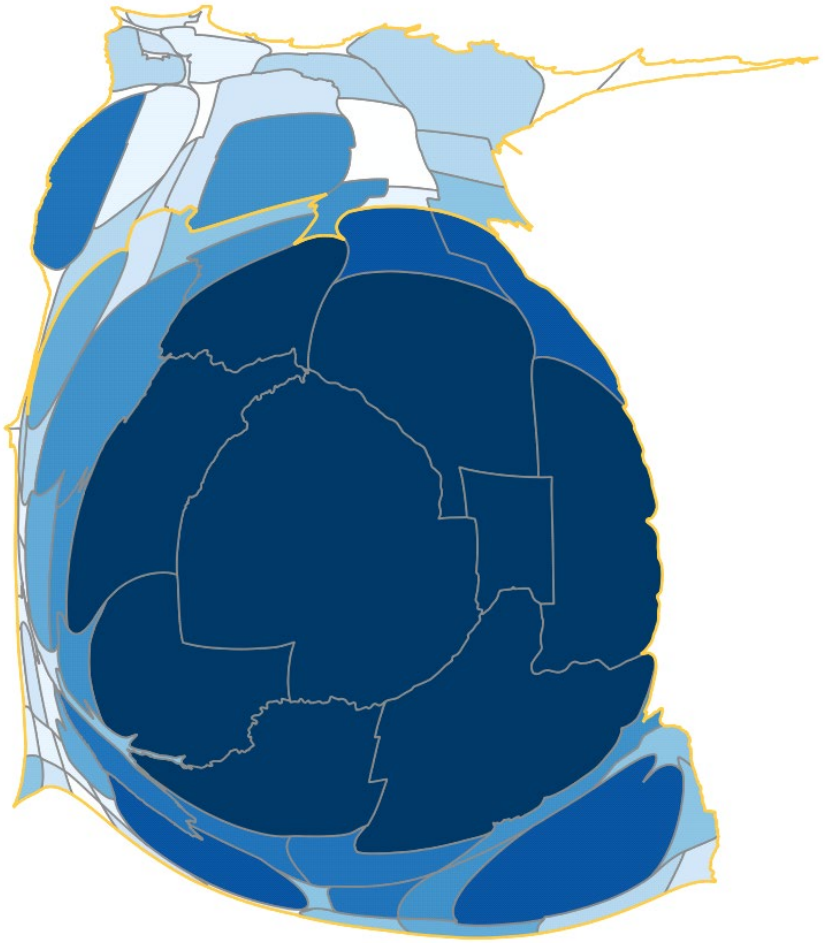
Not discussed today -- see final report



Single-Family New Construction – the Big Picture

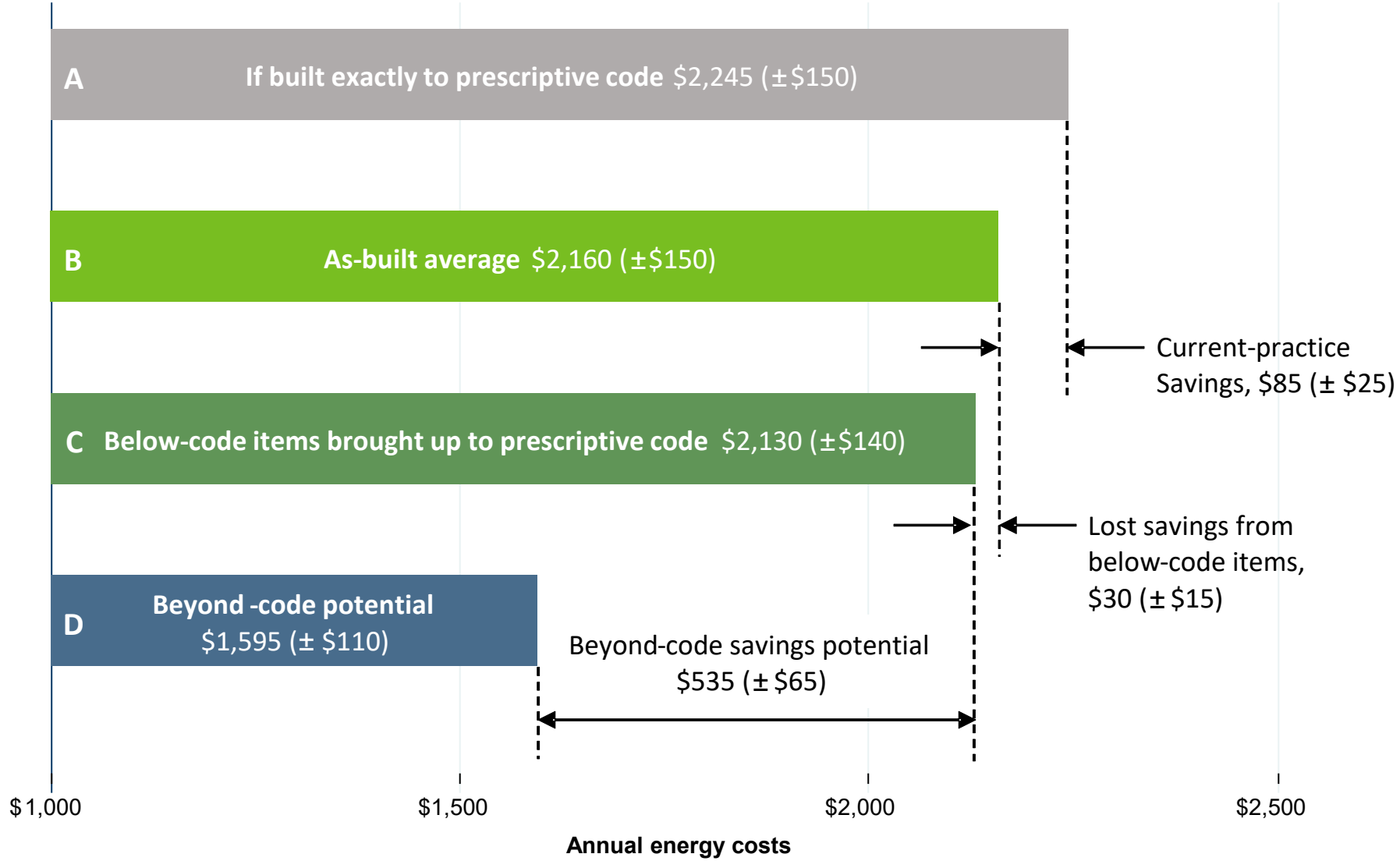
Percent of new single-family homes with natural gas service



