GAS FURNACE MARKET TRANSFORMATION MODEL DEVELOPMENT AND MARKET RESEARCH

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FINAL REPORT

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E EXECUTIVE SUMMARY

The gas furnace market transformation model development and market research project consisted of two major objectives:

- Develop a reasonable and defensible baseline estimate for the gas furnace market in the absence of the Energy Trust program; and
- Adapt a current market transformation model for gas furnaces for use with many different programs and increase the usability and functionality of the current model.

Baseline Estimate

Due to a high amount of uncertainty in the baseline, the Summit Blue team (the Team) ran two scenarios— a high case and a low case— based on input provided by the Energy Trust of Oregon (Energy Trust). The uncertainty in the baseline resulted from difficulty in finding a true control region to consider how the market, in areas where Energy Trust has been active in the market, might have looked in the absence of Energy Trust programs. There is a lack of available data on market penetration of high efficiency furnace sales at the state and local level. The Team ended up establishing two baselines. For the *low case* baseline, the Team compiled interviews with market actors in Clark County and national market data on high efficiency furnaces. The national market data alone was used as the *high case* baseline. It should be noted that there is a high level of uncertainty around both baselines. Because the market transformation results are highly dependent on these baselines, the low case provides a more conservative estimate of the market effects of Energy Trust efforts.

Market Transformation Model

The market transformation model is updated and is ready to serve as a template for other Energy Trust programs. Use of the model for other programs may require minor changes to the model, but the structure of the model should remain constant for all programs.

Using the updated model, the Team estimated savings from the market transformation portion of Energy Trust's gas furnace program. Table 1 includes the estimated first year lifetime energy savings for a low and high case, which differ by their assumed baseline and number of conversions within the Northwest Natural Gas (NNG) service area. This table shows the savings divided into two groups: the Energy Trust direct incentive program and the market savings attributable to Energy Trust. The low case resulted in savings of 5,552,292 therms and the high case resulted in savings of 8,586,001 therms.

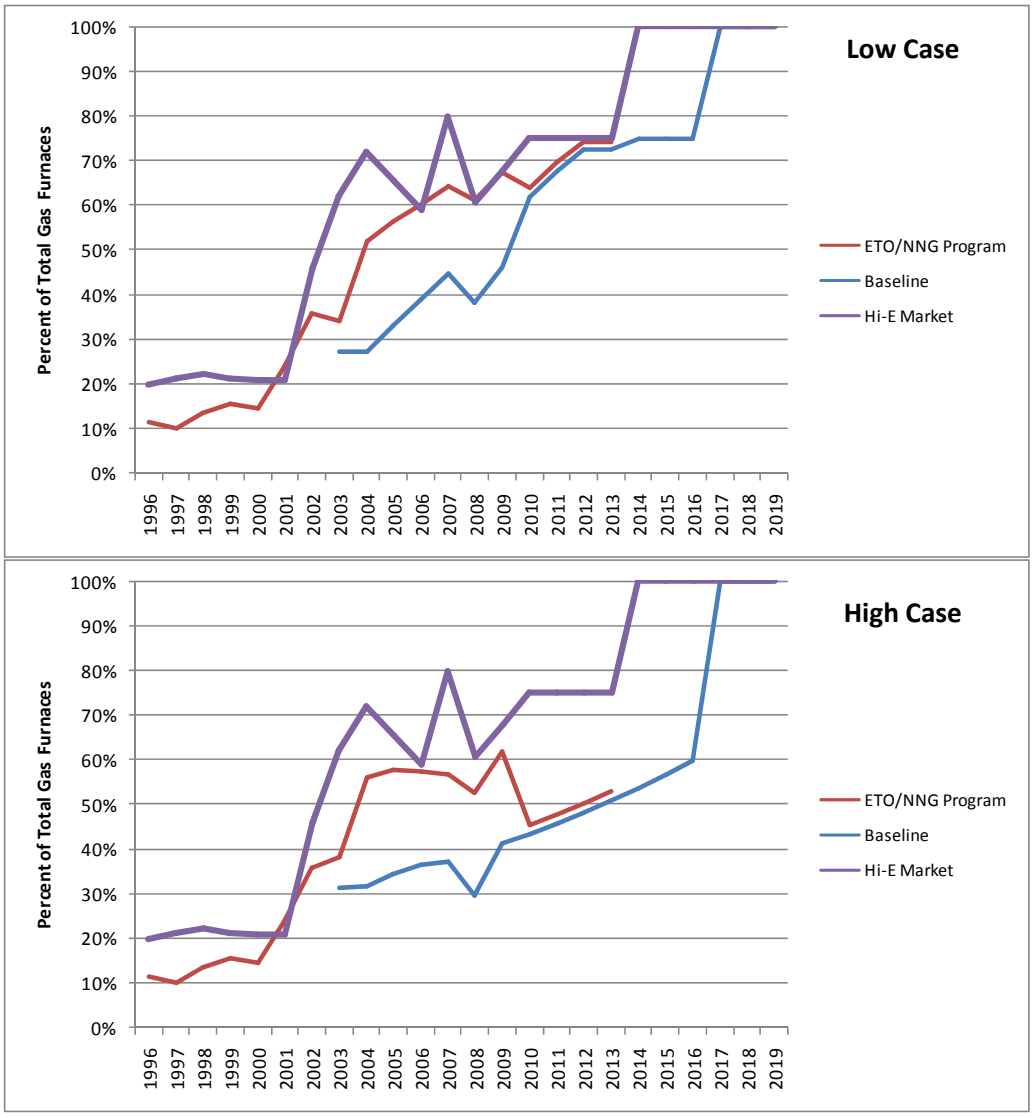
Table 1. Estimated First Year Energy Savings

Program Portion	Low Case (therm savings)	High Case (therm savings)
Energy Trust Direct Incentive Program (2003-2013)	2,638,309	2,638,309
Market Savings Attributable to Energy Trust	2,913,983	5,947,692
Total	5,552,292	8,586,001

Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.

The model also assumes that there will be a likely federal code change for non-weatherized gas furnaces. Through the model, the Team assumes a federal code change in 2013 to an Annual Fuel Utilization Efficiency (AFUE) of at least 90%. This estimate is based on interviews with representatives of the Appliance Standards Awareness Project, the Natural Resources Defense Council, and the Northwest Power and Conservation Council. Due to an estimated 1-year lag between the code change and full market transition, the model shows that 100% of gas furnaces sold in 2014 will be high efficiency. Based on the interviews, the Team also concludes that Energy Trust efforts will have an influence on the code change in relative proportion to the area served by Energy Trust programs. The Team shows this influence in the model by adjusting the year of the code change for the baseline to 2017. This indicates that for the first three years after the code change transition, Energy Trust is credited with inducing this change, and thus for the additional high efficiency sales that occur during those three years. Figure 1 shows the model results in graphical format. These charts show the change in the high efficiency market, the Energy Trust/NNG programs, and the baseline over time for the low case and the high case.

Figure 1. The Gas Furnace Market Transformation Model Results



Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.
Note: 1996 to 2002 are provided in these charts for context only.

Table 2 shows the results of cost effectiveness tests. The program is cost effective under both cases and both the system and society benefit-cost tests.

Table 2. Cost Effectiveness Results: Low and High Case

Year	System Benefit-Cost Ratio	Societal Benefit-Cost Ratio	Total ETO Levelized Cost ($/therm)	Total Society Levelized Cost ($/therm)	Total NPV of ETO Customer Retail Savings	Average Hi-E Customer Simple Payback
Low Case	7.4	1.2	$0.15	$0.94	$47,603,542	6.51
High Case	10.9	1.2	$0.10	$0.86	$47,603,542	7.30

Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.

1 INTRODUCTION

The Energy Trust of Oregon (Energy Trust) provides incentives for high efficiency gas furnaces to customers of Northwest Natural Gas (NNG) and Cascade Natural Gas (Cascade). The gas furnace program began in 2003 and will continue until the end of 2009. A complementary low income program will begin in 2009 and continue until a federal code change. This low income program will provide higher incentives to participants than the 2003 to 2009 program. Prior to 2003, Northwest Natural Gas provided incentives to its customers for high efficiency gas furnaces. The NNG program began in 1996. The Energy Trust high efficiency gas furnace program aims to increase the market share of gas furnaces not only through direct incentives, but also through a transformation of the market.

In addition to the incentive provided by Energy Trust, the Oregon Department of Energy provides tax credits through the Residential Energy Tax Credit (RETC) program. This program started in 2002 and requires the furnace to meet three requirements: it must have an Annual Fuel Utilization Efficiency (AFUE) of 92% or higher; it must have an electrically-efficient fan motor; and it must be installed with ducted outdoor air for combustion.[1] The tax credits are not considered in the model because the program requirements and tax credit requirements are not consistent.

Market transformation projects are long-term in nature with little market impact in the initial years and the major market effects occurring many years after a program is launched. The development and launching of new products and services can be visualized as an "S" shaped diffusion curve. This "S" shape can be discerned in the results of the high efficiency gas furnace market in shown in Figure 1.

Objectives

The research and analysis conducted for this project were structured to achieve the following objectives:

- Develop a reasonable and defensible baseline estimate for the gas furnace market in the absence of the Energy Trust program; and
- Adapt a current market transformation model for gas furnaces for use with many different programs and to increase the usability and functionality of the current model.

Report Organization

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

- Section 2 outlines the methodology used during the project.
- Section 3 details the findings and results from the project, including the baseline and market penetration findings, the federal code change findings, and the model template development and model results.
- Section 4 presents conclusions and recommendations from the study.

[1] Oregon Department of Energy- Conservation Division. Available at www.oregon.gov. Requirements as of January 1, 2009.

2 METHODS

The Team used a variety of methods to develop the inputs to the gas furnace market transformation model, including completing a secondary data review, interviewing vendors, and researching savings associated with federal code change. Each of these methods is described below. Methods employed in the model development are also described in this section.

Market Transformation Model Development

The Team included many overarching assumptions in the model. Additional specific assumptions in the model, such as number of customer and inflation rates, can be found in the model on the "Assumptions" tab. A few of the major assumptions in the model are listed below.

- The model assumes no incremental operations and maintenance (O&M) costs for high efficiency furnaces. Therefore, all maintenance costs required for a high efficiency furnace would also be required for a standard efficiency furnace.

- The model assumes a 25 year residential gas furnace lifetime. The 2005 Energy Trust of Oregon Natural Gas Furnace Market Assessment[2] also assumes a 25 year gas furnace lifetime. The Consortium for Energy Efficiency assumes the equipment life of a residential gas furnace is 15-18 years.[3]

- Degradation of gas furnace performance is not taken into account in the model, so it is implicitly assumed to occur to the same degree for standard and efficient furnaces.

Due to the level of uncertainty surrounding some of the inputs in the model, the Team has run two possible scenarios in the model, a low case and a high case. Two factors change under each case: the baseline and the number of gas conversions in Northwest Natural Gas' service area. The values in each case for the baseline are shown in Table 3 and for the number of conversions in Table 4. Note that the baseline values begin at the same time as the program, in 2003. Because the high case uses a lower baseline and a higher number of conversions, the results show higher attributable energy savings. The low and high case baseline is discussed in further detail in Section 3.1.

[2] Habart, Jack, and GDA Hewitt, Hewitt Consulting. "Natural Gas Furnace Market Assessment." Prepared for Energy Trust of Oregon. August, 2005.

[3] Consortium for Energy Efficiency (CEE). "High Efficiency Residential Gas Heating." Fact Sheet. www.cee1.org.

Table 3. Baseline Estimates for the High and Low Cases

Year	Low Case (using Clark County interview results and National Sales)	High Case (using National Sales data)
2003	27%	31%
2004	27%	32%
2005	33%	34%
2006	39%	36%
2007	45%	37%
2008	38%	30%
2009	46%	41%
2010	62%	43%
2011	68%	46%
2012	72%	48%
2013	72%	51%
2014	75%	54%
2015	75%	57%
2016	75%	60%
2017	100%	100%
2018	100%	100%
2019	100%	100%

Source: Summit Blue Consulting Surveys with contractors and distributors; weighted responses, The Air-Conditioning, Heating, and Refrigeration Institute.

The number of gas conversions in the *low case* is based on an estimated number of conversions for 1996-2006. These estimates are based on the ratio of conversions to total customers in 2007. The value is then held constant at the 2007 level. The number of conversions in the *high case* is based on the Northwest Natural Gas forecast of conversions.

Table 4. Northwest Natural Gas Conversion Values for High and Low Cases

Year	Low Case NNG Conversions	High Case NNG Conversions
1996	2,991	2,991
1997	2,991	2,991
1998	2,991	2,991
1999	3,136	3,136
2000	3,270	3,270
2001	3,386	3,386
2002	3,501	3,501
2003	3,618	3,618
2004	3,721	3,721
2005	3,824	3,824
2006	4,007	4,007
2007	3,990	3,990
2008	3,990	3,864
2009	3,990	4,656
2010	3,990	4,845
2011	3,990	4,991
2012	3,990	5,139
2013	3,990	5,296
2014	3,990	5,296
2015	3,990	5,296
2016	3,990	5,296
2017	3,990	5,296
2018	3,990	5,296
2019	3,990	5,296

Source: Energy Trust of Oregon. Existing Residential Population Worksheet. Provided by Matt Braman. (For Single Family, Multifamily, and Manufactured Home for NNG 2006-2019 and Cascade 2007-2019); 2007 Oregon Utility Statistics. (For Single Family, Multifamily, and Manufactured Home for NNG 1996-2005 and Cascade 1996-2006). Note that 1996 and 1997 are set to equal 1998, because no data exists for 1996 and 1997. Note that new construction is not explicitly broken out in the Oregon Utility Statistics.

Note: Conversions for 1996-2006 are based on the 2007 ratio of conversions to existing customers.

Consistent with the Energy Trust's cost-effectiveness policy, the Team used multiple benefit-cost tests to assess the cost effectiveness of the program as a whole— the Energy Trust program with direct incentives and the market transformation. The system benefit-cost ratio assumes the benefits to be the first year

energy savings from both the Energy Trust incented program and the market transformation times the present value of avoided cost. It is important to note that the present value of avoided cost represents the avoided cost of one energy unit (a therm) over the lifetime of the savings, in this case 25 years. The costs for the system benefit-cost ratio are the Energy Trust program administration and delivery costs plus the Energy Trust incentive costs.

