NAVIGANT

2014 HVAC Market Update

Residential Gas Furnaces
Air-Source, Ducted, Split-System Heat Pumps
Ductless Heat Pumps

Presented to

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Presented by

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1 Executive Summary

In 2012, Navigant conducted an HVAC market characterization study for Energy Trust of Oregon and gathered data related to sales and efficiency levels for three HVAC technologies for the years 2009 through 2011. This HVAC market characterization study is an update to the 2012 study and covers the years 2012 and 2013. Both studies cover three residential HVAC technologies: gas furnaces, air-source heat pumps, and ductless heat pumps (also referred to as ductless mini-splits in some contexts). All data presented in this report for the years 2009 through 2011 was collected in the previous study.

1.1 Research Objectives

The objectives of the study include understanding overall sales trends for all three technologies in Oregon, investigating the penetration of efficient gas furnaces and air-source heat pumps, exploring the market penetration of ductless heat pumps, and understanding the types of motors used in gas furnaces.

The primary research questions addressed were the following:

- What percentage of gas furnace sales are standard efficiency compared to high efficiency levels?
- What percentage of heat pump sales are standard efficiency compared to high efficiency levels?
- What is the size of the ductless heat pump market?
- What are the types and prevalence of fixed torque motors used in furnaces of various efficiency levels?

1.2 Findings

Navigant's research and analysis during the course of this effort led to the following key findings:

Overarching Finding

- Gas furnaces, heat pumps and ductless heat pumps have all seen an overall increase in sales in Oregon over the five-year period of 2009 through 2013.

Findings on Residential Gas Furnaces

- Overall sales of gas furnaces in Oregon increased by approximately 11% between 2012 and 2013. All distributors experienced decreases in sales in 2011, and then increases in 2012. In 2013, most distributors' sales remained stable or showed only modest growth, with one distributor experiencing a modest decrease.
- The trend in efficiency levels for residential gas furnaces shows an increase in the sales of higher efficiency units (90% AFUE or higher) each year since 2011.
- Distributors indicated that the percentage of gas furnaces sold with fixed torque motors ranges from approximately 12% to 26% based on efficiency level. There is no clear trend in the data that shows higher efficiency units correlate with the use of fixed torque motors.

Findings on Residential Split-System Heat Pumps

- Overall sales of air source heat pumps in Oregon increased by approximately 19% between 2012 and 2013.

» Individual distributor data collected by Navigant indicates that sales for heat pumps of 9.5 HSPF or higher have remained consistently low (below 5% of all ducted heat pump sales) for all distributors since 2009.

» From 2009 to 2013, 2-4% of split-system heat pump sales were HSPF 9.5 or greater, 42-56% of split-system heat pump sales were HSPF 9.0-9.4, and 41-55% of the split-system heat pump sales had a rated HSPF less than 9.0. A comparison to supplemental data collected by D&R indicates a lower percentage of units with 9.0+ HSPF than Navigant's data (20% as compared with 47%).

Finding on Residential Ductless Heat Pumps

» Overall sales for ductless heat pumps increased between 2009 and 2013 by a total of 34%.

2 Introduction

In 2012, Navigant conducted an HVAC market characterization study for Energy Trust of Oregon and gathered data related to sales and efficiency levels for three HVAC technologies for the years 2009 through 2011. This HVAC market characterization study is an update to the 2012 study and covers the years 2012 and 2013. Both studies cover three residential HVAC technologies: gas furnaces, air-source heat pumps, and ductless heat pumps (also referred to as ductless mini-splits in some contexts). All data presented in this report for the years 2009 through 2011 was collected in the previous study.

2.1 Research Objectives

The objectives of the study include understanding overall sales trends for all three technologies in Oregon, investigating the penetration of efficient gas furnaces and air-source heat pumps, exploring the market penetration of ductless heat pumps, and understanding the types of motors used in gas furnaces.

The primary research questions addressed were the following:

- What percentage of gas furnace sales are standard efficiency compared to high efficiency levels?
- What percentage of heat pump sales are standard efficiency compared to high efficiency levels?
- What is the market penetration rate and size of the ductless heat pump market?
- What are the types and prevalence of fixed torque motors used in furnaces of various efficiency levels?

2.2 Report Structure

The report is organized in four sections with detailed supporting information located in appendices.

- Section 3 outlines the methodology used during the study.
- Section 4 details the findings and results from the study.
- Section 5 presents conclusions from the study.

3 Methods

Navigant used both primary and secondary research methods to gather data for this market update. The details of each are described below.

3.1 Secondary Data Review

Navigant identified and reviewed publicly available data from various sources to understand the market for residential HVAC equipment in Oregon. The following sources contained relevant information and are referenced in this report. Each source is listed along with a description of the source and its use.

- *2012 Energy Trust of Oregon Trade Allies Survey*[1] – The trade ally survey report is available on Energy Trust's website and contains efficiency level percentages from 2005 through 2011 for air source heat pumps. The report also shows 2011 efficiency levels for gas furnaces and ductless heat pumps. Energy Trust's trade allies are a network of contractors who work with Energy Trust to promote energy efficient products.

- *Air-Conditioning, Heating and Refrigeration Institute (AHRI)*[2] – AHRI historical data is available on their website. This data tracks U.S.-manufactured historical shipments of heating and cooling equipment and was used for national sales of both gas furnaces and heat pumps.

- *Department of Energy (DOE) Technical Support Document for Central Air Conditioners and Heat Pumps*[3] – This data was prepared by the DOE to support the federal standard for central air conditioning and heat pump equipment. Navigant used this documentation to better understand sales of heat pumps. However, the support document includes data on a national level rather than a state level and only provides data through 2009.

- *HARDI Unitary HVAC Market Share in Oregon*[4] – This survey, commissioned by Heating Air-conditioning & Refrigeration Distributors International (HARDI) and conducted by D&R International provided market share information by efficiency level for all three technologies for sales in 2013. Throughout the report, the data from this survey is referred to as "the D&R data".

- *Northwest Ductless Heat Pump Initiative: Market Progress Evaluation Report #2*[5] – This report contains background information on ductless heat pumps in the region and provides

[1] Energy Trust Trade Ally Surveys completed in 2102. Available at http://energytrust.org/library/reports/TA_RPT_2012-tradeally-survey.pdf.
[2] Air-Conditioning, Heating, and Refrigeration Institute. Available at http://www.ahrinet.org/statistics.aspx.