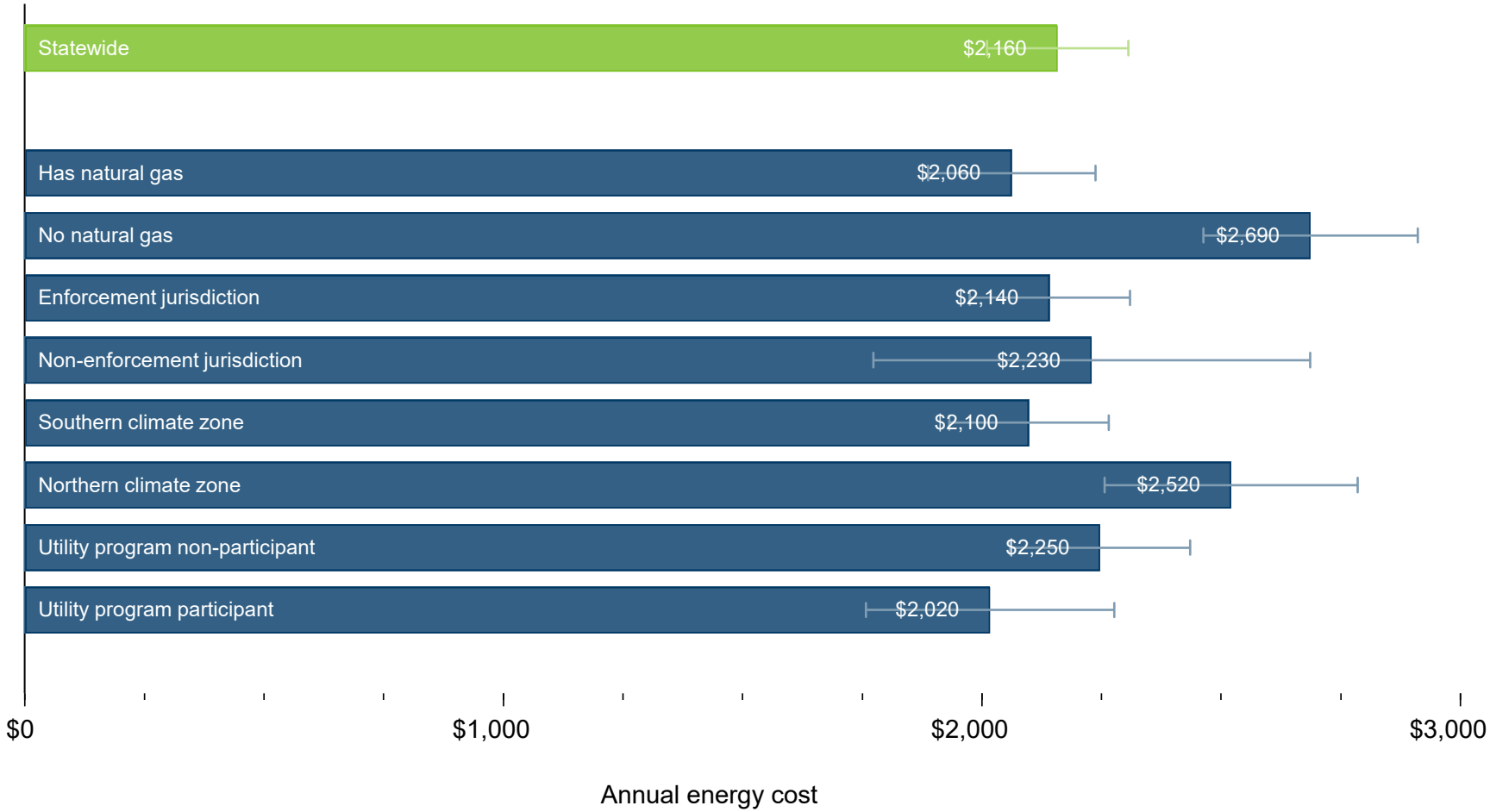


(County size proportional to housing starts)