The societal benefit-cost ratio assumes the benefits to be the energy savings from the high-efficiency market minus the baseline times the present value of avoided cost. The costs are equal to the Energy Trust program administration and delivery costs plus the total participant costs, including the incremental measure costs and operations and maintenance costs, minus the value of tax credits, which is equal to zero in the gas furnace model. Incentives are treated as transfer payments for the societal benefit-cost ratio.

The model also calculates the levelized cost from the Energy Trust perspective and the societal perspective. The Energy Trust levelized cost is equal to the total Energy Trust costs, program administration, delivery, and incentive costs, put into the first year cost divided by the first year energy savings from both the Energy Trust program with direct incentives and the market transformation. The society levelized cost is equal to the total societal costs, as described above, put into the first year cost divided by the first year energy savings from the high-efficiency market minus the baseline.

Other metrics include the total net present value (NPV) of customer retail savings and the average hi-efficiency customer simple payback. The NPV of customer retail savings is estimated to be equal to the Energy Trust program savings times the NPV of the gas retail rate. The average high-efficiency customer simple payback is estimated to be the participant cost minus the incentive divided by the energy savings from the high-efficiency market minus the baseline times the gas retail rate in the first year. It should be noted that the simple payback calculation likely overestimates the payback time due to use of the first year gas retail rate.

Secondary Data Review

The Team reviewed existing data sources to facilitate the development of a more robust baseline and market penetration values. Each data source is listed along with a description of the source and its use.

- *Energy Trust Participation Data*[4] – Energy Trust provided the Team with the most recent Energy Trust program participation data. This data was used to estimate energy savings from Energy Trust program participants.

- *Incentives for Gas Furnaces in Oregon: Interaction between Energy Trust and the Residential Energy Tax Credit Study*[5] – This study analyzed the interaction between Energy Trust and the Residential Energy Tax Credit. Data from this study was not directly used in the model, but the study was used for background information on the Oregon gas furnace environment.

[4] This data was provided by Matt Braman at Energy Trust.

[5] Incentives for Gas Furnaces in Oregon: Interaction between Energy Trust and the Residential Energy Tax Credit.

- *Gas Appliance Manufacturers Association (GAMA) Data*[6] – The Team explored the option of getting furnace sales data. This association has sales data by state and by efficiency type for gas furnaces. However, recent data are not publicly available nor is it available for purchase.

- *Air Conditioning, Heating, and Refrigeration Institute (AHRI)*[7] – AHRI provides industry statistics on their website. These statistics include the number of shipments of high and standard efficiency gas furnaces on a national scale from 1999-2007.

- *The 2005 Energy Trust of Oregon Natural Gas Furnace Market Assessment*[8] – This market assessment includes a section on natural gas furnace sales. The data include the GAMA data described above and an estimate of high efficiency furnace shares in 2002-2004. The 2002-2004 data is more applicable to the market penetration of high efficiency gas furnaces than to the baseline.

- *The 2003-2004, 2004-2005, and 2005-2006 Home Energy Solutions Evaluations*[9] – Data from this study was not directly used in the model, but the study was used for background information on the Oregon gas furnace environment.

- *The Energy Trust trade ally surveys for 2007, 2008, and 2009*[10] – These surveys provided information on the market penetration of high efficiency gas furnaces. The data from these surveys was used to estimate the high efficiency gas furnace market in 2006-2008.

- *A filing from GAMA to the U.S. Department of Energy concerning efficiency standards for residential furnaces and boilers*[11] – This letter contained data on high efficiency sales prior to the Energy Trust program, from 1995-2000.

Vendor Interviews

The Team conducted three sets of interviews and one additional vendor survey. The interviews were with furnace vendors in Northwest Natural Gas Oregon and Clark County, Washington service territories, and furnace vendors in Cascade Natural Gas' territory. The purpose of the interviews was to collect data that could help inform the baseline estimate, primarily for residential gas furnaces, but also for heat pumps.[12] The Team consulted with Sarah Castor and Matt Braman at Energy Trust on interview and survey instruments. With input from Energy Trust, the Team examined the diversity of the vendor population to determine which vendors (i.e., retailers, distributors, installers, etc) to interview. Energy Trust provided the Team with a list of trade ally contractors. A sample was then selected among the different vendor

[6] Available at www.gamanet.org.

[7] Available at ari.org.

[8] Habart, Jack, and GDA Hewitt, Hewitt Consulting. "Natural Gas Furnace Market Assessment." Prepared for Energy Trust of Oregon. August, 2005.

[9] Available at www.energytrust.org.

[10] Provided by Matt Braman at the Energy Trust.

[11] Docket No. EE-RM/STD-01-350, April 10, 2002.

[12] Summit Blue anticipates conducting the same type of research as outlined here for heat pumps under a different contract in 2009. By asking the heat pump questions during the furnace interviews, we can avoid having to contact the furnace vendors more than once.

types for each of the three areas, with the goal of interviewing those representing a significant portion of sales and also those that have *not* been as active in the program. Distributors were selected based on sales territory, which was established through an Internet search. The Team tried to contact major distributors to get the best information possible. Some distributors serve multiple regions, and thus provided a good base of comparison. The results of the interviews showed significant variance in baseline sales estimates. Therefore, distributors were then asked to provide their 2008 unit sales data for Clark County and for Oregon in an additional distributor survey. A summary of the number of interviews in each group is shown in Table 5 and each interview group is described below.

Table 5. Vendor Interview Counts

Region	Number of Contractor Interviews	Number of Distributor Interviews	Total Number of Interviews	Additional Distributor Surveys[13]
Northwest Natural Gas Oregon service territory	7	3	10	NA
Cascade Natural Gas service territory	7	2	9	NA
Northwest Natural Gas Clark County, Washington service territory	3	3	6	3

Source: Summit Blue Consulting.

Northwest Natural Gas Oregon territory – The Team interviewed furnace vendors in Northwest Natural Gas Oregon territory to assess the status of the high efficiency market in that region. The results from these interviews helped inform the penetration of high-efficiency furnaces on the current market.

Cascade Natural Gas territory – The Team interviewed furnace vendors in Cascade Natural Gas territory to assess the status of the high efficiency furnace market in that region. These surveys had a two-fold purpose:

- This region could serve as a comparison region to help inform how the furnace market in NWN territory would look without the intensive marketing program that Energy Trust ran with Northwest Natural and local distributors and contractors. Cascade has had furnace efficiency programs for many years (first on its own and then through Energy Trust), but has not had the type of promotional platform that Northwest Natural operates.

- Information about the penetration of the high efficiency units in the home furnace market in this area will help Energy Trust to decide whether or not to continue efficient gas furnace replacement rebates in this area.

Northwest Natural Gas Clark County, Washington – The Team interviewed furnace vendors in NWN Clark County to assess the status of the high efficiency furnace market there. This region served as a

[13] The additional distributor surveys were only conducted in the Northwest Natural Gas Clark County, Washington service territory.

partial control region to help inform where the Team would expect the furnace market in NWN, Oregon territory would be with a more limited marketing program. Information about the penetration of the high efficiency market in this area will also help inform program design if Energy Trust were to provide services to NWN customers in Washington. Interviews can also provide baseline information on sales of high efficiency residential heat pumps.

Research on Federal Code Change Savings

The Team assessed the reasonableness of the argument that successful utility programs are a key precedent and influence for upgrading the federal appliance manufacturing standard for residential furnaces, and thus they contribute proportionally to the savings achieved through the new standards in their territory. This task included interviews with key personnel at the Appliance Standards Awareness Project, the Natural Resources Defense Council (NRDC), and the Northwest Power and Conservation Council.

3 FINDINGS AND RESULTS

3.1 Baseline and Market Penetration Findings

The Team combined the secondary data sources with the vendor interviews discussed in Appendix A: Vendor Interview Summaries to determine the baseline and the total high efficiency market penetrations.

High Efficiency Gas Furnace Market Penetration

The high efficiency gas furnace market penetration represents the percentage of residential gas furnaces that have a high efficiency in Oregon. Additional information regarding the market penetration estimates include:

- The 1996-2000 data are from GAMA.
- Due to lack of data, the market in 2001 is considered to be equal to the market in 2000.
- The 2002-2004 values are based on the 2005 Energy Trust of Oregon Natural Gas Furnace Market Assessment.[14]
- The 2006-2008 values are based on trade ally surveys completed by the Energy Trust of Oregon. These surveys were completed in 2007, 2008, and 2009.
- The value used for 2005 is an average value of 2004 and 2006.
- The 2009 value is an average of the 2008 and 2010 values.
- The value in 2010 is assumed to reach an estimated cap of 75%.
- For the years 2010-2013, the Team assumes a constant value of 75%.

All of the high efficiency gas furnace market penetration values are specific to the retrofit market. Based on a reasonably possible code change in 2013 affecting the total market in 2014, the high efficiency market penetration is set to 100% in 2014. Table 6 shows the high efficiency gas furnace market as a percentage of the total gas furnace market from 1996-2019.

[14] Habart, Jack, and GDA Hewitt, Hewitt Consulting. "Natural Gas Furnace Market Assessment." Prepared for Energy Trust of Oregon. August, 2005.

Table 6. The Estimated High Efficiency Gas Furnace Market in Oregon

Year	High Efficiency Market
1996	20%
1997	21%
1998	22%
1999	21%
2000	21%
2001	21%
2002	46%
2003	62%
2004	72%
2005	66%
2006	59%
2007	80%
2008	61%
2009	68%
2010	75%
2011	75%
2012	75%
2013	75%
2014	100%
2015	100%
2016	100%
2017	100%
2018	100%
2019	100%

Source: Gas Appliance Manufacturers Association. Historical shipment data to support a review of the NAECA efficiency standards for products. April 10, 2002; Habart, Jack, and GDA Hewitt, Hewitt Consulting. "Natural Gas Furnace Market Assessment." Prepared for Energy Trust of Oregon. August, 2005; and Energy Trust trade ally survey, existing homes, surveys in 2007, 2008, and 2009.

Baseline Gas Furnace Penetration

The baseline market penetration represents the percentage of residential gas furnaces that would be high efficiency furnaces absent the Energy Trust program. This baseline is based on numerous sources, all of which have some downsides. It is important to note that the baseline described here is the Team's best estimate for the baseline in Oregon. It is highly likely that the baseline is above or below either of the baselines in the low case and high case. Because the results of the market transformation model are highly dependent on the baseline, the results presented in this study only represent the Team's best estimate.

For the low case, the Team determined the values for the baseline penetration in 2003–2019 based on two data sources: (1) the vendor interviews in Clark County, WA, and (2) the national market of high efficiency furnaces. The results from the interviews are in Appendix A. Additional information regarding the market penetration estimates include:

- The Team assumed that the value in 2003 is equal to the value in 2004.
- The value in 2004 is an average of the interview results and the national market.
- The values in 2005, 2006, and 2007 are based on the percent increase from 2004 to the average of the interview results and the national market in 2008.
- The value in 2008 is the average of the interview results and the national market, plus an added reduction equal to the percent reduction in the high efficiency market from 2007 to 2008.[15]
- The baseline in 2009 is based on a line of best fit between 2004 and 2008 with a reduction in 2008 due to the economic situation.
- The 2010 and 2011 baseline is based on a line of best fit between 2004 and 2008 without a reduction, assuming the market will be on the same line in 2010 as it was headed before 2008. The baseline and high efficiency market are assumed to be capped at 75%, meaning the high efficiency market will not surpass 75% penetration without a code change.
- The baseline is reduced in 2012-2013 to show the effect of a low income program in 2009-2013.
- In 2014-2016, the baseline then rises to the cap, 75%.
- The baseline reaches the code change, 100% penetration in 2017, three years after the market to show the assumed influence of the Energy Trust program on the federal code change.

It is important to note that these values are not differentiated for the retrofit and new construction market. Therefore, even though this model only considers the retrofit market and the units incented under the retrofit program, the baseline penetration values are not specific to the retrofit market.

For the high case, the Team determined the values for the baseline penetration in 2003 – 2019 based on the national market. Additional information regarding the market penetration estimates include:

- The values in 2003-2007 are equal to the percent of high efficiency furnaces in the national market.

[15] Note that the national market data included 1997 through 2007. The year 2008 was assumed to be equal to 2007.

- For the years 2008-2016, the Team based the values on the average percent increase from 1999 to 2007.
- The year 2008 has an additional exception. To represent the reduction in the economic situation in 2008, the 2008 value included an added reduction equal to the percent reduction in the high efficiency market from 2007 to 2008.
- The 2009 value uses the pre-reduction 2008 value as its basis.
- Based on a reasonably possible code change in 2013 affecting the total market in 2014, the baseline penetration is set to 100% in 2017, three years later than the market to show the influence of the Energy Trust program on the federal code change.

It is important to note that these values are not differentiated for the retrofit and new construction market. Therefore, even though this model only considers the retrofit market and the units incented under the retrofit program, the baseline penetration values are not specific to the retrofit market.

Section 2 includes tables with the low case and high case baseline.

3.2 Federal Code Change Findings

The current federal code for residential non-weatherized gas furnaces is an annual fuel utilization efficiency (AFUE) of 78%. The current law increases the AFUE to 80% for residential non-weatherized gas furnaces on November 19, 2015.[16] Because a majority of the furnaces sold today already have a minimum AFUE of 80%, this code change in 2015 will not result in a large amount of increased energy savings. Therefore, stakeholders are currently undergoing discussions about increasing the code to an AFUE of 90%.

The Team interviewed representatives from the Appliance Standards Awareness Project, the Natural Resources Defense Council (NRDC), and the Northwest Power and Conservation Council (Council) to better understand the possible federal code changes. All of the respondents agreed that the current planned increase of the standard from 78% to 80% will result in little to no energy savings, due to the fact that the majority of the residential gas furnace market has at least an 80% AFUE. Two of the respondents do think that the federal code for residential gas furnaces will change to 90% AFUE in the foreseeable future for the northern tier;[17] the third respondent did not comment. The respondents think that the standard will go into effect in the same timeline as is set now, sometime between 2013 and 2015.