[3] Department of Energy. "Technical Support Document: Energy Efficiency Program for Consumer Products: Residential Central Air Conditioners, Heat Pumps, and Furnaces." June 2011. Available at http://www1.eere.energy.gov/buildings/appliance_standards/residential/residential_furnaces_central_ac_hp_direct_final_rule_tsd.html
[4] *HARDI Unitary HVAC Market Share in Oregon*. February 28, 2014. Prepared by: D&R International, Ltd. under license to Heating Air-conditioning & Refrigeration Distributors International (HARDI)
[5] Evergreen Economics. "Northwest Ductless Heat pump Initiative: Market Progress Evaluation Report #2" October 9, 2012.

additional context for understanding the Ductless Heat Pump market in the Northwest region.

3.2 Primary Data Collection

Navigant conducted market actor interviews with six HVAC distributors in Oregon. The same six distributors were interviewed in 2012 using a similar battery of questions. Navigant updated the interview guide used in the 2012 study to ensure that it met the current research objectives. Additional questions were added based on areas of interest that arose during the February 2014 kickoff meeting with Energy Trust staff. Energy Trust reviewed and approved the interview guides before Navigant fielded the interviews. The interview guide consists of a mix of quantitative and qualitative questions to gain a full snapshot of the residential HVAC market in Oregon. Appendix D contains the final interview guide.

The list of six distributors that were used in the 2012 study which were provided by Energy Trust was estimated to represent 75% of the HVAC market cumulatively for the state of Oregon in 2012. In 2014, the survey instrument was updated to include respondents' estimation of their company's market share for each technology to validate this assumption. Discussion of these values is included in the Findings and Results section and additional discussion in Appendix E

The contact person at each organization held various roles within the organization including regional sales managers, presidents, and owners. All respondents had a significant understanding of the region's sales. The distributors that Navigant contacted for the interview are the following[6]:

- Geary Pacific
- Mar-Hy Distributors
- Johnstone Supply
- Gensco
- General Pacific
- Thermal Supply

Interviews were completed during March and April 2014. Due to the sensitive nature of some of the requested data, the level of effort required by distributors to collect, and the onset of the 'busy season' for Oregon HVAC distributors, several follow-up efforts were required during this period.

Results of the quantitative information collected from these interviews were weighted in the same manner as the 2012 study – by technology according to market share using the total number of units sold by each distributor. Weightings and values were adjusted as needed to account for missing data or distributor territory estimates. Data offered by different distributors vary in the level of precision and, in some cases, data was deemed unreliable and excluded from the sample. Where relevant, Navigant describes these situations in further detail in the findings.

[6] An additional distributor, Johnson Controls, was pursued in an effort to expand the size of the study. However, they were unresponsive.

4 Findings and Results

This section presents the findings for the key research questions. This section first presents overall sales trends for the aggregate of all three technologies analyzed and then is divided into three additional sub-sections by technology. The findings for each technology are discussed in detail to answer the research questions and follow the outline of the interview guide.

The data presented is focused on single-family existing homes. The responses are also weighted by distributor size in the market, specifically by sales data for each technology. Detailed data tables are provided in Appendix A for gas furnaces, Appendix B for air source heat pumps, and Appendix C for ductless heat pumps.

All data for 2009 through 2011 was collected in the 2012 market characterization study. All data for 2012 through 2013 was collected in 2014 for use in this study and for comparison with the data collected in 2012. Due to the nature of the data collected, the following points must be made before reviewing the data comparisons:

- In several cases, the survey respondent in this study was a different contact from that of the 2012 study due to employee turnover at the distributor.
- Slight semantics changes to the survey instrument may have introduced inconsistencies in the way that the questions were answered between the two studies.
- There is variation in the level of rigor applied by each distributor when providing estimates for both units sold and efficiency levels.

While there may have been some inconsistencies introduced due to the multi-year data collection effort, Navigant believes that the majority of the data is comparable and valid over the entire five year period. The main impact of the inconsistency in data collection results in uncertainty about the change between 2011 and 2012 unit sales. In some cases, the change may be over or understated. In addition, one distributor's efficiency level data has been removed from all five years of data for gas furnaces and air source heat pumps because the survey respondent indicated that he believed there to be inconsistencies between the two survey efforts. This distributor's data is believed to be consistent for ductless heat pumps, and total unit sales for all technologies, and is therefore included in those respective sections. The efficiency level data presented in this report plus the excluded distributor's data can be found in the Appendices.

In the 2012 study, the six surveyed distributors were assumed to cover 75% of the market share for each technology. Navigant attempted to verify this assumption in 2014 by asking each distributor to self-report their market share as part of the data collection. Table 1 shows the total market share by technology according to the self-reported estimates. Appendix E provides additional analysis of the total market surveyed. Five of the six distributors sell all three HVAC technologies, and one distributor sells only ductless heat pumps.

Table 1: Total Distributor Self-Reported Market Share Estimates

Gas Furnaces	Heat Pumps	DHPs
38.0%	52.2%	128.8%

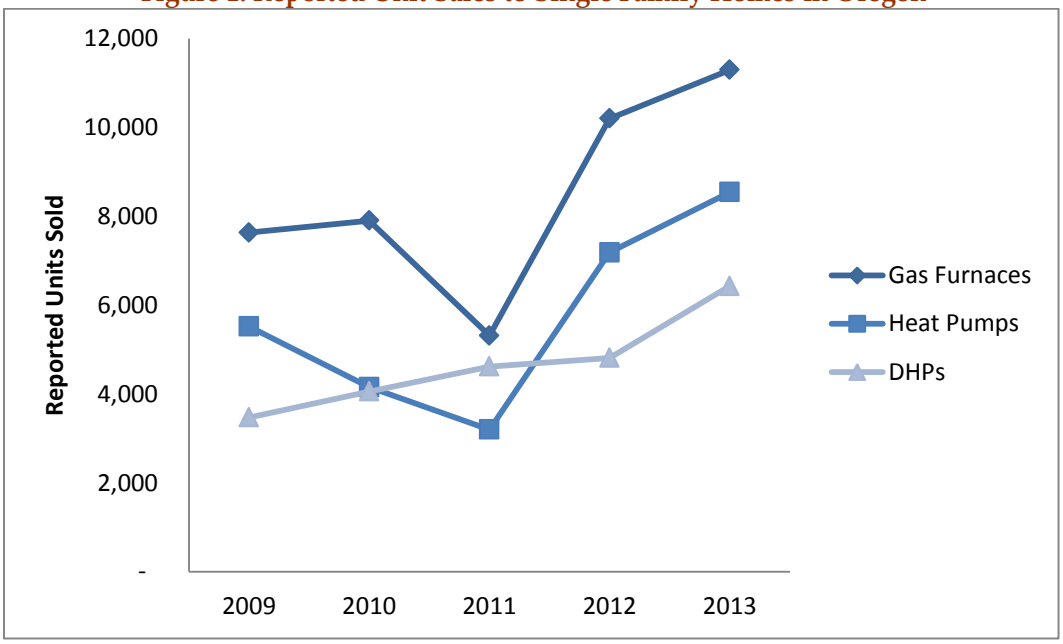
Taken at face value, the self-reported market share estimates indicate that the interviewed distributors do not cover 75% market share in Oregon for gas furnaces and heat pumps. However, due to the inconsistent self-reported market share values received in the interviews, Navigant concludes that self-reported market share estimates do not provide the confidence needed to assess the overall market size. Additionally, the obvious over-estimation of the cumulative market share for ductless heat pumps indicates that there is error in the distributors' estimates. Navigant assumes that these errors are not exclusive to ductless heat pumps. Navigant believes that the error in self-reported market share estimates originates from the uncertainty in the total market size in Oregon.

