

MEMORANDUM

To: Massachusetts Program Administrators
From: COOL SMART Impact Evaluation Team
Subject: Ductless Mini-Split Heat Pump (DMSHP) Final Heating Season Results
Date: Final October 12, 2015

Heating Season Metering Objective and Approach

As part of a large impact metering study, the COOL SMART Impact Evaluation Team was tasked by the Massachusetts Program Administrators with determining heating season savings and full load hours associated with DMSHPs installed through the COOL SMART program. The team metered approximately 150 participating systems during the winter of 2014-2015 and extrapolated their usage to a more typical weather year.¹

Heating Season Draft Results for Planning

As shown in the separate DMSHP baseline memo, the most common heating baseline for DMSHPs was a code-minimum DMSHP. Starting in 2016, all DMSHP units sold in the United States must meet a minimum heating season performance factor (HSPF) of 8.2, up from 7.7. The team calculated equivalent full load hours consistent with a HSPF-based savings calculation and savings against an 8.2 HSPF baseline, shown in Table 1 below.

Table 1. Draft Heating Season Full Load Hours and Savings

Stated Purchase Intent	Full Load Hours ²	Estimated Annual Savings – 8.2 HSPF Baseline (kWh)	Percent of Total
Purchased for Cooling	220	103	31%
Purchased for Heating	841	395	4%
Purchased for Heating and Cooling	531	250	65%
Total	447	210	100%

As part of the data collection effort, the team asked participants about their purchase intent, in order to test the hypothesis that there was a significant group of customers who purchased DMSHPs for cooling

¹ The team corrected both for differences in temperature and snow depth by removing 6 weeks of weather with atypical snow depths in February and March of 2015 and instead extrapolating usage from December, January, late March, and April to a typical year. In all cases, the included systems had at least 8 weeks of metered data including operation during cold weather and more mild weather that spanned the operating range of the equipment.

² Full load hours (FLH) in the table are defined relative to HSPF. To calculate annual heating energy consumption (kWh) for a DMSHP, use the following equation: $kWh = Capacity (tons) * \frac{12}{HSPF} * FLH$

primarily, and that these customers would have different usage³ behavior. The team found that 31% of participants stated that they bought the DMSHP for cooling only. However, these participants still had significant heating usage and savings, approximately 40% of the usage of participants who bought the systems for both heating and cooling.

While the team found 447 equivalent full load hours and 210 kWh savings on average, the group of participants who purchased systems for both heating and cooling (65% of the total) had 20% higher usage (as measured in annual full load hours) and savings. The very small sample of customers who purchased for heating only shows even higher usage (as measured in annual full load hours) and savings.

³ The team uses the word “usage” to mean how much heating and cooling is being used and when. Annual usage is correlated to full load hours, which is correlated with energy *consumption* in kWh.