Two of the respondents believe that statewide and utility energy programs have an influence on the federal changes. One respondent noted that energy programs can have two types of influences: a data influence and a qualitative influence. The data influence is the result of the energy program changing the economics of high efficiency furnaces, thus making it more likely that the high efficiency furnaces become standard. In addition, energy programs can provide data to the Department of Energy to help inform their decision on the standard. The qualitative influence is the example that these energy programs

[16] Department of Energy. Federal Register. "Energy Conservation Program for Consumer Products; Energy Conservation Standards for Residential Furnaces and Boilers; Final Rule." Vol. 72, No. 222 / Monday, November 19, 2007.

[17] Because this standard is of a regional nature, the U.S. will be divided into a northern tier, or cold zone, and a southern tier, or hot zone. The standards will likely be different for the different zones.

set by promoting high efficiency furnaces. This support behind high efficiency products sends a message to decision makers. In addition, the fact that contractors and distributors are already working with high efficiency products due to a program can also increase the endorsement of a higher standard due to familiarity with the high efficiency products. Another respondent mentioned that without the statewide and utility programs, the market share of high efficiency furnaces may be much lower. Therefore, the current law increasing the standard to 80% AFUE may appear more stringent in the absence of a program, and a push to a 90% AFUE standard could have not been warranted. Another respondent thinks that they may or may not have an influence depending on their ability to apply political pressure.

One respondent believes that the Energy Trust, specifically, could play a large role in the decision to include Oregon in the northern tier, or cold zone, because Oregon is currently a border state. Including Oregon in the northern tier would make it more likely that the code for Oregon will change to 90% AFUE. In addition, the Energy Trust has solid data from their program that they could present as evidence of the success of high efficiency gas furnaces in the market. The other respondents think that at this point in the process, it is difficult to ascertain the influence of the Energy Trust on the possible increase in the federal standard.

From these interviews and additional knowledge from Energy Trust in July 2009, the Team determined that the federal code will likely change around 2013 to 90% AFUE and Energy Trust's program has an influence on that change. Therefore, the model includes a code change in 2014 (incorporating the 1-year time lag between a code change and total market transition) for the market and a code change three years later, in 2017, for the baseline to show the influence of Energy Trust.

3.3 Model Template Development and Model Results

The model template development included assessing the functionality of Energy Trust's current gas furnace market transformation model. The model was originally created in Excel and was updated in the same format. The changes that the Team has implemented are outlined below.

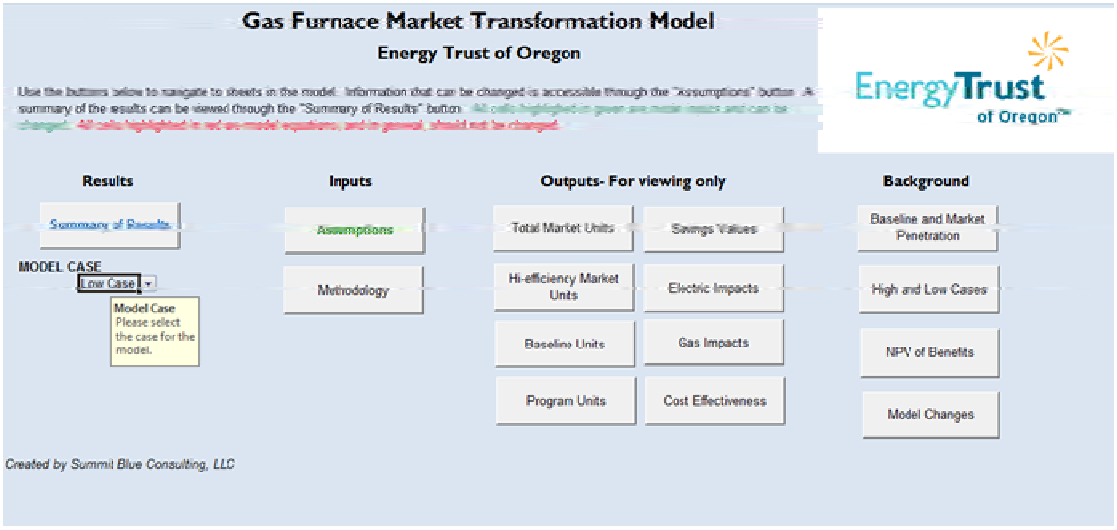
Improve documentation. The Team has improved documentation in the model by creating a global "Assumptions" tab. This Excel sheet includes all of the major assumptions in the model along with their sources. Previously, many assumptions were either embedded within equations in cells or were placed on separate sheets in the model. Having a single tab for assumptions allows the user to quickly and easily make changes to the major assumptions in one location. This also allows for major assumptions to be updated over time as assumptions change. Where possible, all assumptions are now defined and cited.

Develop a standard summary output table. The Team built upon the "Summary" tab in Energy Trust's current gas furnace model. The Team removed the methodology explanation and placed it on a separate "Methodology" tab. The Team also reformatted the results information to include placeholders for annual energy savings results, annual market penetration results, and benefit-cost analysis results. Both tables and charts are available on the "Summary of Results" tab for ease of using the information for other purposes, such as copying into a report. Previously, the results were shown in a table for 2004-2008 and 2023, and in a chart for 2003-2023. In addition, the results included therms savings, but it did not appear to include market penetration results. Additional charts were also located on a separate sheet.

Added functionality/Changed model layout. Based on discussions with the Energy Trust, the Team made additional changes to the model. These changes are listed below:

- The Team added a "Home Page," which includes a menu. This menu provides links to all tabs in the model and groups them into results, inputs, outputs, and background (see Figure 2).

Figure 2. Screenshot of the Gas Furnace Market Transformation Model Home Page



Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.

- The Team formatted the cost effectiveness tables to show results for each year and for the program as a whole. Previously, cost effectiveness was shown only for the whole program and for the first year.

- The Team modified the building types and heating zones and continued this nomenclature consistently through the model. There are now three building types— single family, multifamily, and manufactured home— and six climate zones— HZ1/CZ1, HZ1/CZ2, HZ1/CZ3, HZ2/CZ1, HZ2/CZ2, HZ3/CZ1.[18] Previously, there were the same three building types with three climate zones— Z1/1, Z1/2, and Z2/2.

- The Team changed the residential types to include existing buildings (retrofit) and new construction. Previously, the residential types were retrofit, new construction- base, new construction with PCTS, and new construction with Energy Star. This change simplifies the inputs. The detailed building types are not needed, because the Energy Trust classifies energy savings by retrofit and new construction and because Energy Trust does not account for electric savings from ECMs.

- The Team added a section at the top of each Excel sheet to explain the purpose of the sheet and the data included on the sheet. This explanation should help the user navigate through the model.

[18] Where "HZ" means heating zone and "CZ" means cooling zone. A review of the heating and cooling zones in Oregon resulted in these six combinations.

- The Team color coded the cells in the model to make it more user-friendly. Green shading represents a cell that can be changed by the user; red shading represents a cell that should not be changed by the user.

- The Team updated values and assumptions in the model where possible. For example, the gas savings per unit have been updated.

- The Team updated the baseline based on market research— interviews and secondary data. Previously, it was based on an assumed S-curve. The baseline development is discussed in more detail in Section 3.1.

- The Team added a toggle on the "Home Page," allowing the user to view the high or low case results.

Gas Furnace Market Transformation Model Results

The market transformation model produces results on the total high efficiency market,[19] the baseline,[20] and the impact of the program.[21] The market transformation piece indicates additional savings that may be claimed by the program in addition to the formal program savings.

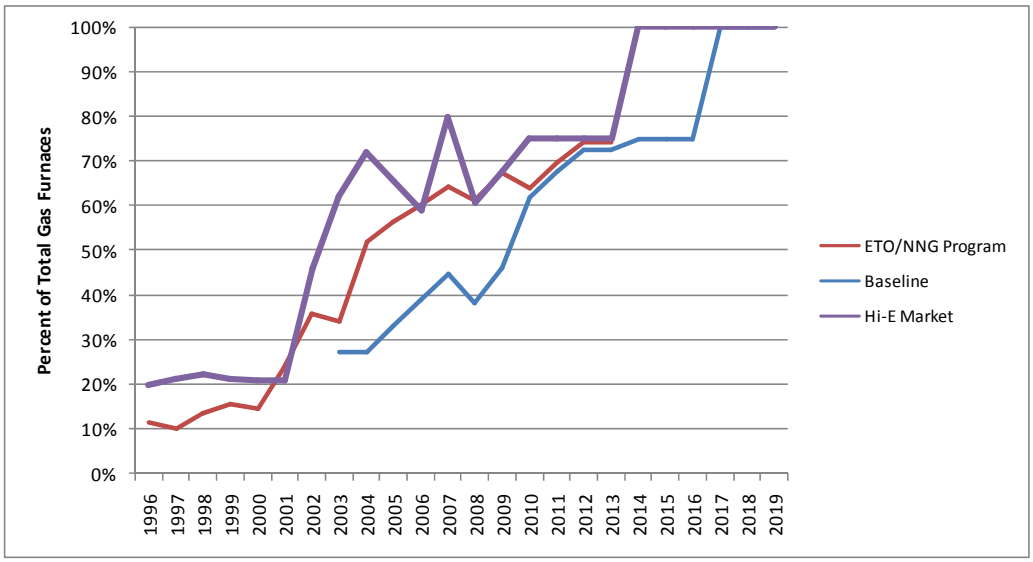
Figure 3 and Figure 4 show the results from the gas furnace market transformation model for the low case and high case, respectively, in terms of market share. These charts begin in 1996, because Northwest Natural Gas provided incentives to its customers for high efficiency gas furnaces beginning in 1996. The difference between the high efficiency market (purple line) and the Energy Trust program with the baseline (red and blue lines) provides additional units and savings that can be claimed by Energy Trust.

[19] The total high efficiency market is estimated by the number of customers, a gas furnace replacement rate, and a percent of replacement furnaces that are assumed to be high efficiency.

[20] The baseline is an estimate of what the market would look like in absence of the program. The baseline is estimated by the number of customers, a gas furnace replacement rate, and a percent of replacement furnaces that would be high efficiency in absence of the program.

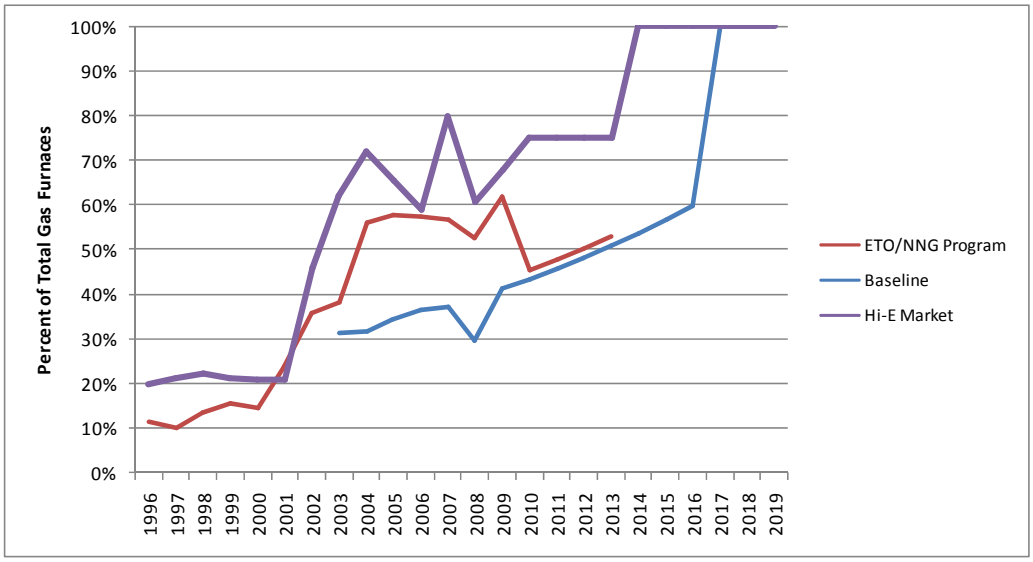
[21] The impact of the program is the impact from direct dollar incentives.

Figure 3. The Gas Furnace Market Transformation Model Results: Low Case



Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.
Note: 1996 to 2002 are provided in these charts for context only.

Figure 4. The Gas Furnace Market Transformation Model Results: High Case



Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.
Note: 1996 to 2002 are provided in these charts for context only.

Table 7 shows the overall cost effectiveness results from the gas furnace market transformation model. The model calculates that the program has a benefit-cost ratio of greater than one for both the low case and the high case and for both the system benefit-cost ratio and the societal benefit-cost ratio. The total ETO levelized cost is $0.15/therm for the low case and $0.10/therm for the high case. The total society levelized cost is $0.94/therm for the low case and $0.86/therm for the high case. The total NPV of ETO customer retail savings is $47,603,542 for both cases. In addition, the average high-efficiency customer simple payback is 6.5 years for the low case and 7.3 years for the high case.

Table 7. Cost Effectiveness Results: Low and High Case

Year	System Benefit-Cost Ratio	Societal Benefit-Cost Ratio	Total ETO Levelized Cost ($/therm)	Total Society Levelized Cost ($/therm)	Total NPV of ETO Customer Retail Savings	Average Hi-E Customer Simple Payback
Low Case	7.4	1.2	$0.15	$0.94	$47,603,542	6.51
High Case	10.9	1.2	$0.10	$0.86	$47,603,542	7.30

Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.

Table 8 and Table 9 show results from the gas furnace market transformation model for the first year energy savings, in therms, for the each aspect of the market: the baseline, the Energy Trust and Northwest Natural Gas (NNG) program, a NEEA program (absent in the gas market), and the high efficiency market. The market savings attributable to Energy Trust are the difference between the high efficiency market savings and the sum of the baseline, the Energy Trust/NNG program, and the NEEA program. These savings begin in 2003, coinciding with the beginning of the Energy Trust program.