Despite the uncertainty in overall size of the Oregon market and the market share represented by distributor interviews, Navigant believes that the trends for unit sales and efficiency levels are relevant for the purposes of this market update.

4.1 Trends in Overall Sales

Gas furnaces, heat pumps and DHPs have all seen an overall increase in sales in Oregon over the five-year period and since 2009. The sales trends for gas furnaces and heat pumps are similar, showing a significant drop in 2011 and noticeable rebounds in 2012 and 2013. Ductless heat pumps follow a different trend, leveling slightly in 2012 and with a noticeable increase in 2013. Figure 1 shows the overall trend over the five-year period for each technology.

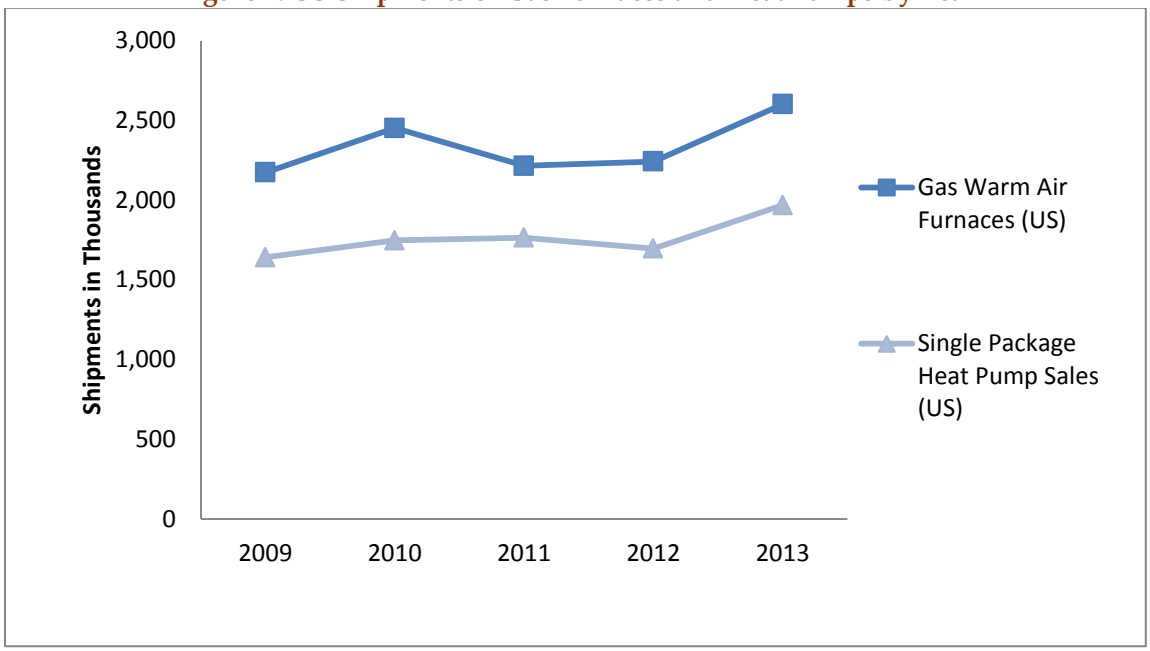
Figure 1: Reported Unit Sales to Single Family Homes in Oregon



Source: Navigant primary data collection
Note: Values are not representative of the entire Oregon market.

AHRI tracks nationwide shipments of various HVAC equipment types[7]. Figure 2 shows shipments of gas furnaces and heat pumps at a national level. The national trend mirrors the trend in Oregon most closely in 2012 and 2013. Gas furnace sales increased by 14% nationally and only 11% in Oregon, while air source heat pump sales increased by 14% nationally and 19% in Oregon. Detailed tables showing percent increases can be found in Appendices A and B.

Figure 2: US Shipments of Gas Furnaces and Heat Pumps by Year



Source: AHRI

4.2 Residential Gas Furnaces

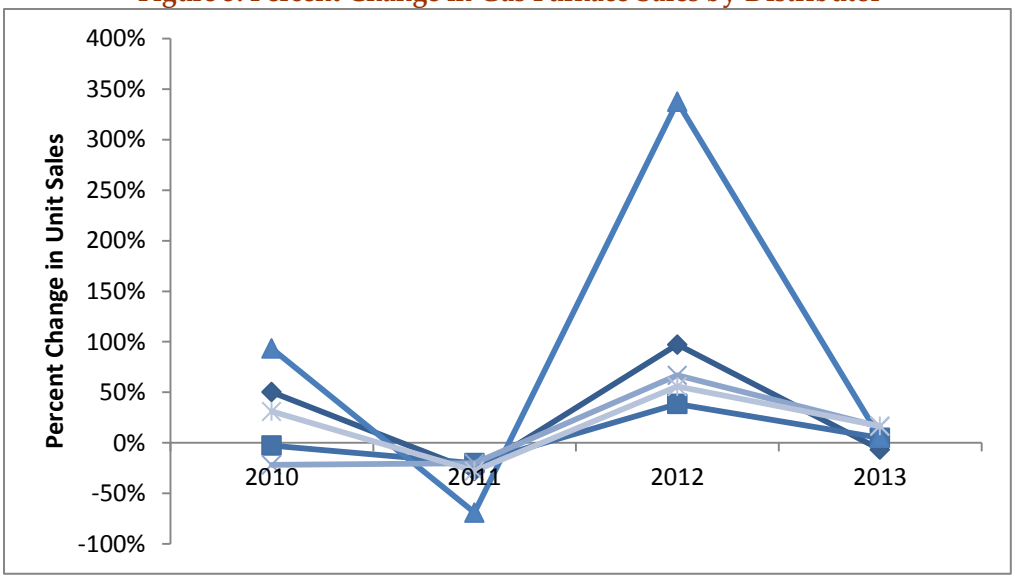
This section addresses the sales and efficiency levels of residential gas furnaces. Five of the six distributors surveyed sell gas furnaces. The self-reported market share of these five distributors amounts to 33% of the Oregon market.

