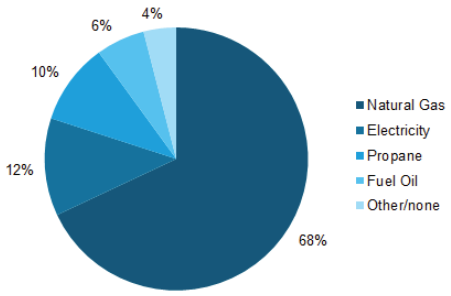
COLD CLIMATE AIR SOURCE HEAT PUMP FIELD ASSESSMENT

This study will assess the efficiency of the newest generation of cold climate air source heat pump technologies to help determine whether they should be included in utility efficiency programs.

WHY THIS RESEARCH IS NEEDED

High efficiency technologies like air source heat pumps (ASHPs) have significant potential to improve space heating efficiency and reduce energy costs for houses in cold climates where natural gas is unavailable. ASHP technology has been available for many years, but technological limitations caused concern about efficiency and reliability during the colder portion of Minnesota winters.



The efficiency and capacity of older ASHPs dropped significantly for outdoor temperatures below 40°F. The newest generation of ASHPs can now operate down to 0°F to -13°F. The efficiency of these technologies in moderate climates is two to three times more efficient than standard electric heating systems, but there is less experience with the use of these systems in Minnesota's colder climate. Monitored field performance tests will help confirm the operation of newer generation ASHP technologies so that they can be confidently included in Minnesota utility Conservation Improvement Programs (CIP).

PROJECT PROCESS AND EXPECTED OUTCOMES

IX research project staff will install ASHPs in four to six occupied Minnesota homes where natural gas is not available. The existing furnace will be left in place to serve as a backup to the ASHP during colder outdoor conditions. In addition, we will alternate between furnace and ASHP operation throughout the heating season to compare energy use of the two systems during milder conditions. Monitoring equipment will measure the ability of each system to meet the space heating load. The annual energy use and contractor installation cost will be used to determine cost effectiveness. Occupant comfort and acceptance will be evaluated from monitored space temperatures and occupant surveys.

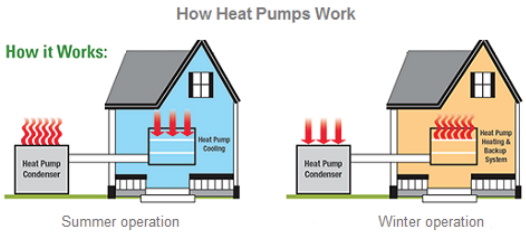


Photo Credit: Minnesota Power

The results from the field study will determine ASHP savings potential and help to facilitate the design of CIP. The project will help determine the house characteristics and existing system types that are best suited for installation of ASHPs. While the primary analysis will be based on replacing electric resistance heat, we will also assess the policy and program implications of reducing delivered fuel consumption.

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Project Partners: ACEEE, Great River Energy, and Electric Power Research Institute

Innovation Exchange
Center for Energy and Environment

PROJECT SUMMARY

Objectives

Monitor the efficiency and heating performance of new generation air source heat pumps in Minnesota cold climate homes.

Identify the house characteristics and existing system types that are best suited for ASHPs.

Utility Implementation

Work closely with utility partners to analyze and compile results in a form that can be more easily integrated into CIP programs. This will allow a rapid transfer of the results to promote adoption of new ASHP technologies in the Minnesota market.

Scope

New single and variable speed ASHP technologies will be field tested in 6 Minnesota homes.

Timeline

January 2015 to December 2017

Non Energy Impacts

The heat output of ASHPs will provide longer run times during milder weather which will improve occupant comfort for many homes. The summer AC dehumidification performance may provide better humidity control for some houses.

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