Table 8. First Year Energy Savings For Each Market Aspect: Low Case

First Year Energy Savings	Baseline	Energy Trust/NNG Program	NEEA Program	Hi-E Market Savings	Market Savings Attributable to Energy Trust
Year	therms	therms		therms	therms
1996	0	155,444	0	268,277	
1997	0	136,675	0	285,974	
1998	0	184,162	0	301,031	
1999	0	222,193	0	301,189	
2000	0	213,585	0	310,362	
2001	0	365,571	0	322,226	
2002	0	570,760	0	734,394	
2003	450,063	110,709	0	1,022,628	461,856
2004	463,957	417,292	0	1,224,230	342,981
2005	580,463	410,800	0	1,148,528	157,264
2006	716,377	388,503	0	1,085,961	-18,920
2007	825,162	362,184	0	1,475,556	288,210
2008	705,336	419,620	0	1,116,154	-8,802
2009	845,430	388,080	0	1,244,304	10,794
2010	1,134,267	35,280	0	1,372,098	202,550
2011	1,237,564	35,280	0	1,368,987	96,143
2012	1,319,184	35,280	0	1,366,224	11,760
2013	1,316,595	35,280	0	1,363,635	11,760
2014	1,361,024	0	0	1,814,698	453,675
2015	1,358,395	0	0	1,811,193	452,798
2016	1,355,743	0	0	1,807,657	451,914
2017	1,804,066	0	0	1,804,066	0
2018	1,800,404	0	0	1,800,404	0
2019	1,796,681	0	0	1,796,681	0

Source: Summit Blue Consulting. Gas Furnace Market Transformation Model. Note that negative savings occur in 2006 and 2008 for the "Market Savings Attributable to Energy Trust" due to the fact that the sum of the baseline savings and the Energy Trust/NNG program is greater than the Hi-efficiency market savings.

Table 9. First Year Energy Savings For Each Market Aspect: High Case

First Year Energy Savings	Baseline	Energy Trust/NNG Program	NEEA Program	Hi-E Market Savings	Market Savings Attributable to Energy Trust
Year	therms	therms	therms	therms	therms
1996	0	155,444	0	268,277	
1997	0	136,675	0	285,974	
1998	0	184,162	0	301,031	
1999	0	222,193	0	301,189	
2000	0	213,585	0	310,362	
2001	0	365,571	0	322,226	
2002	0	570,760	0	734,394	
2003	517,527	110,709	0	1,022,628	394,392
2004	536,841	417,292	0	1,224,230	270,097
2005	603,221	410,800	0	1,148,528	134,507
2006	671,346	388,503	0	1,085,961	26,111
2007	684,464	362,184	0	1,475,556	428,908
2008	543,733	419,620	0	1,111,085	147,732
2009	772,703	388,080	0	1,274,250	113,467
2010	818,694	35,280	0	1,414,593	560,619
2011	866,236	35,280	0	1,418,739	517,223
2012	916,818	35,280	0	1,423,332	471,234
2013	970,766	35,280	0	1,428,545	422,500
2014	1,022,265	0	0	1,901,246	878,981
2015	1,076,479	0	0	1,897,741	821,262
2016	1,133,545	0	0	1,894,205	760,660
2017	1,890,614	0	0	1,890,614	0
2018	1,886,952	0	0	1,886,952	0
2019	1,883,229	0	0	1,883,229	0

Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.

Table 10 shows the total lifetime savings from the gas furnace market transformation model for the Energy Trust program and the market savings attributable to Energy Trust. The low case results in total lifetime savings of an estimated 138,807,311 therms, while the high case results in a total lifetime savings

of an estimated 214,650,015 therms. These results are highly dependent on the baseline, which has a reasonable amount of uncertainty. The Team discusses the baseline in detail in Section 3.1.

Table 10. Total Lifetime Savings from the Energy Trust Program and the Market Savings Attributable to Energy Trust (therms)

Year	Low Case	High Case
2003	14,314,115	12,627,511
2004	19,006,823	17,184,726
2005	14,201,619	13,632,676
2006	9,239,588	10,365,357
2007	16,259,857	19,777,303
2008	10,270,448	14,183,806
2009	9,971,856	12,538,667
2010	5,945,756	14,897,470
2011	3,285,569	13,812,580
2012	1,176,000	12,662,843
2013	1,176,000	11,444,491
2014	11,341,865	21,974,533
2015	11,319,959	20,531,560
2016	11,297,857	19,016,491
2017	0	0
2018	0	0
2019	0	0
Total	138,807,311	214,650,015

Source: Summit Blue Consulting. Gas Furnace Market Transformation Model.

4 SUMMARY AND RECOMMENDATIONS

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

- The market for high efficiency furnaces in Oregon is essentially transformed, due largely to Energy Trust's program efforts. While some market gains are yet to be realized, and sales are suffering this year due the economic climate, the market reached 80% saturation in 2007.
- Baseline high efficiency furnace sales remain difficult to estimate due to the lack of data available. GAMA data may alleviate this concern by assuming the baseline in Oregon is equal to the sales in a similar state with no program, but GAMA is intransigent regarding the sharing of data with non-members.
- Energy Trust's affects on the market for high efficiency furnaces include savings that exceed the direct program outcomes attributable to incentives paid.
- Energy Trust's gas furnace program, and other programs like it, can have a significant influence on the development of high efficiency performance standards at the federal level, accelerating the rate of adoption of more stringent standards. For this reason, the Team has credited Energy Trust with savings attributed to possible new standards (90% efficiency in 20153 predicted) for a period of three years after the code change goes into effect. After that, it is assumed the standards would have occurred in the absence of efforts like Energy Trust's.

4.1 Local Market Conditions Findings

NW natural territory

- The Team conducted ten interviews in NWN service territory.
- Energy Trust's program efforts to influence the gas furnace market did spill over into surrounding areas.
- Overall, there has been a large number of 90-94% efficiency furnaces sold in the NWN gas service territory of Oregon in 2008. Contractors and distributors alike identify incentives (both Energy Trust and tax credit) as very influential in driving these sales. With the incentives in place, sales of high efficiency units have increased significantly over the past few years.
- In these hard economic times, sales of all goods have decreased. Many interviewees stated that it may be the wrong time to be doing this assessment, since sales in all efficiency categories have fallen in the last few months of 2008.
- Contractors and distributors alike state that if program incentives were to be discontinued, a drive to the bottom would take place, with the average unit sold falling to low to mid 80% efficient units. Therefore, the Energy Trust incentive is particularly valuable at this moment of time; without it, a drive to the lowest denominator product might ensue, and some of the market gains developed through the previous hard work and investment of Energy Trust might be lost.

Cascade territory:

- The Team conducted nine interviews in Cascade service territory.

- Cascade service territory is very rural, and there are large territories outside of town where natural gas service is not available. Because economically this is a harder hit area, people are looking to reduce their utility bills. Gas is more expensive than electricity in some of these areas, and when it comes to replacing their furnaces; some people just chose electric heaters. There are not as many furnace installations as in a highly populated territory, like Portland.
- While contractors in NWN Oregon unanimously state that incentives (both Energy Trust and tax credit) have been very influential in driving high efficiency sales, contractors in Cascade service territory are split on the level of influence. Smaller contractors are in greater need of the incentive to sell more high efficiency units, while larger contractors are less in need. Perhaps this is because larger contractors have more experienced salesmen and have a more refined marketing strategy. Furthermore, they may also be able to offer a lower price based on volume and experience.

NWN territory - Clark County

The Team looked at sales of high efficiency furnaces in Clark County to: 1) provide a baseline for NWN Oregon, absent of Energy Trust program and based on responses for Clark County (control group); and 2) help to inform a potential Energy Trust program extension in Clark County. Toward the end of the study, the Team was made aware of the fact that incentives are available in the NWN Clark County area. Therefore, Clark County does not provide an ideal baseline for this study. The NWN Clark County survey effort led to four main observations for establishing a baseline for NWN gas service territory.

- The Team interviewed seven respondents, six in the first round and one unique distributor in the second round, in the NWN service territory of Clark County, Washington.
- While 71% of customers in NWN Oregon ask about high efficiency furnaces, an even higher 84% of customers do the same in NWN Clark County. This indicates that while Energy Trust's program has an important role in educating customers about high efficiency units, a higher level of awareness was achieved in an area where Energy Trust marketing was not as predominant.
- Contractors stated that customer demand had the most influence on their companies' marketing of high efficiency furnaces in Clark County. While 94% of customers in NWN Oregon ask about high efficiency furnaces, an also very high 84% of customers do the same in NWN Clark County. This is likely due to the incentives offered in NWN Clark County. In addition, Clark County shares media, vendors, and distributors with Northern Oregon. Thus, Energy Trust might have a substantial effect on customers in another state and might have induced the increase in high efficiency unit sales through its education component.
- From 2004 to 2008, the efficiency level of the standard unit marketed to customers has also remained the same for these contractors, at an already high level of 91%. They stated that back in 2004, the average unit that they marketed was in the 80% efficiency category. This was specifically due to the boom in new construction around this time.
- The percentage of total units sold that are high efficiency have increased significantly over the past five years, along with an increase in the number of units sold with an ECM motor. Energy Trust's marketing and education was probably partially responsible for this increase in Clark County.
- Energy Trust education and marketing efforts have most likely had an influence on the increase in sales of high efficiency furnaces in Clark County, in addition to the direct incentives offered in the region.

4.2 Recommendations

The Team has compiled a list of recommendations for Energy Trust based on the study findings.

- Energy Trust should continue its work with other entities to push more stringent national standards for gas furnaces, especially with regard to the inclusion of Oregon in the northern tier for the national standard. Code and standard changes constitute one of the most cost effective means of achieving efficiency goals on a large scale.
- Energy Trust should continue to provide training, marketing information, and other infrastructure support to the Oregon furnace market vendors and other trade allies. Incentives should not be provided going forward, except for low-income markets and special promotions.
- Energy Trust should consider working through Energy Star, DOE, CEE, or other sources to convince GAMA to provide "clean" data (data that does not name individual brands or distributors) available to states and other entities that need to perform evaluation of energy efficiency efforts.
- Energy Trust can use the market transformation model for many different programs with minor changes.
- Energy Trust should update this assessment of the gas furnace market every other year.

APPENDIX A: VENDOR INTERVIEW SUMMARIES

Summit Blue Consulting (the Team) completed interviews with vendors in three areas: Northwest Natural Gas service territory, Cascade Natural Gas service territory, and Clark County in Washington. In this section, the Team presents the results of the interviews.

A.1 Northwest Natural Gas Vendor Interviews

This section presents a summary of responses from Northwest Natural's (NWN) service territory and provides insight into high efficiency gas furnace sales. During the interview process, some respondents provided anecdotal comments, which are discussed in italics.

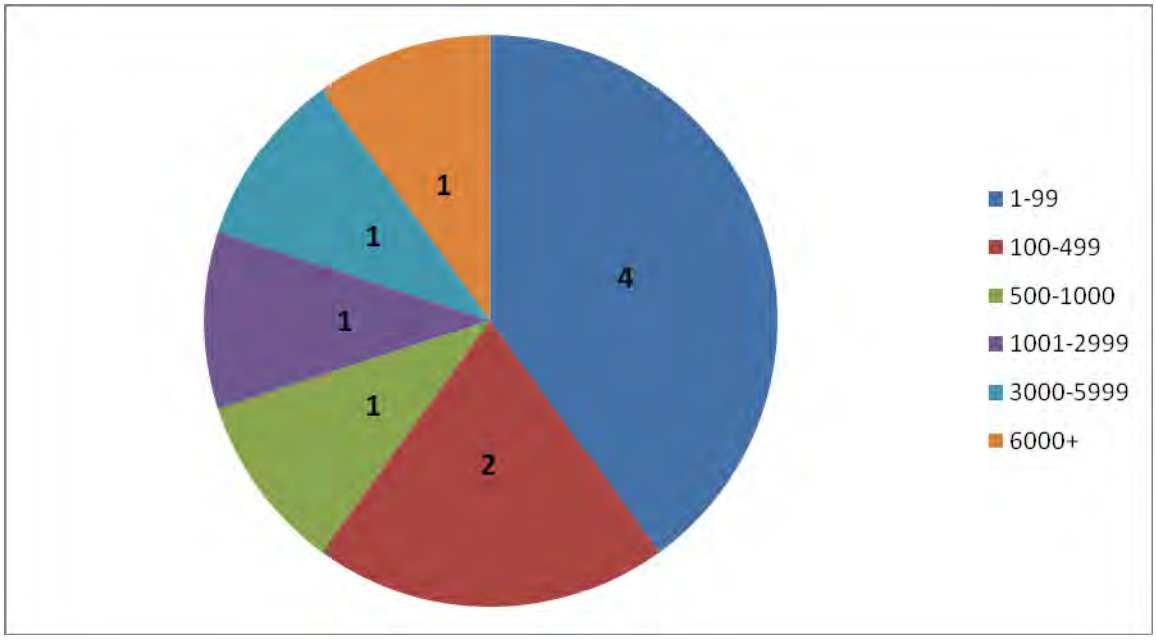
Survey Respondents' Background and Distribution

The Team conducted ten interviews with seven contractors and three distributors in NWN service territory. The majority of respondents have been working at their current positions for more than several years and have been in the industry upwards of 20 years. While the contractors work almost entirely in the NWN Oregon service territory, about 60% of *distributor sales* are for units that get installed in the NWN Oregon service territory. These distributors are general managers for larger territories (entire Oregon and/or Washington State); therefore, they have provided a basis of comparison between the three areas for this analysis.

There has been a fairly even distribution of smaller contractors (one to 99 units) and larger contractors (100-1000 units) in the survey sample. The three distributors interviewed understandably sold the highest number of units (from a few thousand to 6000+). Therefore, this sample provides a representative finding of the overall Oregon gas furnace market. In total, the respondents represent more than 12,000 furnaces sold or installed in Oregon in 2008. See Figure 5 for division of contractors and distributors by *units*[22] sold/installed in 2008.

[22] The term *unit* in this analysis refers to all gas furnaces (standard and high efficiency) sold/installed by a particular contractor/distributor in 2008.

Figure 5. Distribution of Interviewees in Energy Trust Serviced Areas by Units Sold



Source: Summit Blue interviews of furnace vendors in NW Natural service territory.