Residential Gas Furnace Sales

As discussed in section 4.1, overall sales of gas furnaces in Oregon increased by approximately 11% between 2012 and 2013. Figure 3 shows the percent change each year by distributor. All distributors experienced decreases in sales in 2011, and then increases in 2012. In 2013, most distributors' sales showed modest growth, with one only one experiencing a decrease in sales from the previous year.

[7] DHP shipments are not tracked by AHRI.

Figure 3: Percent Change in Gas Furnace Sales by Distributor



Source: Navigant primary data collection.

Note: The figure's legend is intentionally missing to protect distributor anonymity. Percent change is used rather than unit sales for the same reason.

Residential Gas Furnace Efficiency Levels

The trend in efficiency levels for residential gas furnaces shows an increase in the volume and percentage of sales of higher efficiency units (90% AFUE or higher) each year since 2011. Figure 4 shows the sales-weighted efficiencies for four of the five distributors surveyed selling gas furnaces[8,9]. One distributor's data was excluded due to data integrity concerns, as previously discussed. The trend in efficiencies for each of the remaining four distributors is consistent, showing increases each year since 2011. Detailed distributor trends for gas furnaces can be found in Appendix A.

Navigant's findings from 2011 are consistent with findings of Energy Trust's 2012 Trade Ally survey[10], which reports that just over two thirds of all gas furnaces installed were 95% AFUE or higher. Navigant's findings from 2013 align fairly well with the D&R[11] findings, which consistently show that lower efficiency units (below 90% AFUE) make up the smallest segment of the market[12].

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[8] The efficiency level data presented in this section excludes one distributor's data from all five years because it was believed to be inconsistent between the two surveys (total unit sales are included).

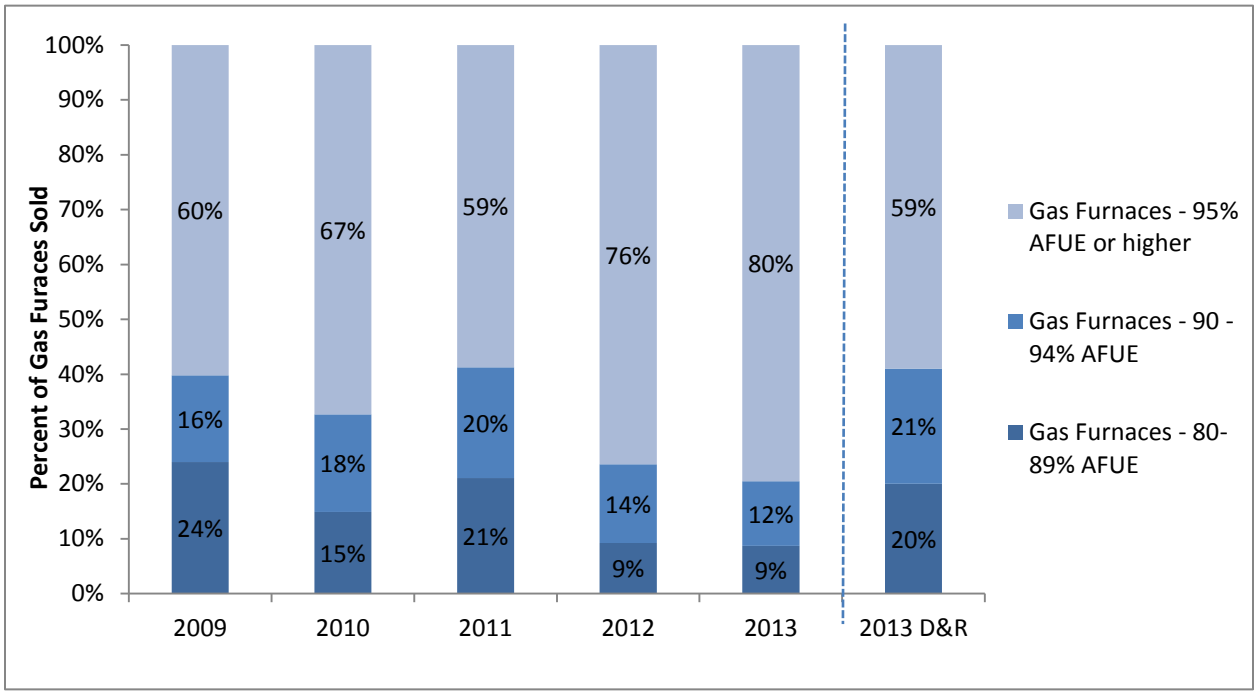
[9] Values are weighted by the number of units sold.

[10] Energy Trust Trade Ally Surveys completed in 2102. Available at http://energytrust.org/library/reports/TA_RPT_2012-tradeally-survey.pdf.

[11] *HARDI Unitary HVAC Market Share in Oregon*. February 28, 2014. Prepared by: D&R International, Ltd. under license to Heating Air-conditioning & Refrigeration Distributors International (HARDI)

[12] While lower efficiency gas furnaces make up the smallest segment of the market, one distributor pointed out that the low efficiency units are still installed in spaces that are not big enough to allow for a larger unit and different ductwork, such as old homes. A group of HVAC contractors in Oregon were polled to confirm whether less efficient furnaces were generally smaller and their responses were mixed.

Figure 4: Residential Gas Furnaces by Efficiency Level



Sources: Navigant primary data collection and D&R 2013 Study conducted for HARDI.

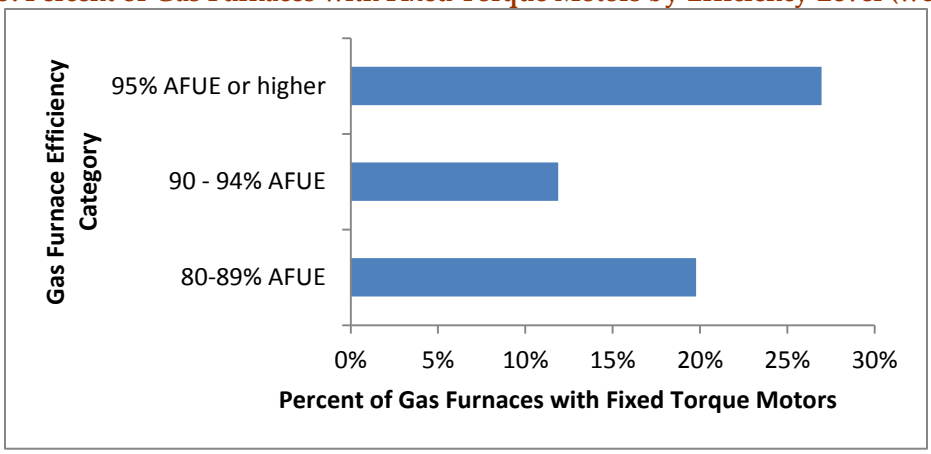
Residential Gas Furnace Motors

Navigant's data collection included a series of questions intended to investigate when fixed torque motors are included in gas furnaces as opposed to electrically commutated motors (ECMs) and permanent-split capacitor (PSC) motors. Navigant made every effort to ensure that the survey respondents clearly understood the difference between the two types of motors described[13]. The exact wording of this question within the survey guide can be found in Appendix D.