Average Energy Costs for Single-Family Homes—Four Scenarios

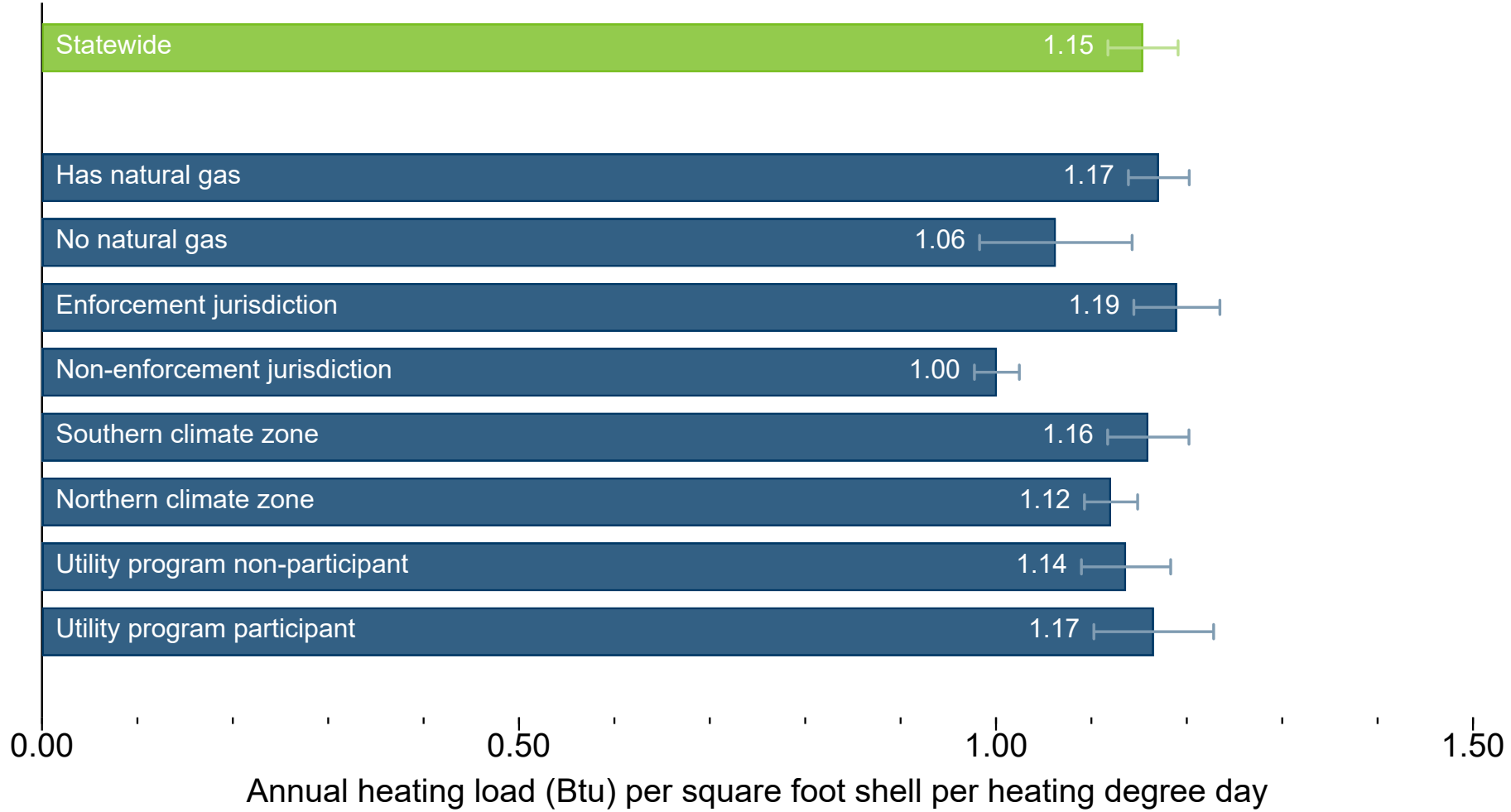


As-Built Modeled Energy Costs for Single-Family New Construction Subgroups



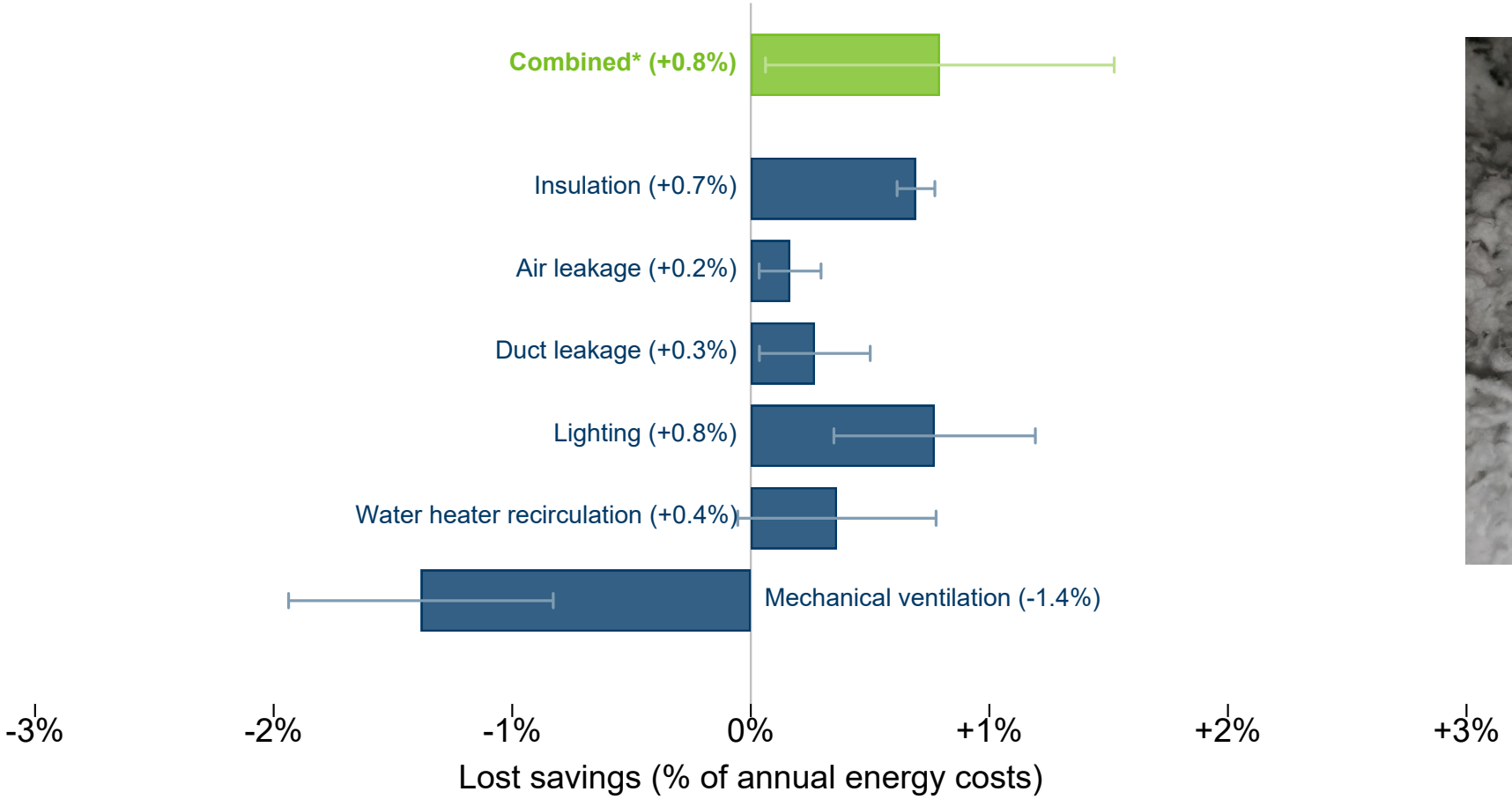
All fuels combined. Includes utility monthly customer charges