Number of Units in Each Efficiency Category and with an ECM Motor

Each interviewee was asked about the percentage of units sold in four different AFUE categories, and also about the percentage of the units *in each category* that had an ECM motor.[23] Since the Oregon state building code does not allow units less than 80% AFUE to be installed in the state of Oregon, none of the interviewees reported selling or installing these units. Table 11 shows a summary of the responses, weighted by the total number of units sold by the respondent.

Table 11. Weighted Average Percentage of Units Sold in 2008 in Each Efficiency Category

Efficiency Category	Percentage of Total 2008 Units	Percentage of *Category* w/ ECM*
80-89% AFUE:	36%	14%
90-94% AFUE:	53%	48%
95% AFUE or higher:	11%	58%
Total:	**100%**	**37%**

**The percentages shown here are the percent of units within the category that have an ECM motor.*

Source: Summit Blue interviews of furnace vendors in NW Natural service territory.

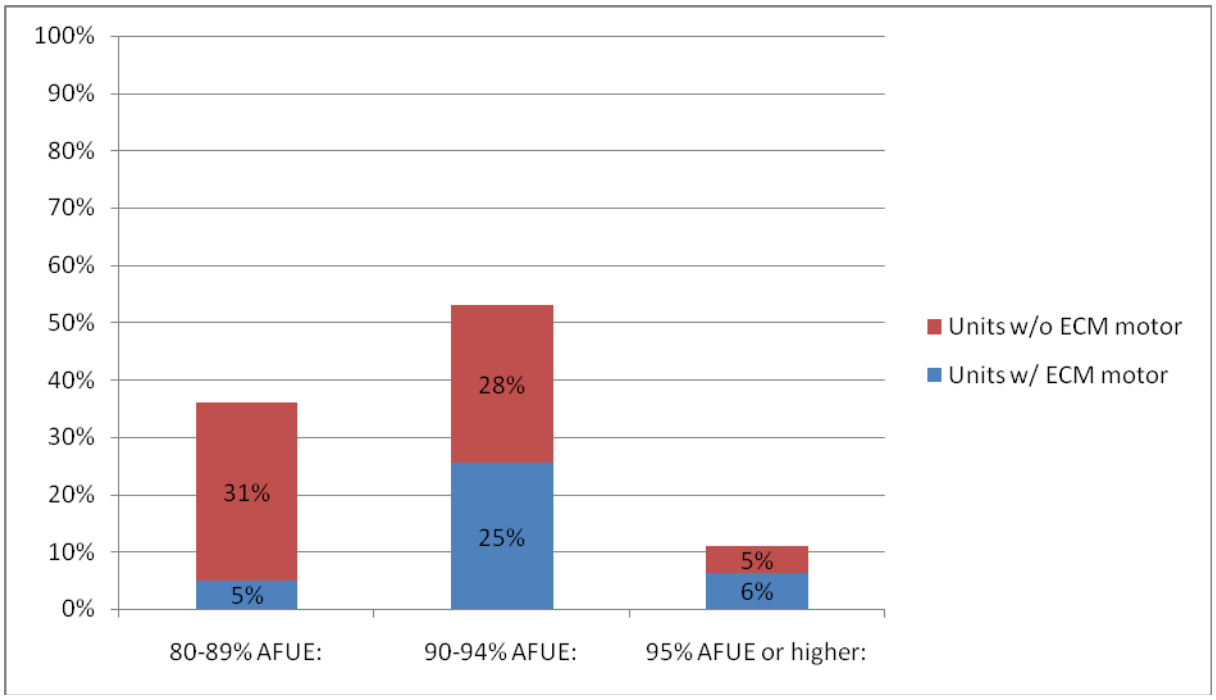
While the weighted-average percentage of 80-89% AFUE units is 36% of total sales, the percentage of units in this efficiency range with an ECM motor is just 14%. This is probably due to the fact that ECM motors are fairly costly, and would not be worth the investment with a lower efficiency unit.

[23] The summarized percentages here are weighted by the total number of units sold by the respondent.

Higher efficiency units (90-94% AFUE) sold/installed are around 53% of total sales, and the percentage of units sold/installed *with an ECM motor* in this efficiency range jumps significantly from 14% to 48% of total sales. Anecdotal evidence from a few of the interviewees suggests that they encourage people to purchase a high efficiency unit with an ECM motor, since this makes the temperature inside feel more "comfortable."

Finally, the percentage of 95% AFUE units is around 11% of total sales, and well over half of these (58%) are sold with an ECM motor. The Oregon Residential Tax Credit, which provides a tax credit for units that are above 90% efficiency and with an ECM motor, partially explains this high percentage. Figure 6 shows the percentage of total market units in 2008 with and without an ECM motor.

Figure 6. Percentage of Total 2008 Units With and Without an ECM Motor*



**The sum of the percentages in each column add to the percentage in each category in* Table 4.

Source: Summit Blue interviews of furnace vendors in NW Natural service territory.

Standard Efficiency Marketed to Customers

The interviewees were also asked about the efficiency of the *standard or typical unit* they marketed to customers in both the first and the last half of 2008. With the exception of one respondent, the efficiency level of the standard unit marketed to customers remained the same from the first to the second half of 2008, and the respondents plan to continue marketing the same unit to their customers in 2009. The efficiency level of the standard unit marketed by the outlier respondent changed from 95% AFUE or higher for the first half of the year, to 80-89% AFUE for the second half of the year. *The repondent blames the economic downturn for this drop, noting that right now, these are the units that are selling in his area.*

Others note that the overall market has dropped by about 25-30%; therefore, the number of jobs available has decreased. While a large percentage of the 80-89% AFUE units were installed in new construction, with the housing market crash, these jobs have almost totally disappeared in 2008. However, the number of contractors performing replacement work increased, leading towards a drive to the bottom; contractors

are offering the cheapest price by selling the cheapest units in order to secure the job in the first place**.** *Many furnace vendors see a larger number of old (20+ year old) furnaces, which were previously being replaced by high efficiency ones, now being fixed instead. Furthermore, some people choose to use secondary heating methods, like wood burning fireplaces, instead of replacing their broken furnaces.*

Importance of Incentives

When asked how influential the Incentive Offers (Energy Trust incentive and tax credit) have been on the efficiency level they market to customers, all but one respondent replied "Very Influential." *One respondent stated that incentives help to make the sale by offsetting the cost of upgrading from an 80% to a higher efficiency furnace, as it allows for a shorter return on investment. Another respondent estimated that without incentives, high efficiency furnace sales would decrease by 3 or 4% and payback increase from six to eight years to ten to 12 years.*

Next, the contractors were asked which factors had the most influence on their companies' marketing of high-efficiency furnaces. As Table 12 shows, out of the factors listed (Energy Trust incentive, tax credit, manufacturer's rebate or information, distributors, customer demand), three contractors named all as equally important, one naming both incentives as important, and one each naming the Energy Trust incentive, the tax credit and customer demand as most influential. Other factors discussed were price and environmental consciousness.

Table 12. Number of Contractors Stating a Particular Factor the Most Influential in Increasing High Efficiency Gas Furnace Sales

Factors	Number of respondents
Energy Trust incentive	1
Oregon Residential Tax Credit	1
Both incentives are equally important	1
Customer demand	1
Manufacturer rebate/information	0
Distributors	0
All are equally important	3

Source: Summit Blue interviews of furnace vendors in NW Natural service territory.

Distributors were asked to pick which of the two incentives (Energy Trust or tax credit) are more influential in increasing high efficiency furnace sales. All respondents stated that both incentives are equally influential. Specifically, ***they cannot distinguish necessarily which program is driving the increase in high efficiency units, since it is the combined total that makes high efficiency units more attractive to customers.*** However, some anecdotal evidence identifies some major differences between the two.

- *One respondent elucidates that Energy Trust is probably more influential since older people do not pay taxes and therefore, the residential tax credit is meaningless for them.*

- *Rebates are cash back now, so people see it as fast cash, and in this economic situation, this is important.*

- *Another states that in such a bad economy, incentives make such a huge difference, that without them, his sales would reverse, go back to 80% in the 80% AFUE category and 20% in the high efficiency category.*

Considering all aspects of the Incentive Offers (including equipment rebates, Contractor Trade Ally List, and program literature) for increasing sales of high efficiency gas furnaces, all respondents stated that they have been very influential.

Customers Asking About High-Efficiency Units and Receiving Incentives

Overall, 47% of customers received an Energy Trust incentive, and almost the same amount, 45% received a tax credit, as can be seen in Table 13. The majority of customers (71%) also ask about high efficiency units. Contractors credit this to overall "green marketing" and frequent discussions about energy efficiency in the media. *Furthermore, Energy Trust is identified as a great source of information on energy efficient appliances, providing a list of trade allies, providing the incentive, and also identifying all other incentives and rebates that are available. A few respondents noted that since they joined Energy Trust's Home Energy Solutions (HES) and have been listed on the website, the number of new clients call them mentioning the list and the incentives offered by Energy Trust, and their sales of high efficiency units have dramatically increased.*

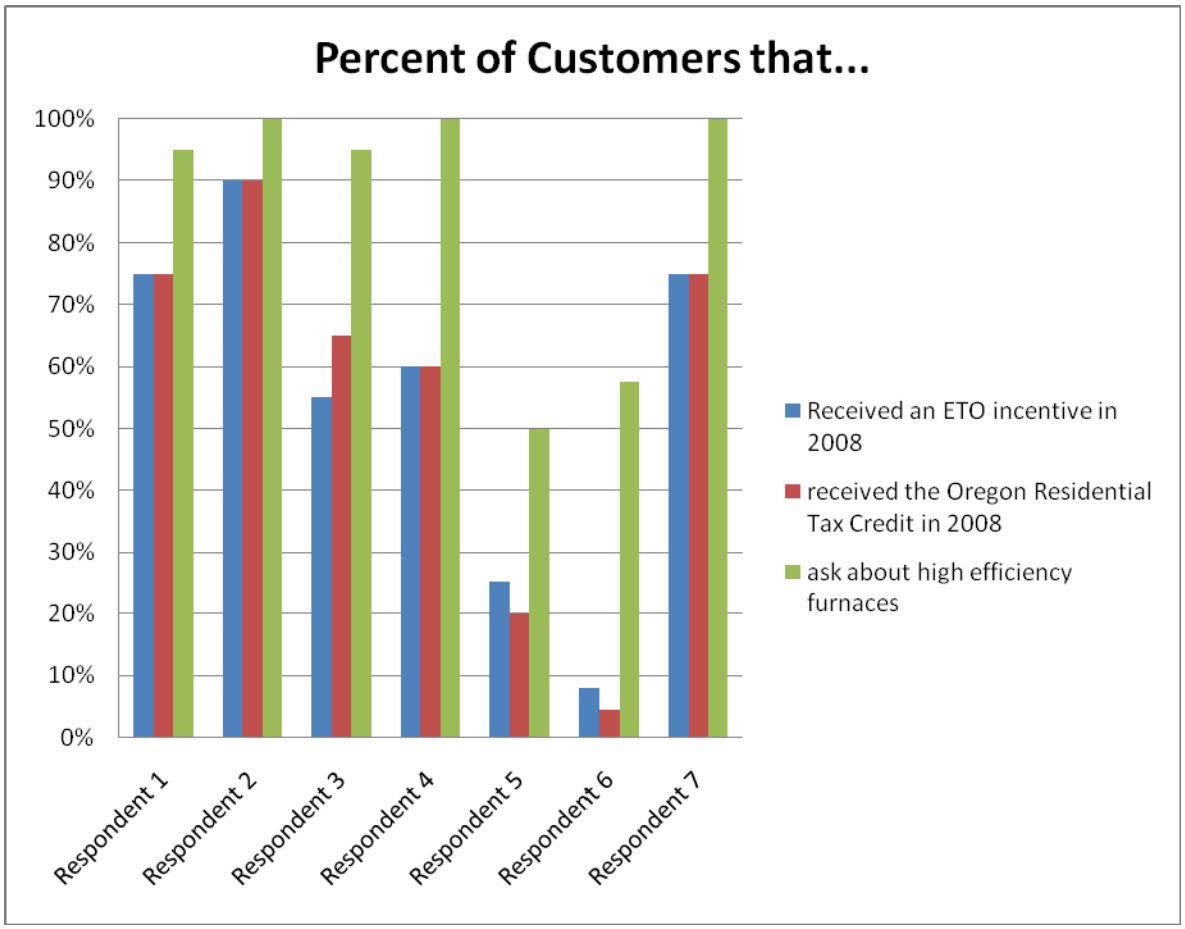
Table 13. Weighted Average Percentage of Units Sold in 2008 in Each Efficiency Category

Question	Weighted Average Response
Percent of customers receiving an Energy Trust incentive in 2008:	47%
Percent of customer receiving the tax credit in 2008:	45%
Percent of customers asking about high-efficiency furnaces:	71%

Source: Summit Blue interviews of furnace vendors in NW Natural service territory.

Figure 7 shows the responses by interviewee.

Figure 7. Percent of Customers that Received an Energy Trust Incentive / Tax Credit and High Efficiency Gas Furnaces.



Source: Summit Blue interviews of furnace vendors in NW Natural service territory.

Sales Expectations for 2009

All distributors expect a decrease in the number of high-efficiency units sold in 2009. They also note that in the current economic downturn, incentives are even more important for selling high efficiency units.

One distributor states that without Energy Trust incentive and tax credit, he would not be selling high efficiency units. With these incentives, the cost differential is closer between the standard efficiency and high efficiency units. He believes that if the incentive is reduced or eliminated, the market will be driven to sell "entry level gear."

Contractors are split in their expectations of sales of high efficiency furnaces for 2009. Four expect sales to decrease by 15-30%, while two respondents expect an increase, one with 30%, and one of 1-2%, *provided that incentives remain*. *Without incentives*, he expects a decrease of 4-8%. For 2009, all respondents stated that incentives will be very influential, with the exception of one, who believes the incentives will be somewhat influential.