Based on the primary data collected by Navigant, distributors indicate that the proportion of gas furnaces sold with fixed torque motors ranges from approximately 12% to 26% based on efficiency level. While there is no clear trend in the data that shows higher efficiency units correlate with the use of fixed torque motors, narratives provided by distributors indicate that 95% AFUE gas furnaces have the highest percentage of fixed torque motors (26%). The percentages of fixed torque motors sold within gas furnaces in Oregon according to the surveyed distributors are shown in Figure 5 below.

[13] While Navigant made every effort to ensure that the survey respondents clearly understood the difference between the fixed torque motors and ECMs, there is still a chance that the distributors used the terms interchangeably.

Figure 5: Percent of Gas Furnaces with Fixed Torque Motors by Efficiency Level (weighted)



Source: Navigant primary data collection.

Distributors reported that the reasons that manufacturers may include fixed torque motors in gas furnaces include:

- Manufacturers select motors based on motor ratings and performance targets, such as efficiency. Units with fixed torque motors offer higher overall unit efficiency compared with units equipped with other types of motors, specifically ECMs and PSCs.
- Manufacturers are continually aware of their competition with other manufacturers with respect to cost and performance. Some distributors listed competition as a driver for more efficient motor types being included in residential gas furnaces.

Distributors reported that the reasons a homeowner would buy a furnace with an ECM or PSC motor rather than a fixed torque motor is to reduce both initial cost and replacement cost of fixed torque motors, which are not readily available on service trucks.

Residential Gas Furnace Incentives and Tax Credits

Table 2 provides a high-level summary of the Energy Trust of Oregon incentives, federal tax credits, and Oregon tax credits available to consumers of residential gas furnaces. This table provides market context for gas furnace sales in Oregon. Disaggregating the incentives available to consumers can be challenging. It should be noted that not all ENERGY STAR® products qualify for the federal tax credits. This information is not meant to be fully exhaustive. Anyone interested in purchasing energy efficient equipment should consult the organization for details on incentives and requirements.

Table 2: Incentives and tax credits for residential gas furnaces in Oregon

	2009	2010	2011	2012	2013
Energy Trust Incentives Requirements: AFUE of 90% or higher	$150, through April 30, 2009; $100, beginning May 1, 2009	$100 through April 30, 2010 when combined with tankless gas water heater purchase; No incentive beginning May 1, 2010	No incentive	No incentive	No incentive
Federal Tax Credit Requirements: AFUE of 95% or higher	30% of cost, up to $1,500	30% of cost, up to $1,500	$150	$150	$150
Oregon Tax Credit Requirements: Electrically efficient blower (GAMA "e" rating), and ducted combustion air	Up to $350 Additional Requirements: • AFUE of 92%	Up to $350 Additional Requirements: • AFUE of 92%	Up to $350 Additional Requirements: • AFUE of 94%	Up to $350 Additional Requirements: • AFUE of 94%	Range from $352 - $492 depending on efficiency level Additional Requirements: AFUE 95 – 96.9 and 97% or higher

Sources: [Oregon Tax Credit] Oregon Department of Energy. "2009 Oregon Residential Energy Tax Credits, HVAC & Water Heating Systems." October 2009.; Oregon Department of Energy. "2010 Oregon Residential Energy Tax Credits, HVAC & Water Heating Systems." October 2009.; Advantage Heating & Air Conditioning, LLC. "Energy Tax Credits extension for Oregon homes and businesses." Available at www.advantageheatingllc.com/SpecialOffers/TaxesandRebates.aspx (accessed on March 20, 2011).; Oregon Department of Energy. "2009 Tax Credit Listed Company Training, Heat Pump/AC & Duct." July 28, 2009.
[Federal Tax Credit] U.S. Department of Energy. "Energy Savers: Energy Efficiency Tax Credits Available Through 2010." Available at www.energysavers.gov/financial/70015.html (accessed on March 20, 2011).; U.S. Department of Energy. "Energy Savers: Tax Credits for Energy Efficiency." Available at www.energysavers.gov/financial/70010.html (accessed on March 20, 2011).

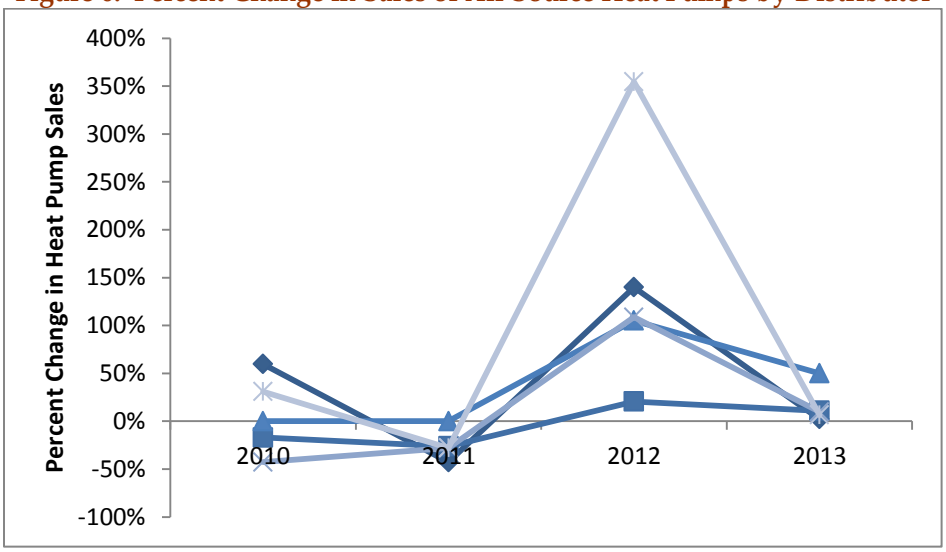
4.3 Residential Air Source Heat Pumps

This section addresses the sales and efficiency levels of residential air source heat pumps. Five of the six distributors surveyed sell air source heat pumps. The self-reported market share of these five distributors amounts to 52% of the Oregon market.