Horizontal lines are 95% sampling error margins

Heating Load Intensity for New Single-Family Homes



Horizontal lines are 95% sampling error margins

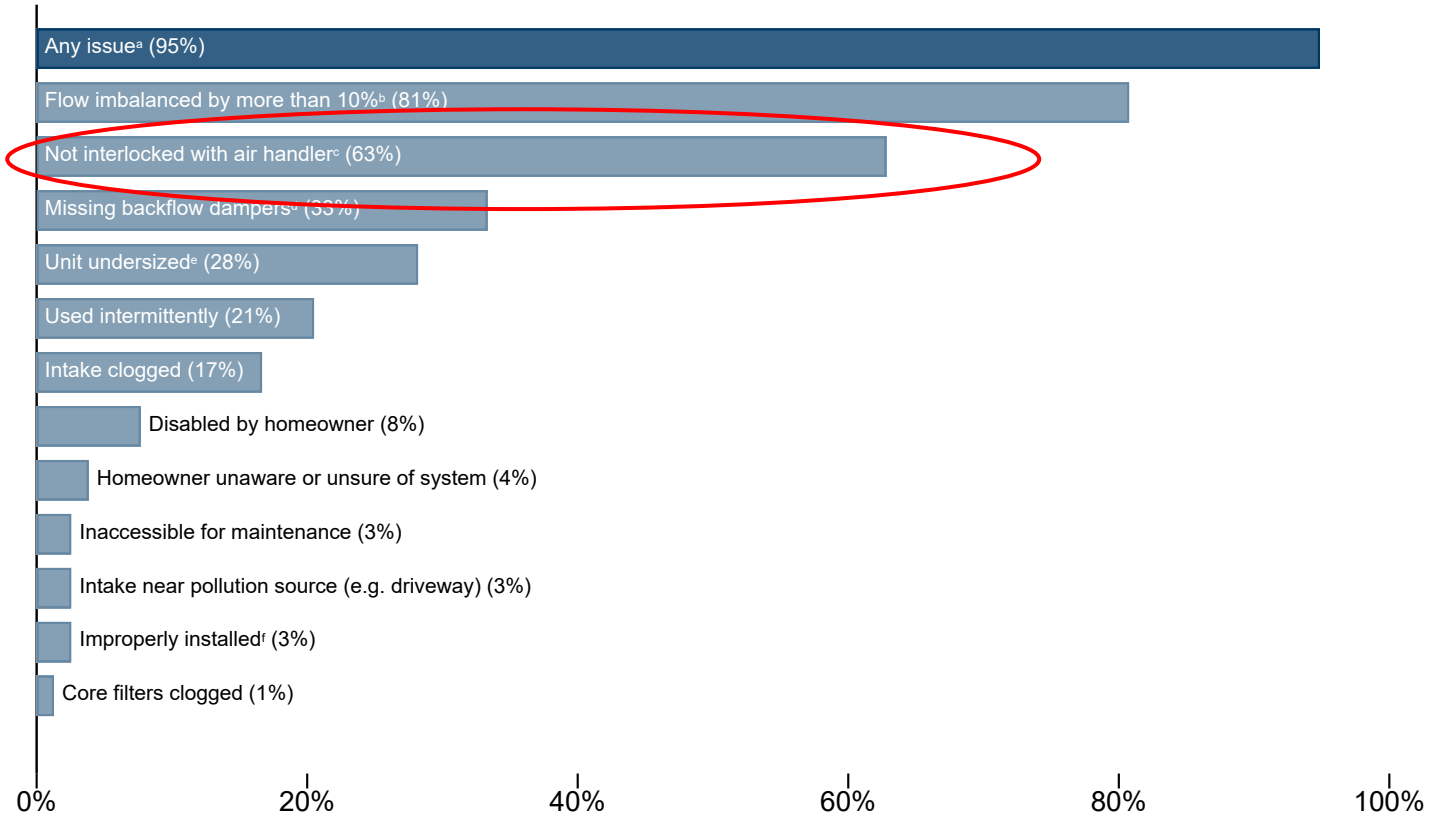
“Lost” Energy Savings Associated with Below-Prescriptive-Code Items