- *One contractor notes that without new construction, there has been a 26% decrease in installation, while there are 30% more contractors vying for all jobs.*

- *Another contractor said that people are not spending as much nowadays. With some people, their house values have decreased so much that they do not want to spend a lot on high efficiency units; therefore, the incentives are incredibly influential in making the cost differential between a standard unit and a high efficient one become closer. Units are also becoming more costly, as they improve in efficiency, and this cost is somewhat offset by the incentives.*

When asked (for those customers that received incentives) if incentives would not have been available, all but two respondents said most customers would have chosen a lot less efficient furnace. The two other respondents said that they did not know. Many also stated, however, that each person wants something else and have different financial backgrounds.

Summary

This analysis is based on a sampling of large and small contractors and retailers. While the results of certain questions provide much insight as to how the market has changed in the past few years, anecdotal comments answer why the market has changed and why the Energy Trust incentive is influential in continuing the increase in the number of high efficiency units being sold/installed in the NWN gas service territory.

Overall, there has been a large number of 90-94% efficiency furnaces sold in the NWN gas service territory of Oregon in 2008. Contractors and distributors alike identify incentives (both Energy Trust and tax credit) as very influential in driving these sales. *With the incentives in place*, sales of high efficiency units have increased significantly over the past few years.

In these hard economic times, sales of all goods have decreased. People are not purchasing as much, and are trying to spend less money on items both discretionary *and* necessary (since Oregon is very cold in the winter, furnaces are a necessity). Many respondents stated that it is the wrong time to be doing this assessment, since sales in all efficiency categories have fallen in the last few months of 2008.

However, with the incentives in place, the respondents noted that sales of high efficiency units are still holding relatively high in relation to lower efficiency units. With a reduction in new construction (most of which gets built with 80% AFUE units), the share of higher efficiency units can be increased even further, especially since most customers (71%) are asking about high efficiency units. But contractors and distributors alike state that if the incentives were to be discontinued, a drive to the bottom would take place, with the average falling to low to mid 80% efficient units.

This clearly identifies people's need for a higher efficiency unit that can save money on increasingly high utility bills and provide comfort for their home, while also being gentler on the environment. Therefore, the Energy Trust incentive is particularly valuable at this moment in time, and without it, a drive to the lowest denominator product might ensue, and some of the market gains developed through the previous hard work and investment of Energy Trust might be lost.

Supporting Table

Table 14. Percentage of Units in the AFUE Category

Respondent	Total # of units sold in 2008	Percentage of units in each category				Percentage of units in each category with an ECM motor			
		Less than 80%	*80-89% AFUE*	*90-94% AFUE*	*95% AFUE or higher*	*Less than 80%*	*80-89% AFUE*	*90-94% AFUE*	*95% AFUE or higher*
1	350	0%	25%	50%	25%	0%	5%	90%	90%
2	280	0%	10%	40%	50%	0%	0%	100%	100%
3	70	0%	45%	55%	0%	0%	14%	55%	0%
4	100	0%	40%	50%	10%	0%	0%	100%	100%
5	1,000	0%	50%	45%	5%	0%	9%	20%	20%
6	40	0%	75%	20%	5%	0%	1%	9%	9%
7	15	0%	5%	10%	85%	0%	?	100%	100%
8	1,500	0%	50%	40%	10%	0%	20%	20%	20%
9	3,000	0%	30%	70%	0%	0%	15%	15%	0%
10	6,000	0%	35%	50%	15%	0%	15%	70%	100%
Total	**12,355**	**0%**	**36%**	**53%**	**11%**	**0%**	**14%**	**48%**	**58%**

Note: Numbers for ECM motors are percentages of the percentage of units in that AFUE category.

Source: Summit Blue interviews of furnace vendors in NW Natural service territory.

Appendix A.2 Cascade Natural Gas Vendor Interviews

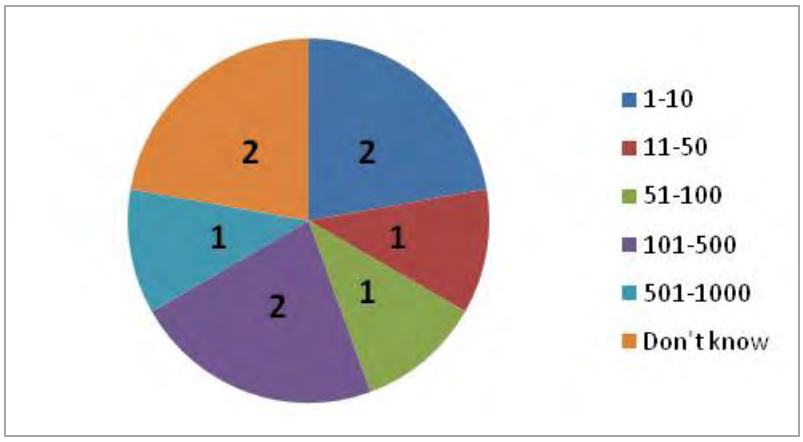
In this subsection, the Team presents a summary of interview responses from Cascade Natural Gas service territory and provides insight into high efficiency gas furnace sales. The purpose of this effort is two-fold: using Cascade Natural Gas as a comparison region to help inform where the furnace market would be in NWN Oregon without the extensive marketing that Energy Trust ran in NWN Oregon and to provide information about the penetration of the high efficiency market in Cascade service territory to help decide for Energy Trust whether or not to continue providing rebates to this area. During the interview process, some respondents provided anecdotal comments, which are discussed in italics.

Survey Respondents' Background and Distribution

The Team conducted nine interviews with seven contractors and two distributors in Cascade service territory. The majority of respondents have been working at their current positions for more than five years and have been in the industry upwards of ten years. A few interviewees are the owners of their companies, while others are in sales manager positions. While the contractors work almost entirely in the Cascade service territory, the distributors are regional managers for larger territories (entire Oregon and/or Washington State); thus, they have provided a basis of comparison between the three areas for this analysis.

The Cascade service territory is much more rural than the NWN service territory; therefore, the number of units sold per contractor (in the tens) is also lower than in the NWN service territory (in the hundreds). Natural gas is not available in many areas, and propane tanks are commonly used. Electric heaters are more prominent in this area. The majority of contractors sold less than a 100 units and two contractors did not know how many units they sold. The two distributors interviewed understandably sold the highest number of units (400 and 900). Nevertheless, the sample is representative of the Cascade service territory, where smaller contractors and lower sales figures are common. In total, the respondents represent more than 1800 furnaces sold or installed in Oregon in 2008. See Figure 8 for division of contractors and distributors by *units*[24] sold/installed in 2008.

Figure 8. Distribution of Interviewees in Energy Trust Serviced Areas by Units Sold in 2008



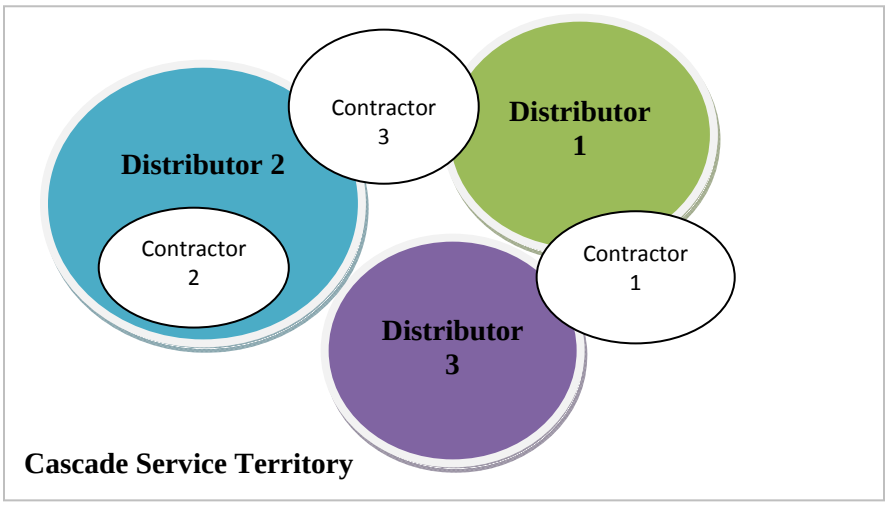
Source: Summit Blue interviews of furnace vendors in Cascade Natural Gas service territory.

Number of Units in Each Efficiency Category and with an ECM Motor

Each interviewee was asked about the percentage of units sold in four different AFUE categories, and also about the percentage of the units *in each category* that had an ECM motor. While the Oregon state building code does not allow units less than 80% AFUE to be installed in the state of Oregon, one interviewee reported selling or installing these units (10% of their sales). This contractor was one of the two who did not know how many total units his/her company sold, and therefore, was probably due to lack of knowledge on the subject. Table 15 shows a summary of the responses, weighted and unweighted, by the total number of units sold by the respondent. While weighting the responses provides a more accurate representation of the market, the large sales volume of distributrors skew the weighted averages. Since many of the contractor units likely came from the same distributors the Team interviewed, this effect is negated (see Figure 9). Un-weighted numbers are presented as a reference, but in the discussion, weighted numbers are used.

[24] The term *unit* in this analysis refers to all gas furnaces (standard and high efficiency) sold/installed by a particular contractor/distributor in 2008.

Figure 9. Distribution channel linkages



Source: Summit Blue interviews of furnace vendors in Cascade Natural Gas service territory.

Table 15. Average Percentage of Units Sold in 2008 in Each Efficiency Category

Efficiency Category	Percentage of Total 2008 Units		Percentage of Category w/ ECM*	
Weighted/ Un-weighted Averages	Un-weighted	Weighted	Un-weighted	Weighted
80-89% AFUE:	40%	37%	9%	16%
90-94% AFUE:	44%	50%	39%	56%
95% AFUE or higher:	15%	13%	55%	70%

**The percentages shown here are the percent of units within the category that have an ECM motor.*

Source: Summit Blue interviews of furnace vendors in Cascade Natural service territory.

The weighted average percentage of units in the 80-89% AFUE category was 37% of total sales. Interestingly, the percent of units in this AFUE category in Cascade service territory is nearly identical to the NWN Oregon percentage (36%).

Higher efficiency units (90-94% AFUE) sold/installed were 50% in 2008. In NWN Oregon, this percentage was at 53%. The percentage of units sold in this category in Cascade is only three percentage points lower than in NWN Oregon.

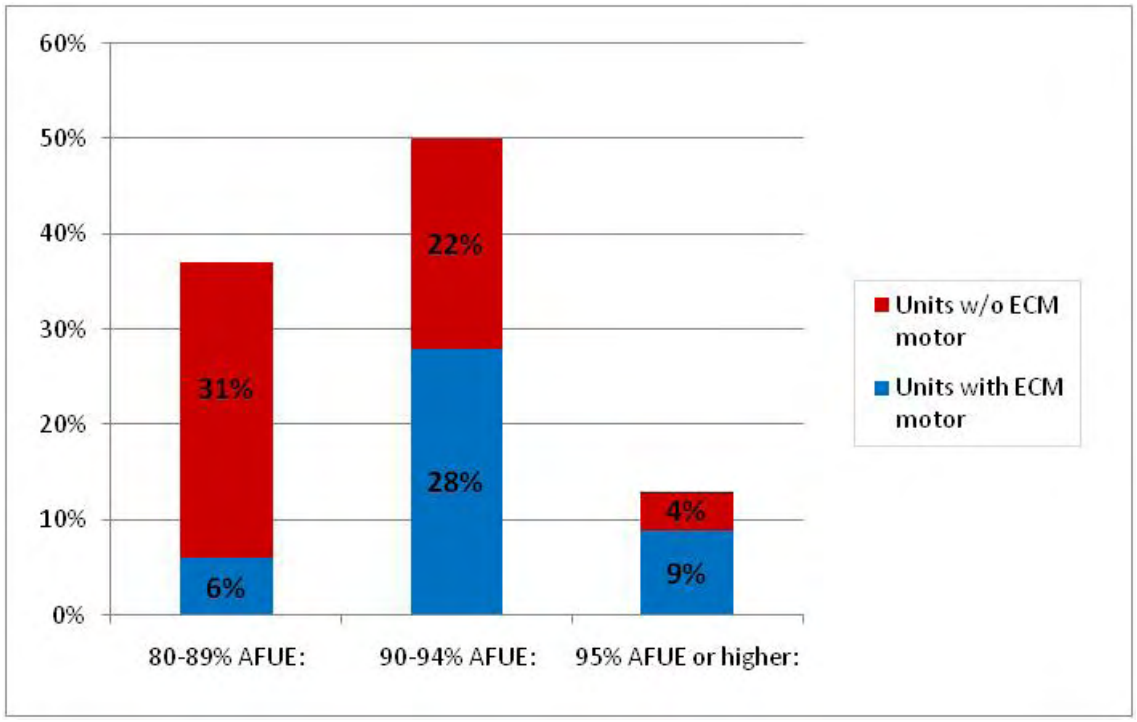
Finally, the percentage of 95% AFUE units were 13% of total sales in 2008. For NWN Oregon, this percentage was at 11%. Thus, Cascade very high efficiency furnace sales were two percentage points higher than those in NWN Oregon.

The data indicate that the two territories have fairly similar energy efficiency penetration rates. While incentives were available for both groups of customers, level of Energy Trust marketing of the program was much lower. Nevertheless, percentages tell only a part of the story, since the NWN Oregon market is an order of magnitude larger than the the market in Cascade area. Many respondents conducted business in both service territories. Therefore, it is possible their responses for Cascade sales might have been biased by their sales in NWN Oregon. Since the majority of their sales come from this area, they might be more familiar with these numbers.This is supported by the fact that when distributors were asked about

the efficiency level of the standard or typical unit that their contractors purchased, they have all stated that this number was the same in both areas.

The percentage of units sold with an ECM motor in Cascade service territory is fairly similar to percentages in NWN Oregon. The Oregon Residential Tax Credit might be responsible for this high level of units sold with ECM motors. Anecdotal evidence from a few of the interviewees suggests that they encourage people to purchase a high efficiency unit with an ECM motor, since this makes the temperature inside feel more "comfortable." Figure 10 shows the percentage of total market units in 2008 with and without an ECM motor.

Figure 10. Percentage of Weighted Average 2008 Units With and Without an ECM Motor*



**The sum of the percentages in each column add to the percentage in each category in* Table 8.

Source: Summit Blue interviews of furnace vendors in Cascade Natural service territory.