Residential Air Source Heat Pump Sales

Overall sales of air source heat pumps in Oregon increased by approximately 19% between 2012 and 2013. Figure 6 illustrates that sales for all distributors dropped in 2011. All except one distributor saw significant growth (greater than 33%) in 2012. Increases leveled off relatively in 2013, with percent changes in sales ranging from 2% to 50% (compared to 355% in 2012).

Figure 6: Percent Change in Sales of Air Source Heat Pumps by Distributor



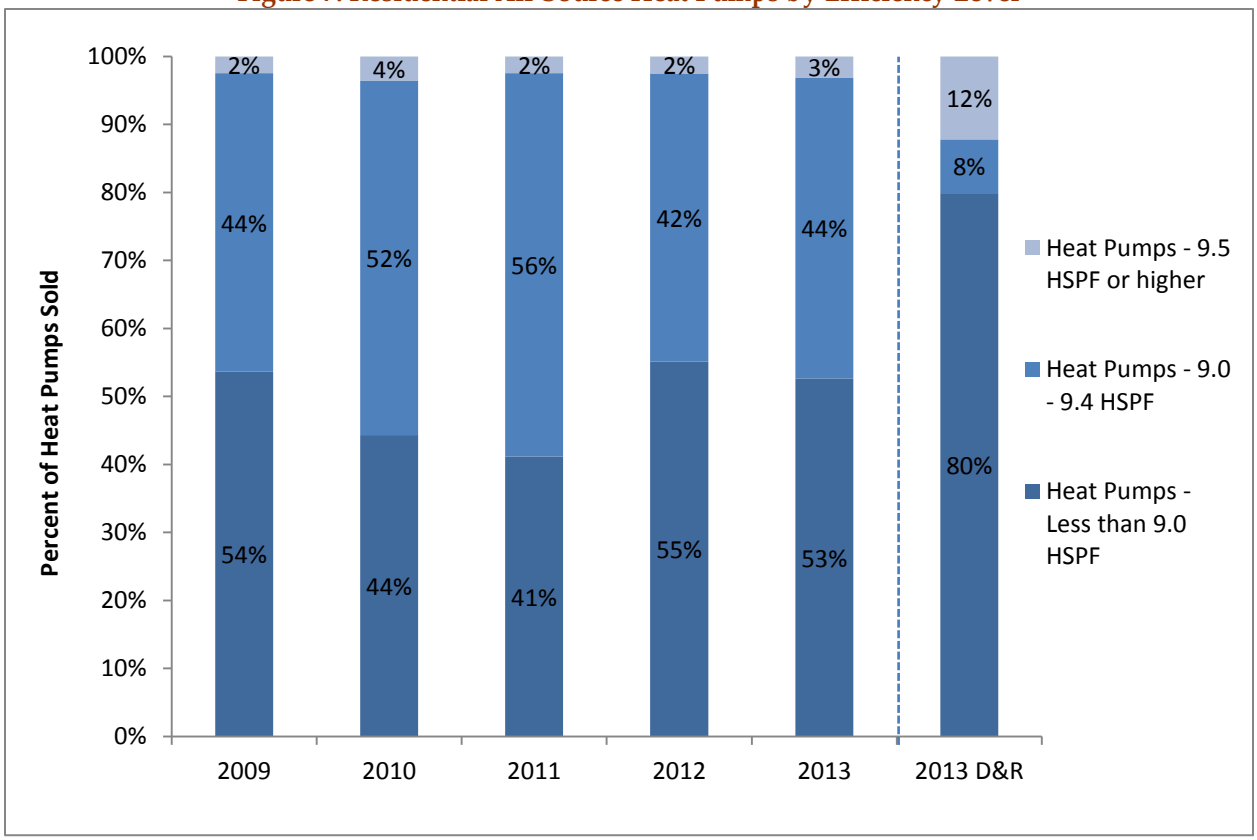
Source: Navigant primary data collection.

Note: The figure's legend is intentionally missing to protect distributor anonymity. Percent change is used rather than unit sales for the same reason.

Residential Air Source Heat Pump Efficiency Levels

Figure 7 shows sales by efficiency level for the five-year period starting in 2009. Navigant's 2013 findings of air source heat pump efficiency levels are somewhat consistent with the corresponding D&R values. The D&R data indicates a lower percentage of units with 9.0+ HSPF than Navigant's data (20% as compared with 47%). Individual distributor data collected by Navigant indicates that heat pumps of 9.5 HSPF or higher have remained consistently low (below 5%) for all distributors since 2009. Detailed distributor trends for air source heat pumps can be found in Appendix B.

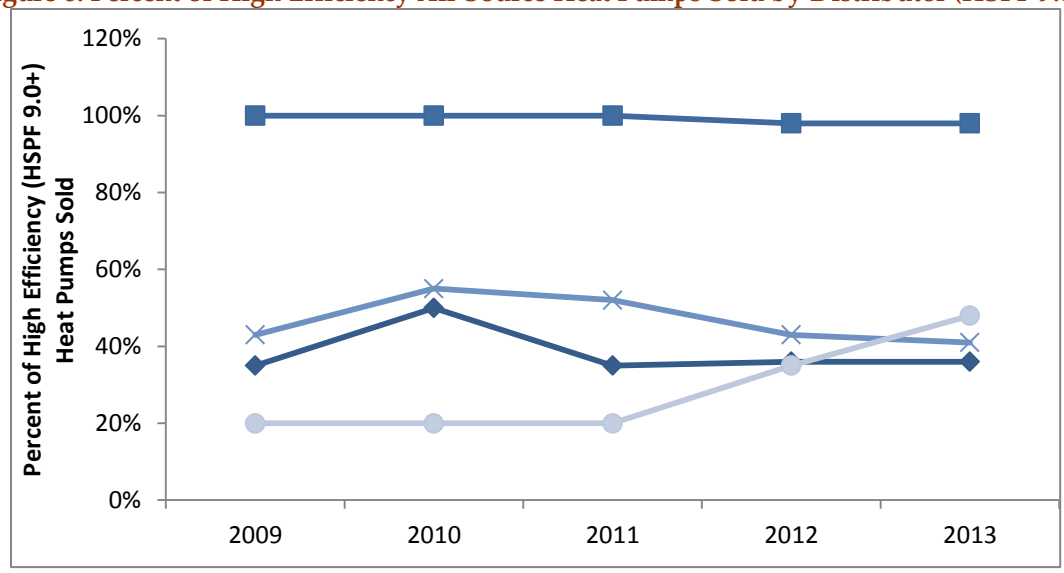
Figure 7: Residential Air Source Heat Pumps by Efficiency Level



Source: Navigant primary data collection and D&R 2013 Study for HARDI.
Note: One distributor's data is excluded from graphic due to data integrity concerns.