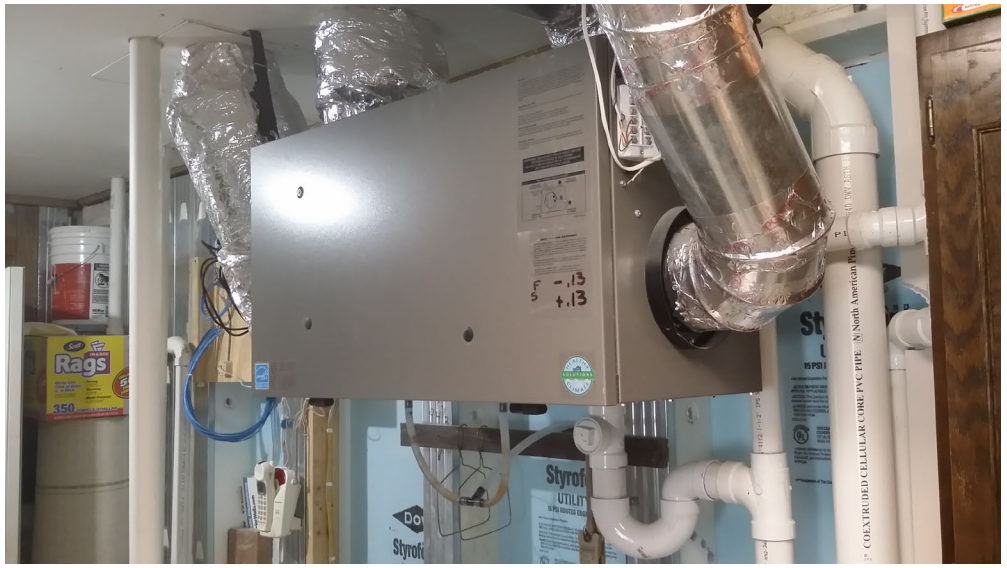




*Includes interactive effects of multiple items
Horizontal lines are 95% sampling error margins