Standard Efficiency Marketed to Customers

The interviewees were also asked about the efficiency of the *standard or typical unit* they marketed to customers in 2008 and five years earlier, in 2004. With the exception of two respondents, the efficiency level of the standard unit marketed to customers increased from 80% to 90% from 2004 to 2008. One of the two outlier respondents saw the efficiency level of the standard unit marketed drop from 90% to 80-89% AFUE in the past five years. The other repondent remained at the 90% level for the past five years. *Respondents stated that the economic downturn, people losing their jobs, and more contractors competing for business is making the sales of higher efficiency units much harder.*

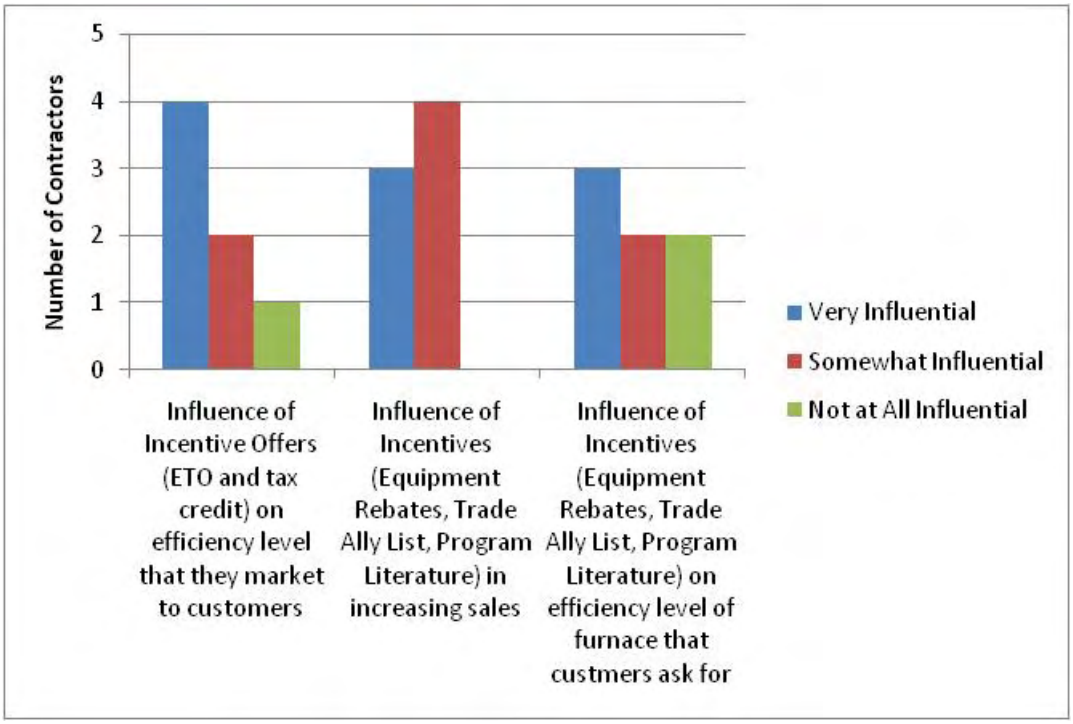
The variance in response by contractors regarding the level of change in sales of high efficiency units in the last five years (declined by 10% to increased by more than 10%) was significant. On average, sales appear to have increased by about 10% from 2004 to 2008. Distributors have seen about a 20% increase. From 2004-2006, sales remained fairly flat, and accelerated signifcantly in the last two years. While sales have slowed down in 2008, since a large percentage of the 80-89% AFUE units were installed in new

construction, with the housing market crash, these jobs have almost totally disappeared in 2008. However, the number of contractors performing replacement work increased, leading to a "drive to the bottom"; contractors are offering the cheapest price by selling the cheapest units in order to secure the job in the first place**.** *As in NWN Oregon service territory, contractors in the Cascade territory also see a larger number of old (20+ year old) furnaces being fixed. Since gas is more expensive in this area, secondary heating methods, like wood burning fireplaces or plug in electric heaters, duel fuel, and hybrid systems are more popular.*

Importance of Incentives

Contractors stated that they always inform their customers of the Energy Trust incentive, but they only sometimes inform their customers about the Oregon Residential Tax Credit; only when these customers are interested in purchasing high efficient units with ECM motors. Contractors were asked how influential the Incentive Offers (Energy Trust incentive and tax credit) have been on *the efficiency level they market to customers*; how influential incentives (including equipment rebates, Contractor Trade Ally List, and program literature) have been for increasing sales of high efficiency gas furnaces; and how influential incentives (including equipment rebates, Contractor Trade Ally List, and program literature) have been on the efficiency level of the standard furnace that customers ask for. Responses are shown in Figure 11.

Figure 11. Contractor Responses to Influence of Incentive Questions



Source: Summit Blue interviews of furnace vendors in Cascade Natural Gas service territory.

This group of contractors is more split on the importance of incentives than their counterparts in the NWN Oregon service territory, where nearly all respondents said Incentive Offers have been "Very Influential" in the efficiency level of the unit they market to customers and in increasing their sales of high efficiency units.

When Cascade respondents were probed further, one contractor said the incentives are not high enough, and thus, do not motivate people to make such a substantially larger investment in a high efficiency model. Another contractor stated that people are generally not knowledgeable about efficiency and he has to tell them why a high efficiency unit is better and what incentives are offered. Nevertheless, information provided by Energy Trust is extremely valuable for these efforts. Most contractors present three packages, one high, one medium, and one low (basic) in price and efficiency. But in this environment, they cannot ***push*** *the customers towards the high efficiency units, since they might lose the job to a lower bidder. However, incentives do help in persuading some people to get a higher efficiency unit.*

Next, the contractors were asked which factors had the most influence on their companies' marketing of high-efficiency furnaces. As Table 16 shows, out of the factors listed (Energy Trust incentive, tax credit, manufacturer's rebate or information, distributors, customer demand, or other), two contractors named customer demand, one named Energy Trust incentive, one named all as equally important, one named the media, and another named cost as most influential. Only two out of seven respondents believed that Energy Trust incentive is the one of the most influential factors in increasing high efficiency gas furnace sales. In NWN Oregon area, it is five out of seven respondents who believe the same.

Table 16. Number of Contractors Stating a Particular Factor the Most Influential in Increasing High Efficiency Gas Furnace Sales

Factors	Number of respondents
Energy Trust incentive	1
Oregon Residential Tax Credit	0
Both incentives are equally important	0
Customer demand	2
Manufacturer rebate/information	0
Distributors	0
All are equally important	1
Media	1
Cost	1
Don't know	1

Source: Summit Blue interviews of furnace vendors in Cascade Natural service territory.

Contractors and distributors were asked to pick which of the two incentives (Energy Trust or tax credit) are more influential in increasing high efficiency furnace sales. The **distributors** stated that both incentives are equally influential. Specifically, ***they cannot distinguish necessarily which program is driving the increase in high efficiency units, since it is the combined total that makes high efficiency units more attractive to customers.*** However, **contractors** ***were more split on this question***. Two said the Energy Trust incentive is more influential, two said both are equally influential, two stated none are influential, and one said he/she does not know. This also differs from respondents in NWN Oregon territory, where all respondents said both incentives are equally important.

Customers Asking About High-Efficiency Units and Receiving Incentives

Overall, 68% of customers received an Energy Trust incentive, and only 7% received a tax credit, as seen in Table 17. In NWN Oregon, these numbers are 47% and 45%, respectively. While the number of Energy Trust incentive recipients is 20% higher in Cascade, the number of tax credit recipients is nearly 40% lower. This could indicate that the customers purchasing higher efficiency units in Cascade do not want to spend more money on an ECM motor (one of the main differences between the incentive and the tax credit), but still takes advantage of the Energy Trust customer incentive by purchasing a 90% or higher efficiency unit. Other factors that could lead to a lower percent of tax credit application might be that customers in the Cascade territory might have a lower tax filing knowledge than customers in NWN territory. Tax rebates are applicable to customers that have a yearly tax burden. Perhaps customers in the Cascade area have lower incomes or are retired, with no tax burden. There are also many vacation homes in the Bend area, which may be owned by out-of-state residents or landlords, thus they cannot take advantage of the incentives.

Nearly half of respondents' customers (48%) ask about high efficiency units. Contractors credit this to overall "green marketing" and frequent discussions about energy efficiency in the media. *Energy Trust is identified as a great source of information on energy efficient appliances, providing a list of trade allies, the incentive, and also identifying all other incentives and rebates that are available. Energy Star is also credited with advertising high efficiency units.* Nevertheless, this is a substantially lower number than in the NWN Oregon service territory (71%). **Since all other factors are fairly constant across these two groups, the lower awareness of high efficiency products in Cascade seems like a clear effect of the lower level of Energy Trust marketing in this territory.**

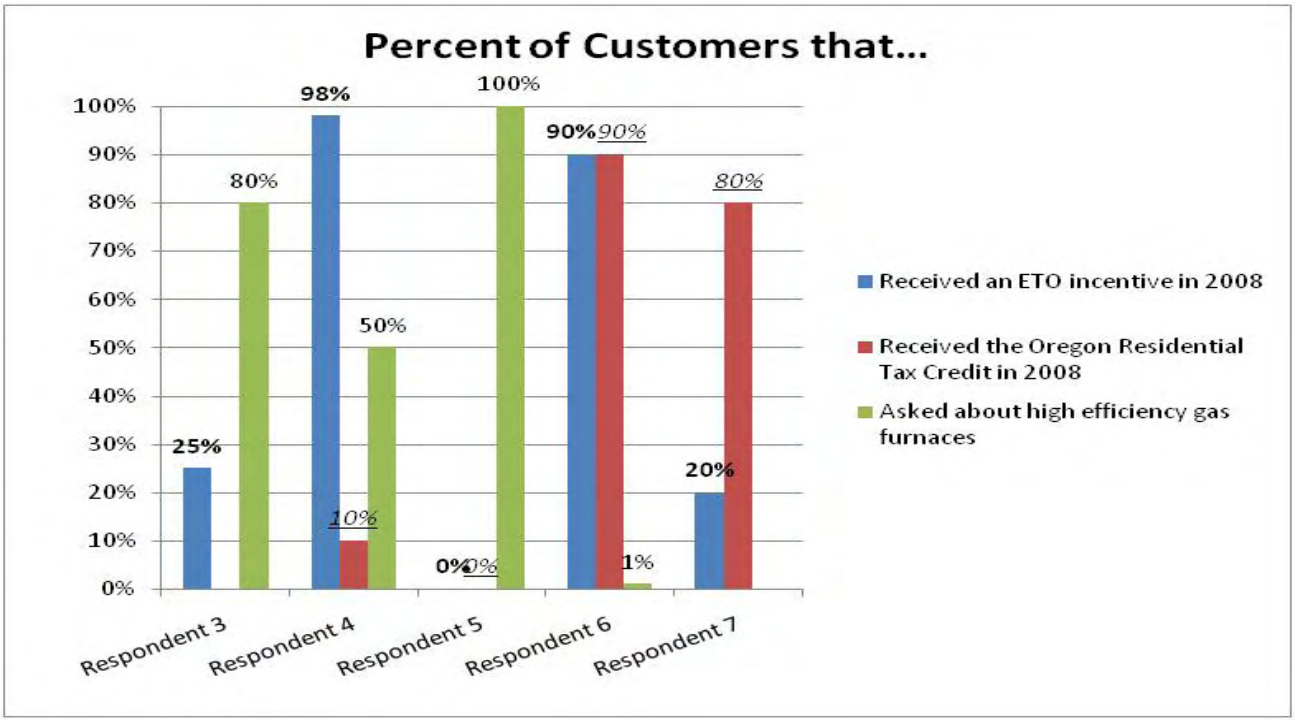
Table 17. Weighted Average Percentage of Units Sold in 2008 in Each Efficiency Category

Question	Weighted Average Response
Percent of customers receiving an Energy Trust incentive in 2008:	68%
Percent of customer receiving the tax credit in 2008:	7%
Percent of customers asking about high-efficiency furnaces:	48%

Source: Summit Blue interviews of furnace vendors in Cascade Natural service territory.

Figure 12 shows the responses by interviewee. Respondents One and Two did not know any of these numbers, and hence are not shown on this graph. Respondent Three did not know what percent of his/her customers received the Oregon Residential Tax Credit and Respondent Seven did not know what percent of his/her customers asked about high efficiency gas furnaces.

Figure 12. Percent of Customers that Received an Energy Trust Incentive / Tax Credit and Asked about High Efficiency Gas Furnaces



Source: Summit Blue interviews of furnace vendors in Cascade Natural service territory.

Sales Expectations for 2009

When asked about what furnace customers would have purchased had the incentives not been available, three respondents said they would have selected a lot less efficient furnace, and three others said that they would have selected the same exact furnace. One person did not know. As with the questions regarding the influence of the incentives, contractors are also split on what would happen in absence of the incentives. In NWN Oregon, nearly all respondents said their customers would have chosen a lot less efficient furnace if the incentives would not have been available.

Contractors in this area are not very optimistic about sales in the coming year. In the past, people were more interested in efficiency, but at this time, cost seems very important for people purchasing a furnace. As one contractor put it: "People are most interested in the bottom price and they just want to get a heating system cheap. Unemployment is 9%, so it is difficult to say now: layoffs, etc. Every year is different; right now it is bad." Perhaps the Energy Trust should consider offering some kind of financing program through savings; therefore, customers would not need to invest so much money up front.

Summary

This analysis is based on a sample of contractors and distributors who conduct business in Cascade Natural Gas territory in Central and Eastern Oregon. Questions were asked to identify changes in high efficiency unit sales in the past five years and also to differentiate between high efficiency furnace sales in the two areas. The two-fold purpose of this memo is: 1) to provide a baseline for NWN Oregon absent of Energy Trust program based on responses for Cascade Natural service territory (comparison group) and 2) to help the Energy Trust decide whether or not to continue efficient gas furnace replacement rebates in this area.

Overall, there has been a large number of high efficiency furnaces sold (more than 1,100 out of 1,800) in the Cascade gas service territory of Oregon in 2008. Interviewees in the NWN Oregon survey effort sold nearly 8,000 high efficiency furnaces (out of nearly 12,500). Since 2004, Cascade respondents state that the average unit that they market to customers has gone up to 90% and overall sales of high efficiency units have increased by at least 10%. Whereas in NWN Oregon service territory, there has been a decrease in the number of units sold throughout 2008, yet the standard unit that these respondents market to customers remained the same, at 95%, and they plan to continue marketing this efficiency category in 2009.