The values shown in Figure 7 are weighted by the number of units sold. Navigant removed data for one distributor that appeared as an outlier, as previously discussed. Of the remaining four distributors, two had efficiency levels remain steady since 2011, one saw a modest increase in higher efficiency units, and one saw a modest decrease in higher efficiency units. This is illustrated in Figure 8.

Figure 8: Percent of High Efficiency Air Source Heat Pumps Sold by Distributor (HSPF 9.0+)



Source: Navigant primary data collection.

Note: The figure's legend is intentionally missing to protect distributor anonymity.

Residential Air Source Heat Pump Incentives and Tax Credits

Table 3 provides a high-level summary of the Energy Trust of Oregon incentives, federal tax credits, and Oregon Tax Credits available to consumers of residential split-system heat pumps. This table provides market context for split-system heat pump sales in Oregon. Disaggregating the incentives available to consumers can be challenging. It should be noted that not all ENERGY STAR® products qualify for the federal tax credits. This information is not meant to be fully exhaustive. Anyone interested in purchasing energy efficient equipment should consult the organization for details on incentives and requirements.

Table 3: Incentives and tax credits for air source heat pumps in Oregon

	2009	2010	2011	2012	2013
Energy Trust Incentives Requirements: HSPF 9.0 or higher	$450 for replacing electric resistance heating; $250 for an upgrade from an old heat pump or replacing non-electric heat	$450 for replacing electric resistance heating; $250 for an upgrade from an old heat pump or replacing non-electric heat	$450 for replacing electric resistance heating; $250 for an upgrade from an old heat pump or replacing non-electric heat	$450 for replacing electric resistance heating; $250 for an upgrade from an old heat pump or replacing non-electric heat	$450 for replacing electric resistance heating; $250 for an upgrade from an old heat pump or replacing non-electric heat
Federal Tax Credit Requirements (all must apply): HSPF of 8.5 or higher, EER of 12.5 or higher, and SEER of 15 or higher	30% of cost, up to $1,500	30% of cost, up to $1,500	$300	$300	$300
Oregon Tax Credit Requirements: HSPF of 9.0 or higher, EER of 12.0 or higher, and must be verified by certified technician	Between $300-$430 depending on efficiency	Between $300-$430 depending on efficiency	Between $300-$430 depending on efficiency	Between $450-$645 depending on efficiency	Between $450-$645 depending on efficiency

Sources: [Oregon Tax Credit] Oregon Department of Energy. "2009 Oregon Residential Energy Tax Credits, HVAC & Water Heating Systems." October 2009.; Oregon Department of Energy. "2010 Oregon Residential Energy Tax Credits, HVAC & Water Heating Systems." October 2009.; Advantage Heating & Air Conditioning, LLC. "Energy Tax Credits extension for Oregon homes and businesses." Available at www.advantageheatingllc.com/SpecialOffers/TaxesandRebates.aspx (accessed on March 20, 2011).; Oregon Department of Energy. "2009 Tax Credit Listed Company Training, Heat Pump/AC & Duct." July 28, 2009.
[Federal Tax Credit] U.S. Department of Energy. "Energy Savers: Energy Efficiency Tax Credits Available Through 2010." Available at www.energysavers.gov/financial/70015.html (accessed on March 20, 2011).; U.S. Department of Energy. "Energy Savers: Tax Credits for Energy Efficiency." Available at www.energysavers.gov/financial/70010.html (accessed on March 20, 2011).

4.4 Residential Ductless Heat Pumps

This section addresses the sales and efficiency levels of residential ductless heat pumps. All six distributors surveyed sell ductless heat pumps as of 2011. The self-reported market share of these six distributors amounts to 129% of the Oregon market[14].

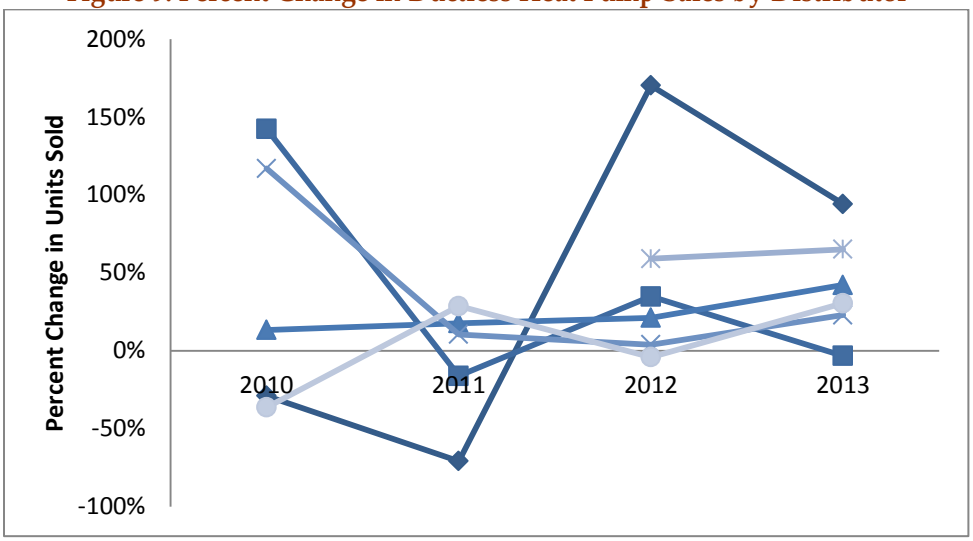
[14] Several attempt were made to understand the size of the overall market in Oregon, however Navigant and Energy Trust of Oregon were unable to identify a reliable source for the total size.

Residential Ductless Heat Pump Sales

Overall sales for ductless heat pumps increased between 2009 and 2013 by a total of 85%. While sales of DHPs appeared relatively steady overall since 2009, when looking at yearly changes by distributor, there was a fair amount of change each year for most. Volatility in sales appears to be decreasing somewhat for four of the six distributors, however year over year increases continue to be high for all but one – averaging 42% for 2013. The introduction and rapid growth of DHPs in North America in recent years may explain some of the volatility that some distributors experienced in sales growth.

Five of six distributors said they expect sales to increase in 2014. The remaining distributor anticipates that sales will remain the same.