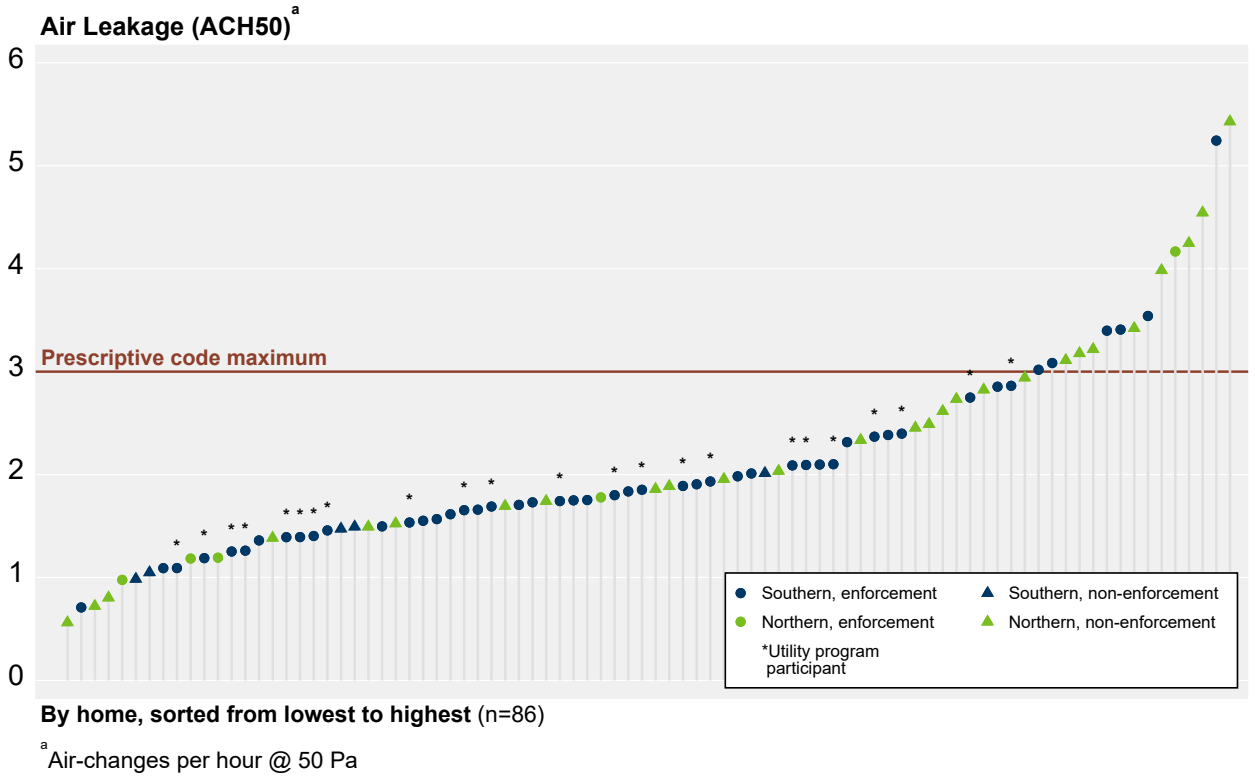
Issues with Mechanical Ventilation

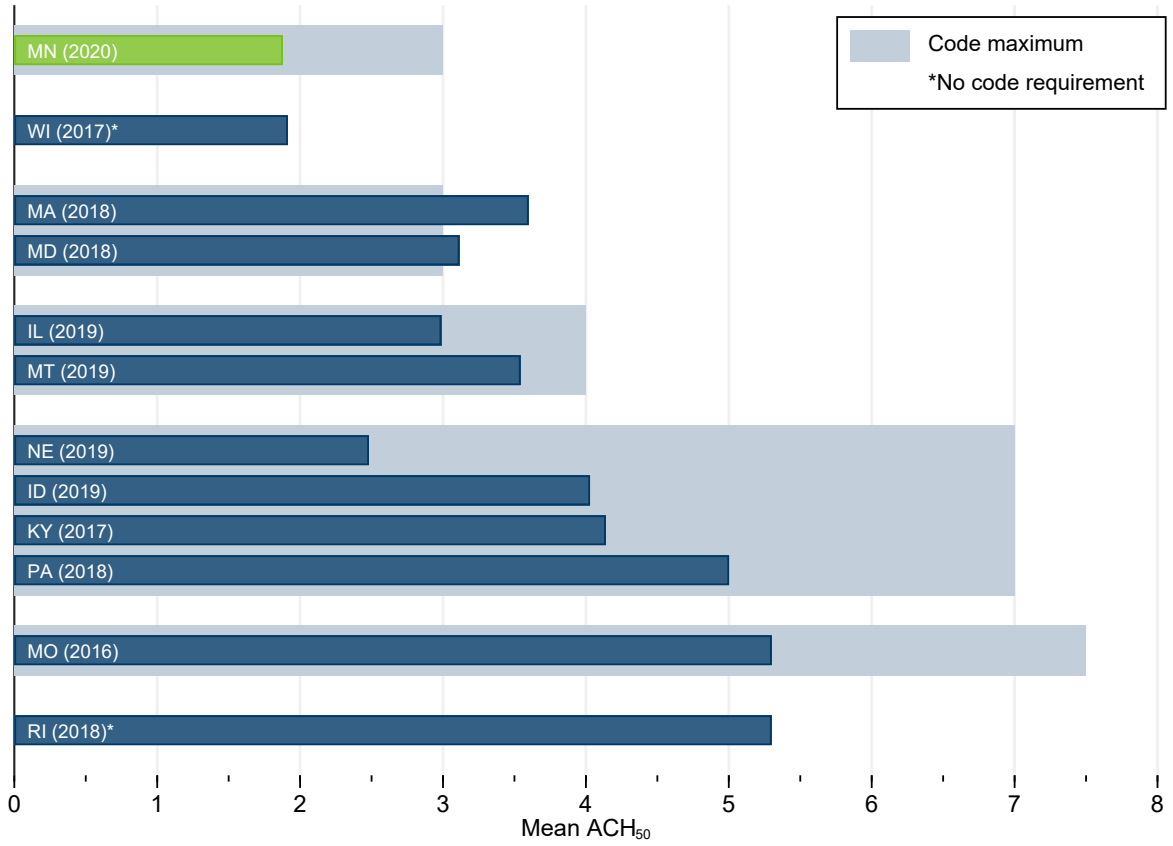




[a] Based on randomly-imputed values for missing data on specific issues (primarily imbalanced flow)
[b] Based on 26 measured systems
[c] Percentage includes fully-ducted and hybrid systems where interlock is not needed and therefore not an issue
[d] Flagged as an issue if no integral dampers or no exterior damper observed for at least one port
[e] Highest rated flow < 90% of code-required total ventilation rate
[f] Based on one non-functional system and one system where intake both the intake and exhaust flow paths were configured for exhaust

