This Home Checks All the Boxes! Using On-site Home Checklists to Assess Heat Pump Technical Potential

Program administrators interested in efficient electric heating and cooling systems are increasingly focusing on ductless minisplit heat pumps (MSHP), but is it reasonable to expect MSHPs to replace many customers' existing systems? A recent study in a Northeastern state developed a unique and flexible scoring system designed to help on-site inspectors estimate the proportion of a home's conditioned floor area suitable for an MSHP installation. Using the results of real-world home inspections, the study developed bottom-up estimates of the technical (rather than economic) potential of MSHP installations in the state, focusing on the parts of the home where MSHP installations were most feasible.

This study developed a checklist-style scoring rubric and used this tool at 75 on-site visits (single- and multifamily homes) recruited for a residential appliance and mechanical system saturation survey. The scoring tool allowed technicians to make quick, systematic, and replicable assessments of a home's suitability for an MSHP installation based on room-level assessments. Room-level scores were aggregated to create an overall MSHP feasibility score for each home. The poster displays an easy-to-follow decision tree that visually demonstrates the scoring criteria.

This poster shows program administrators and evaluators how to use the MSHP scoring system to analyze their housing stock to make assessments of the likely MSHP potential in their territories. A key focus of the poster is providing suggestions for other customizable scoring criteria that researchers can use to develop their own modular scoring systems, depending on their electrification priorities. Program stakeholders can readily incorporate these tools in on-site visits for evaluations or weatherization programs and also in surveys that supplement on-sites. The poster shows how to systematically implement these tools in the field and turn the results into home-level scores. Finally, for studies without on-site visits, this poster suggests simple tools that can be used to inform MSHP potential efforts in other states, based on the room and home-level results of this study.

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Background

- Program administrators are increasingly relying on minisplit air source heat pumps for efficient electric heating and cooling
- Minisplits are often considered supplemental, not whole-home systems
- Minisplit technology has improved, allowing for complex, whole-home installs

Research Questions

- How much of the typical home would be a good candidate for a minisplit install?
- How much load can be handled by these systems in a typical home?
- What is the likely technical potential for minisplits?
- Can we develop a scoring rubric to quickly assess minisplit feasibility at the room level that can be redeployed and customized?

Methodology

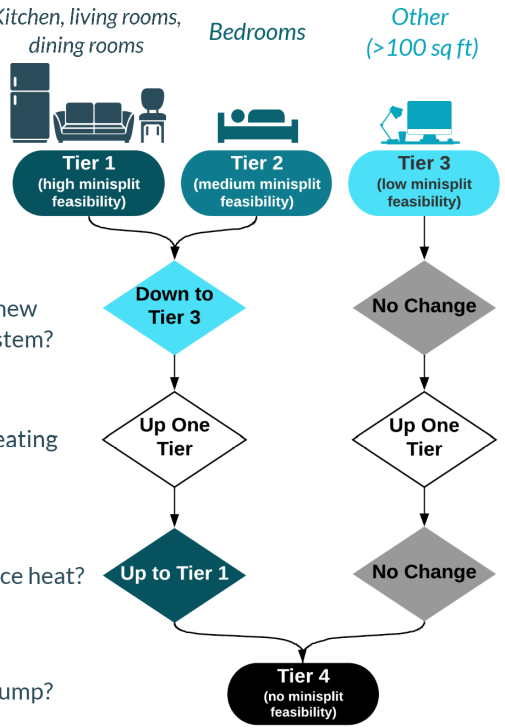
- On-sites at 75 existing homes in Rhode Island
- Part of a Residential Appliance Saturation Study
- Data on building shell, mechanical equipment, lighting, appliances, air and duct leakage
- In-person interviews with occupants to learn about comfort issues
- Manual J heating/cooling loads
- Room-level assessments using scoring rubric
- Room-level schematics of each home
- Technical potential for minisplits in RI

Minisplit Feasibility Scoring Rubric

1. Initial assessment based on room type

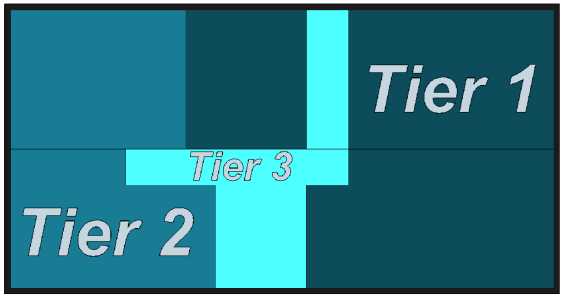
2. Fill out checklist based on room features

- Is the room served by a new heating AND cooling system?
- Is there supplemental heating OR cooling?
- Is there electric resistance heat?
- Is there already a heat pump?



3. Finalize feasibility score and color-code in schematic

Tier 1: High minisplit feasibility	Tier 2: Medium minisplit feasibility	Tier 3: Low minisplit feasibility	Tier 4: No minisplit feasibility



Results

- Calculated likely technical potential for heat pumps; cost not part of this study
- 60% of average home's floor area would be a strong candidate for minisplits (Tier 1 spaces)
- 23% of average home's floor area poorly suited to minisplits (Tier 3)
- 47% of Tier 1 area in the typical home is contiguous, meaning well-suited to a multi-head/ducted system
- Available minisplit systems can meet average heating and cooling loads
  - Average heating load: 42 kBTUh for single-family, 22 kBTUh for multifamily
  - Average cooling load: 23 kBTUh for single-family, 14 kBTUH for multifamily

Future Applications for Scoring Criteria

- Scoring criteria can be adjusted to study needs
- Data points add minimal time on-site
- Criteria can be added depending on research needs
  - Fuel Type
  - Floor Plan
  - Install Logistics
  - Electric Panel
  - Solar
  - Existing Ducts
- Checklist rubrics can be deployed to assess feasibility of other electrification priorities (i.e., heat pump water heaters)
- Schematics can be sent to HVAC contractors to get quotes on install cost, which could be presented to homeowners to inform economic potential studies
- Results can be applied to other studies/datasets (baseline studies, assessor databases, etc.) to leverage RI results without having to do on-sites