Figure 9: Percent Change in Ductless Heat Pump Sales by Distributor



Source: Navigant primary data collection.

Note: One distributor only started carrying DHPs in 2011.

The drop in the value of incentive from $1,500 in 2010 to just $300 in 2011 does not appear to have affected the market, except for possibly a minor plateau between 2011 and 2012. The drop in growth between 2010 and 2011 is consistent with the findings of the Northwest Ductless Heat Pump Initiative's *Market Progress Evaluation Report*, which reported a 13% decline in 2011 as part of that initiative.

Residential Ductless Heat Pump Types

Distributor expectations about trends relating to single head versus multi head ductless heat pump units varied. Distributors were consistent in stating that the type of unit sold depends on the needs of the space. Otherwise, no trends emerged in the data collected about residential ductless heat pump types.

Residential Ductless Heat Pump for Cold Climates

Distributors indicate that heat pumps for cold climates range from zero to 80% of their sales. This result may be due to distributors specializing in various technologies. The distribution was bi-modal, meaning that distributors either sold less than 15% or sold between 75-80%. None indicated a 50/50 split with this question.

Residential Ductless Heat Pump Incentives and Tax Credits

Table 4 provides a high-level summary of the Energy Trust of Oregon incentives, Federal Tax Credits, Oregon tax credits, and Northwest Ductless Heat Pump Project incentives available to consumers of residential ductless heat pumps. This table provides market context for ductless heat pump sales in Oregon. Disaggregating the incentives available to consumers can be challenging. It should be noted that not all ENERGY STAR® products qualify for the Federal Tax Credits. This information is not meant to be fully inclusive. Anyone interested in purchasing energy efficient equipment should consult the organization for details on incentives and requirements.

Table 4: Incentives and tax credits for ductless heat pumps in Oregon

	2009	2010	2011	2012	2013
Energy Trust Incentives Requirement: Variable speed compressor "inverter technology"	$400 for replacing electric resistance heating	$600 for replacing electric resistance heating	$600 for replacing electric resistance heating	$800[15] for replacing electric resistance heating	$800 for replacing electric resistance heating
Federal Tax Credit Requirements (all must apply): HSPF of 8.5 or higher, EER of 12.5 or higher, and SEER of 15.0 or higher	30% of cost, up to $1,500	30% of cost, up to $1,500	$300[16]	$300[16]	$300[16]
Oregon Tax Credit Requirements: Variable speed compressor "inverter technology", and must be installed by a factory-trained technician	$50 per half ton up to $400	$50 per half ton up to $400	$50 per half ton up to $400 Additional Requirements: Listed in the ARI directory and provide at least 50% of rated capacity efficient operation when outside air is 17°F	$50 per half ton up to $400 Additional Requirements: Listed in the ARI directory and provide at least 50% of rated capacity efficient operation when outside air is 17°F	$350 - $1,500 depending on estimated kWh savings (HSPF and Size of unit) Requirements:

[15] Incentive increased mid-year.

[16] NW Ductless Heat Pump initiative references a drop from $1,500 to $300. Additional research on requirements sourced from the following websites: http://energy.gov/savings/residential-energy-efficiency-tax-credit (indicates $300 incentive for electric heat pumps which achieve the highest efficiency tier established by the Consortium for Energy Efficiency) and http://library.cee1.org/sites/default/files/library/9570/CEE_ResHVAC_CAC_and_ASHP_Specifications_1March2014.pdf to indicate minimum requirements for split system heat pumps.

Northwest Ductless Heat Pump Project Requirements: Primary heating source must be zonal electric resistance heat	$1500 (amount can vary) for one outdoor and the first indoor head	$1500 (amount can vary) for one outdoor and the first indoor head	$1500 (amount can vary) for one outdoor and the first indoor head	No incentive[17]	No incentive[17]

Sources: [Oregon Tax Credit] Oregon Department of Energy. "2009 Oregon Residential Energy Tax Credits, HVAC & Water Heating Systems." October 2009.; Oregon Department of Energy. "2010 Oregon Residential Energy Tax Credits, HVAC & Water Heating Systems." October 2009.; Advantage Heating & Air Conditioning, LLC. "Energy Tax Credits extension for Oregon homes and businesses." Available at www.advantageheatingllc.com/SpecialOffers/TaxesandRebates.aspx (accessed on March 20, 2011).; Oregon Department of Energy. "2009 Tax Credit Listed Company Training, Heat Pump/AC & Duct." July 28, 2009.
[Federal Tax Credit] Call to the ENERGY STAR Hotline on March 21, 2011.
[Ductless Heat Pump Projects]
Ductless Heat Pump Project. Available at http://goingductless.com (accessed April 15, 2014); Discussions with NEEA and Ductless Heat Pump Project staff.

[17] DHPs became a deemed measure in 2010, at which point BPA allowed utilities to offer rebates. Evaluation reports indicate that the Northwest Ductless Heat Pump Project continued installing units through 2011.

5 Summary

Navigant's research and analysis during the course of this effort led to the following key findings:

Overarching Finding

» Gas furnaces, heat pumps and ductless heat pumps have all seen an overall increase in sales in Oregon over the five-year period of 2009 through 2013.

Findings on Residential Gas Furnaces

» Overall sales of gas furnaces in Oregon increased by approximately 11% between 2012 and 2013. All distributors experienced decreases in sales in 2011, and then increases in 2012. In 2013, most distributors' sales remained stable or showed only modest growth, with one distributor experiencing a modest decrease.

» The trend in efficiency levels for residential gas furnaces shows an increase in the sales of higher efficiency units (90% AFUE or higher) each year since 2011.

» Distributors indicated that the distribution of gas furnaces sold with fixed torque motors ranges from approximately 12% to 26% based on efficiency level. There is no clear trend in the data that shows higher efficiency units correlate with the use of fixed torque motors.

Findings on Residential Split-System Heat Pumps

» Overall sales of air source heat pumps in Oregon increased by approximately 19% between 2012 and 2013.

» Individual distributor data collected by Navigant indicates that heat pumps of 9.5 HSPF or higher have remained consistently low (below 5%) for all distributors since 2009.

» For all five years, 2-4% of split-system heat pump sales were HSPF 9.5 or greater, 42-56% of split-system heat pump sales were HSPF 9.0-9.4, and 41-55% of the split-system heat pump sales had a rated HSPF less than 9.0. The D&R 2013 data indicates a lower percentage of units with 9.0+ HSPF than Navigant's data (20% as compared with 47%).

Findings on Residential Ductless Heat Pumps

» Overall sales for ductless heat pumps increased between 2009 and 2013 by a total of 34%.