Air Leakage for Single-Family Homes





Mechanicals and Lighting



Heating systems

- 130 systems in 87 homes
- 96% of homes have a gas or propane furnace
  - AFUE: 92-98%
- Heat pumps, electric boilers, etc. in homes w/o gas service



Water heaters

- 54% conv. gas or propane
- 30% conv. electric
- 12% tankless, high-efficiency
- 3% indirect-fired



Cooling systems

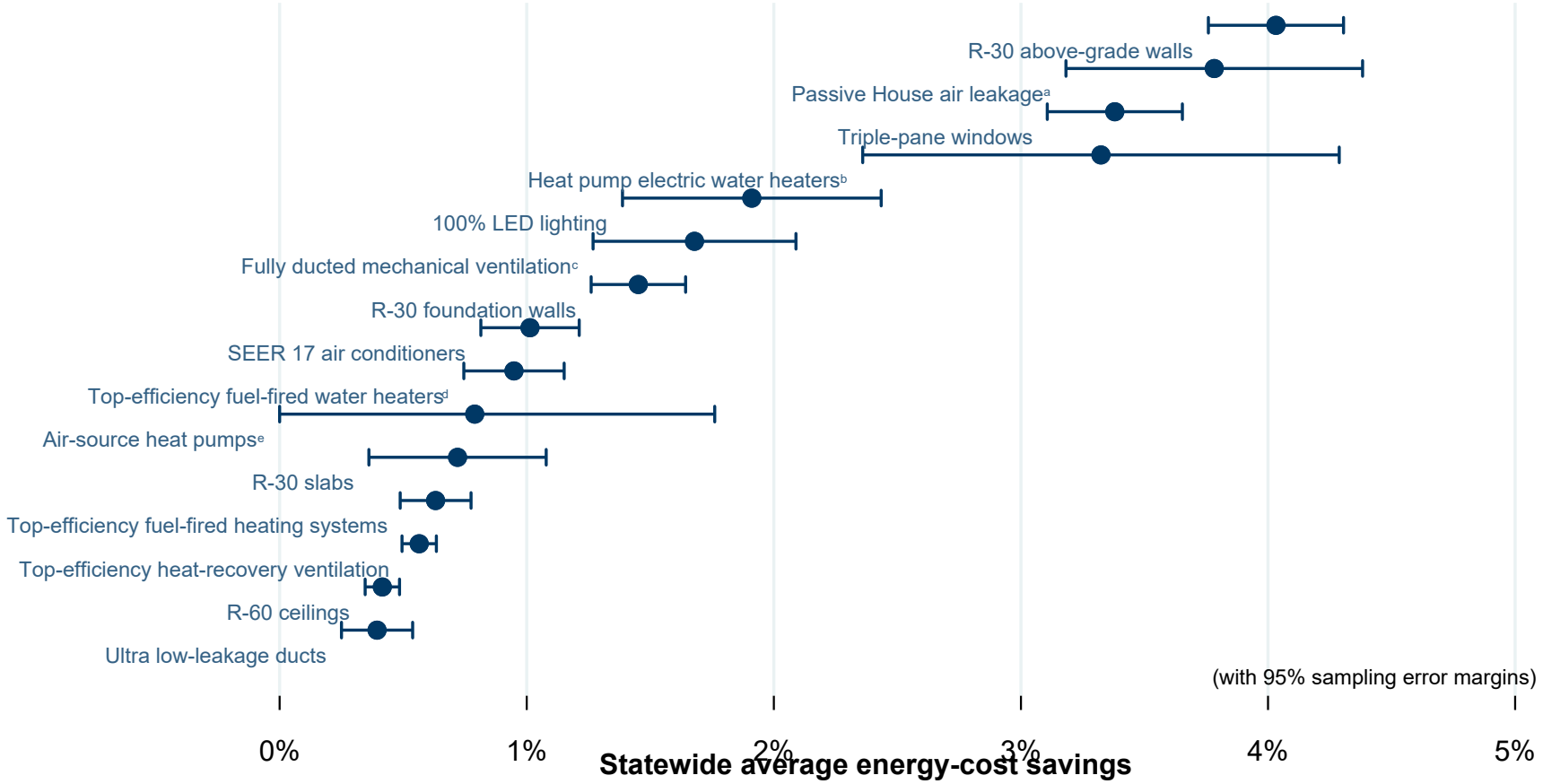
- 95% have central A/C or heat pump
- 3% ductless heat pump
- 50% are SEER 13
- Up to SEER 21



Lighting

- ~100 sockets per home
- 93% hard-wired fixtures
  - 75% LED
  - 8% CFL or LF
  - 17% incandescent or halogen

Beyond-Prescriptive-Code Opportunities for New Single-Family Homes



Recommendations for Residential New-Construction CIPs

- Structure new-construction programs to incentivize going beyond current practice
- Work with regulators and stakeholders toward a common understanding of the role of new-construction programs in moving the market
- Mechanical ventilation (HRVs and ERVs)
  - Step up efforts to ensure proper specification, installation, operation and maintenance
  - Incentivize systems that don't require an air-handler interlock
  - Incentivize high-efficiency systems
- Create joint programs to address the unique needs of the market that is outside of natural gas service areas and mostly served by rural cooperatives

