Prospectus

An E SOURCE Multi-Client Study

Will the Low-Temperature Heat Pump Flatten Peak Heating Loads?

Although the air-source heat pump represents an inexpensive and efficient way to provide both air conditioning and heating for homes and small businesses, its market share has been held in check by a key limitation: as outdoor temperatures drop, so does its capacity and efficiency. Typically, when ambient air temperatures drop below freezing, heat pump systems switch on electric resistance heaters, which further degrades overall system efficiency and contributes to wintertime peak demands. So far, this limitation has served to minimize the diffusion of heat pumps into northern climates. A new product—the low-temperature heat pump (LTHP)—has the potential to sweep aside such limitations and directly compete with both electric and natural gas heating technologies. In some markets, this invasion will reduce both summer and winter peak demands. No matter where it goes, the LTHP is likely to improve space heating efficiency.

The low-temperature heat pump has the potential to reduce both summer and winter peak demands, and improve space heating efficiency.

A small company in Maine and several Asian manufacturers are marketing these new air source heat pumps, which they claim are capable of operating at rated capacity down to about 0° Fahrenheit (F), with a coefficient of performance (COP) of greater than 2. At that temperature, conventional air-source heat pumps operate much less efficiently, produce less than half their rated capacity, and rely primarily on backup electric resistance heaters to maintain comfort. Better controls, compressors, heat exchangers, and refrigerants give LTHPs their edge, and these units aren't limited to extremely cold temperatures. Across most outdoor temperatures, LTHPs should exhibit better performance than their conventional counterparts (see table). And with natural gas prices at nearly historical highs, LTHPs may also be competitive with gas furnaces on the basis of energy costs. But it remains to be seen how competitive they'll be with conventional heating technologies on the basis of lifetime costs for owning and operating the units.

Low-temperature heat pumps beat highly-efficient conventional units on efficiency and capacity

Outdoor Temperature (°F)	Coefficient of Performance		Capacity (Btu/hr)	
	Conventional	LTHP	Conventional	LTHP
0	1.7	2.3	16,000	47,000
20	2.4	2.8	24,500	65,000
40	3.2	3.3	32,500	38,000

The LTHP is more efficient and has greater capacity than conventional heat pumps across a wide range of outdoor temperatures, according to the only U.S. manufacturer now producing these systems. For example, at 0° Fahrenheit (F), a low-temperature unit is over one-third more efficient and puts out nearly three times as much heat as a comparably sized conventional unit. As a result, LTHPs can heat without backup sources at much lower temperatures than a conventional unit. This unique capability enables LTHPs to dramatically reduce winter peak loads in some situations and to compete with gas furnaces in others.

Source: E SOURCE; data from Nyle Special Products

To help utilities evaluate the opportunities presented by LTHPs, we'll be conducting research to determine the current status of this new technology and the market sector in which it currently competes. In addition to investigating the technical aspects of these devices, we'll determine the capabilities and intentions of manufacturers, the economics of LTHP installations, and the opinions of a wide variety of market players, including consumers.

Study Methodology

Techniques that we'll use over the course of this study include interviews, building simulations, literature collection and review, and economic analysis. Based on the data we collect, we'll formulate a set of strategies that utilities could use to help stimulate the diffusion of LTHPs into the marketplace. These options might include: incentive programs, information programs, channel development, and field demonstrations.

Study Objectives

This study will answer such questions as:

- How well do LTHPs work in terms of temperature range, efficiency, noise, comfort, reliability, and maintenance?
- Are manufacturers capable of manufacturing, distributing, and maintaining these units on a mass-market basis?
- Are major domestic HVAC manufacturers getting into this market?
- How will HVAC wholesalers, retailers, and installers react to this new product?
- What are consumer attitudes toward these heat pumps likely to be?
- What are the economics of low-temperature heat pump installations in different climates?
- Which applications (new construction, retrofit, room additions) make the most economic sense?
- How might the diffusion of low-temperature heat pumps impact greenhouse gas emissions?
- Will this technology shift the balance in new home developments toward all-electric homes?
- What's the potential market size for low-temperature heat pumps?
- What strategies might utilities adopt to make the most of opportunities presented by low-temperature heat pumps?

Deliverables

Study subscribers will receive two summary reports and will be invited to participate in several teleconferences. For Volume I, we'll collect and analyze technical data on low-temperature heat pumps, reviewing field tests, lab tests, performance simulations, and economic analyses. We'll also analyze the market, including the capabilities and intentions of manufacturers.

For Volume II, we'll present the results of our market research with manufacturers, retailers, wholesalers, and consumers. In addition, we'll offer our conclusions on the strategies, incentives, promotions, and partnerships that energy service providers might find useful for helping their customers make decisions about whether to purchase this technology.

The scope of this research will be subject to input from our charter subscribers. We expect to release both volumes in the third quarter of 2005.

Project Advisors

Most E SOURCE studies include advisors from outside organizations, including the national labs, manufacturers, as well as those from other market sectors. For this study, our advisors will include:

Charlie Stephens, Policy Analyst, Technology Development Section, Oregon Department of Energy
Russell K. Johnson, Johnson Research, LLC
Vince Mei, Researcher, Oak Ridge National Laboratory

About Us

For more than 18 years, E SOURCE has provided information services focused on retail energy markets, services, and technologies. At our core is an exceptional team of research professionals whose technical and analytical skills and real-world experience have earned E SOURCE international acclaim. Our customers value their relationships with us because we're always ready to provide prompt, friendly, expert advice and guidance. Clients include roughly 300 electric and gas utilities, other energy service providers, large energy users, government agencies, and other organizations from nearly two dozen countries worldwide.

For More Information

Contact a member of our business development team for more information on this or any other E SOURCE Multi-Client Study.

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