Energy Savings Opportunities in New and Renovated Minnesota Homes



Scott Pigg
spigg@slipstreaminc.org



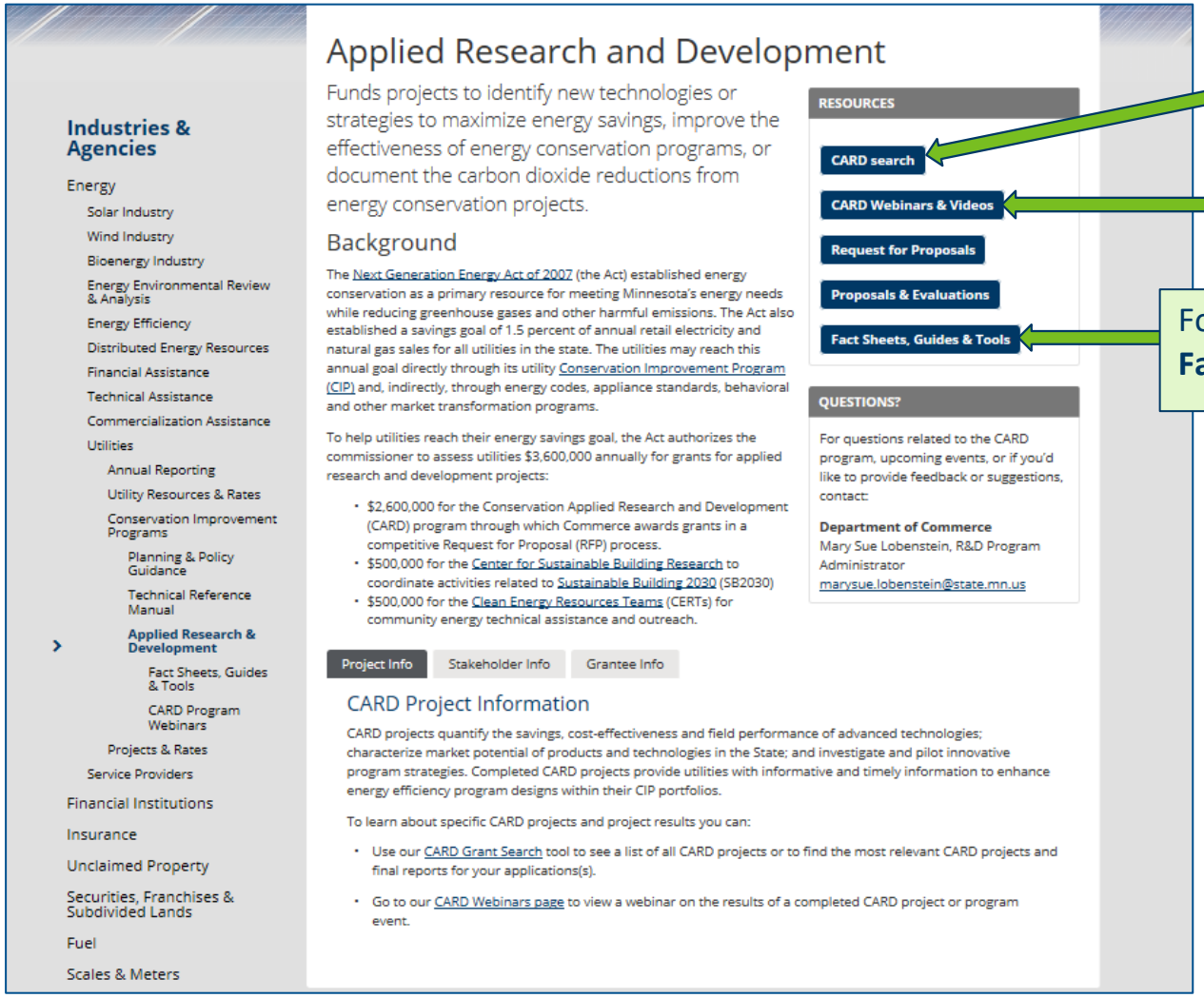
Lindsay Anderson
indsay.anderson@state.mn.us



Mary Sue Lobenstein
marysue.Lobenstein@state.mn.us

Type questions into the Q&A box on the bottom right side of the WebEx panel and send them to "**All Panelists**."

CARD Project Resources



For **Reports** use **CARD Search** Quick Link

For **Webinars** use **CARD Webinars & Videos** Quick Link

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

Webinar Recording & Final Report
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:

- **September 22** – Capture Energy Savings in New Commercial Construction (Slipstream)
- **September 29** – Improve Your Commercial Light Levels and Save on Cost (Slipstream)
- **October 20** – Portable Dehumidification in MN Single-Family Homes (Center for Energy and Environment)

Commerce Division of Energy Resources e-mail list sign-up

If you have questions or feedback on the CARD program contact:
Mary Sue Lobenstein
R&D Program Administrator
marysue.Lobenstein@state.mn.us
651-539-1872

How Did We Do?



Location:

https://app.keysurvey.com/f/41507325/2273/