Nevertheless, the percentage of units sold in each efficiency category is fairly similar between the two areas, and in the case of 95% efficiency units, it is even higher in the Cascade area than in the NWN Oregon territory. However, these results should be taken with caution, and the order of magnitude difference in market size should also be taken into account, since in NWN Oregon, the average contractor sells hundreds of furnaces annually, while in Cascade service territory, the average sales are in the tens.

Key Difference Between the Two Territories

Cascade service territory is very rural and there are large territories outside of town where natural gas service is not available. Because economically this is a harder hit area, people are looking to reduce their utility bills. Gas is more expensive than electricity in some of these areas, and when it comes to replacing their furnaces; some people just chose electric heaters. There are not as many furnace installations as in a highly populated territory, like Portland. Perhaps this lower volume of sales makes incentives "more expensive" case by case than in other areas for Energy Trust.

While contractors in NWN Oregon unanimously state that incentives (both Energy Trust and tax credit) have been very influential in driving high efficiency sales, contractors in Cascade service territory are split on the level of influence. The two contractors selling the highest number of total units (250 and 100 each) with more than 50% of these being high efficiency, have said that incentives have been somewhat influential in increasing their sales of high efficiency furnaces. *It seems that smaller contractors are in greater need of the incentive to sell more high efficiency units, while larger contractors are less in need*. Perhaps this is because larger contractors have more experienced salesmen and have a more refined marketing strategy. Furthermore, they may also be able to offer a lower price based on volume and experience.

While 71% of customers in NWN Oregon ask about high efficiency furnaces, an even higher 84% of customers do the same in NWN Clark County. This indicates that while Energy Trust's program has an important role in educating customers about high efficiency units, a higher level of awareness was achieved in an area where Energy Trust marketing was not as predominant.

This survey effort led to three main observations for establishing a baseline for NWN gas service territory. While each observation can be counterbalanced, when taken together, it can be concluded that in a region where the program has not been as extensively marketed (Cascade Natural Gas), the penetration of high efficiency furnaces is similar to a region where Energy Trust had extensive marketing of the program (NWN Oregon). One caveat regarding these results: while with more or less marketing, customers in both of these territories **had** incentives available. Therefore, the independent variable in this comparison was either marketing or lack thereof. With certainty, it can only be stated that strong Energy Trust marketing was not particularly influential in increasing high efficiency furnace sales. It did increase awareness of high efficiency furnaces though.

While the Energy Trust incentive is certainly a factor in people purchasing a high efficiency unit rather than a standard unit, there could be significant free-ridership, people who would have purchased the high

efficiency furnace even without the incentives. The influence of Energy Trust incentives in the Cascade Natural Gas service territory is not as clear cut as it was in the NWN Oregon gas service territory. Energy Trust incentives certainly help at least somewhat in increasing high efficiency furnace sales, as was stated by all respondents. But, in order to determine whether this level is acceptable to Energy Trust, Energy Trust should look at the number of incentives that were provided through the program (order of magnitude) in the past years and determine whether providing these incentives is worth the time, effort, and money from a business perspective.

Although questions regarding heat pumps were not asked in the Cascade Natural Gas service territory survey, anecdotal evidence from contractors identifies that there is a higher number of heat pumps being installed in this area based on the facts stated above. Therefore, Energy Trust is encouraged to evaluate providing incentives for heat pumps in this territory.

Supporting Tables

Table 18. Percentage of Units Sold / Installed in the AFUE Category

Respondent	Total # of units sold in 2008	Percentage of units in each category				Percentage of units in each category with an ECM motor			
		Less than 80%	*80-89% AFUE*	*90-94% AFUE*	*95% AFUE or higher*	*Less than 80%*	*80-89% AFUE*	*90-94% AFUE*	*95% AFUE or higher*
1	7	0%	60%	20%	20%	0%	?	?	?
2	20	0%	50%	30%	20%	0%	?	?	?
3	250	0%	50%	20%	30%	0%	30%	90%	90%
4	100	0%	45%	50%	5%	0%	0%	5%	5%
5	5	0%	80%	20%	0%	0%	0%	40%	40%
6	20	0%	10%	90%	0%	0%	0%	50%	50%
7	?	10%	0%	45%	45%	0%	0%	0%	100%
8	400	0%	30%	70%	0%	0%	15%	15%	0%
9	1000	0%	35%	50%	15%	0%	15%	70%	100%
Average		**1%**	**40%**	**44%**	**15%**	**0%**	**9%**	**39%**	**55%**
Weighted Average*		**0%**	**37%**	**50%**	**13%**	**0%**	**16%**	**56%**	**70%**

Source: Summit Blue interviews of furnace vendors in Cascade Natural Gas service territory.
Note: numbers for ECM motors are percentages of the percentage of units in that AFUE category.
**Since the number of total units sold in 2008 was not provided by Respondent Seven, his/her responses are excluded from the weighted average.*

Appendix A.3 Clark County, Washington Vendor Interviews[25]

Prior to and during this survey effort, the Team was under the impression that incentives for high efficiency natural gas furnaces were not offered in the Northwest Natural Gas- Clark County service area. However, toward the end of the study, the Team was made aware of the fact that incentives are available in the NWN Clark County area. This section on interviews in Clark County was written prior to the Team's knowledge of incentives in Clark County. Based on this knowledge, Clark County does not provide an ideal baseline for this study.

The Team interviewed a number of contractors and distributors from these areas in an attempt to establish a baseline for high efficiency furnace sales, i.e., where the market would have been without Energy Trust intervention. This memo presents a summary of responses from contractors and distributors who sell/install furnaces in both the Northwest Natural Gas service territories: in Clark County and in Oregon, providing insight into high efficiency gas furnace sales in both areas. The purpose of this effort is two-fold:

- Using Clark County as a control region to help inform where the furnace market would be in NWN Oregon absent a program; and

- To provide information about the penetration of high efficiency furnaces in the furnace market in Clark County to help inform program design if Energy Trust were to provide services to NWN customers in Washington (Clark County).

During the interview process, some respondents provided anecdotal comments, which are discussed in italics. Throughout this document, the abbreviations "NWN Clark County" and "NWN Oregon" refer to results/responses unique to these respective areas.

Survey Respondents' Background and Distribution

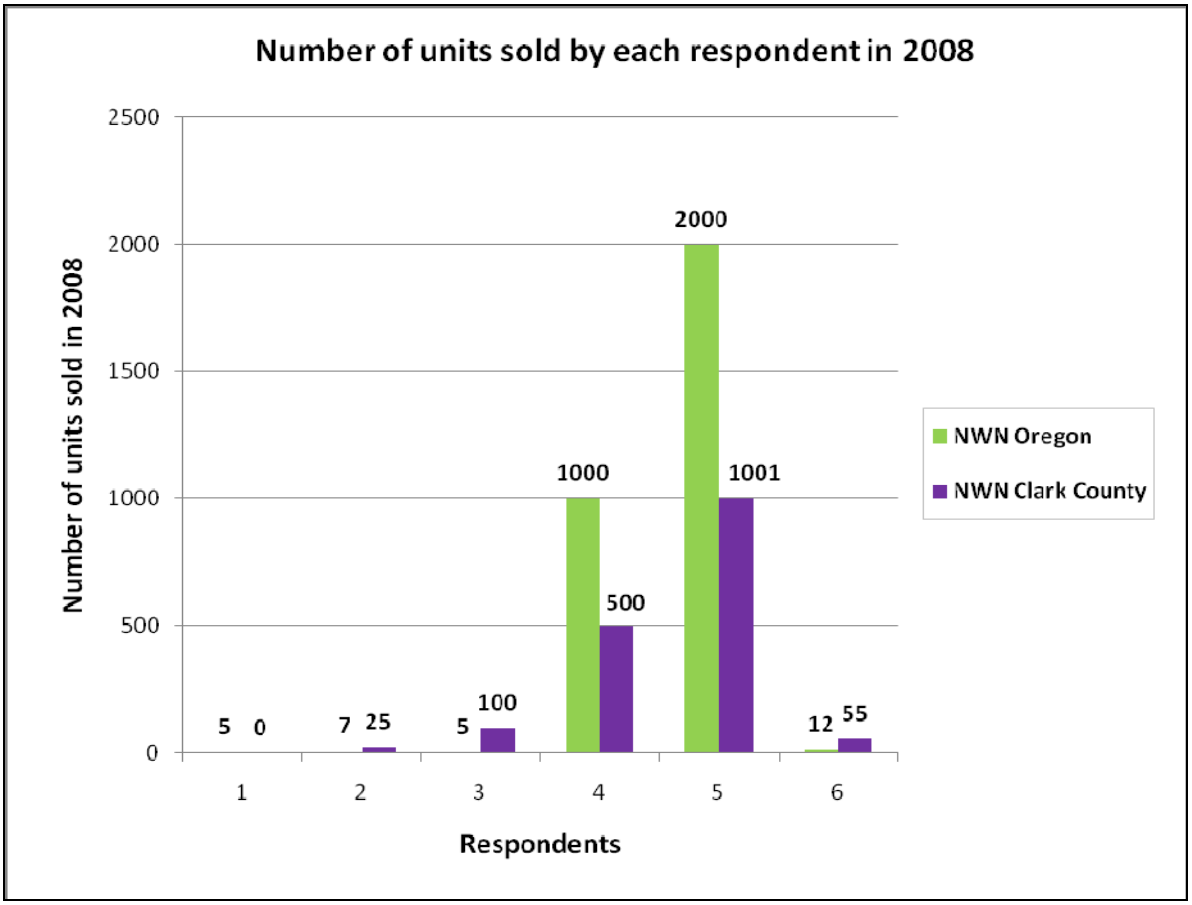
The Team conducted six interviews with three contractors and three distributors in the NWN service territory of Clark County, Washington. Some of the respondents (contractors) have been at their current positions for five years, while others (distributors) have been at their positions for a few decades. All respondents are in managerial positions (usually sales managers). All contractors and distributors sell/install units in NWN's Oregon and Clark County service territories. The distributors are usually regional managers for larger territories (entire Oregon and/or Washington State); thus, they have provided a basis of comparison between the two areas discussed in this analysis.

All of the contractors sampled are "small" relative to contractors in the Portland area, but are average relative to NWN Clark County contractors. The majority of installations for some contractors took place in NWN Clark County, but since they also install some units in Oregon, they are able to compare their

[25] The interviews in Clark County, Washington were conducted in part to help the team estimate a baseline for Oregon. At the start of the project, the Team was under the assumption that no incentives were given in Clark County. However, due to the knowledge that Northwest Natural Gas does provide incentives to customers in Clark County gained toward the end of the project, the Team used the results from these interviews in combination with national data.

projects/experiences in the two areas. The top two distributors interviewed conducted the majority (two-thirds) in NWN Oregon. Therefore, the survey respondents form a representative sample of both the NWN Clark County gas furnace market and the NWN Oregon market. In total, the respondents represent nearly 1,700 furnaces sold or installed in NWN Clark County and more than 3,000 furnaces sold or installed in NWN Oregon in 2008. See Figure 13 for division of contractors and distributors by *units*[26] sold/installed in 2008 in Clark County and in Oregon.

Figure 13. Distribution of Interviewees in Energy Trust Serviced Areas by Units Sold (NWN Oregon/Clark County)



Source: Summit Blue interviews of furnace vendors in Clark County, Washington service territory.

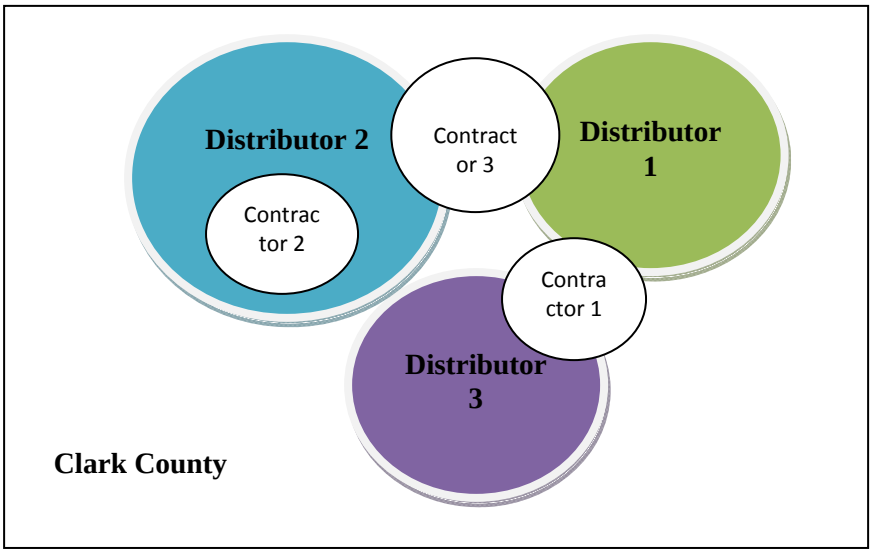
Number of Units in Each Efficiency Category and with an ECM Motor

Each interviewee was asked about the percentage of units sold in four different AFUE categories, and also about the percentage of units *in each category* that were sold with an ECM motor. Since Oregon and Washington State building codes do not allow units less than 80% AFUE to be installed in the state of Oregon and Washington, none of the interviewees reported selling or installing these units.

[26] The term *unit* in this analysis refers to all gas furnaces (standard and high efficiency) sold/installed by a particular contractor/distributor in 2008.

Table 19 shows a summary of the responses, weighted and unweighted by the total number of units sold by the respondent. While weighting the responses provides a more accurate representation of the market, the large sales volume of distributrors skew the weighted averages. However, since many of the contractor units likely came from the same distributors the Team interviewed, this effect is negated (see Figure 14). Therefore, un-weighted numbers are presented as a reference, but in the discussion, weighted numbers are noted. Since sales numbers for 2004 were unavailable, the same weights were used as in 2008.

Figure 14 Distribution Channels



Source: Summit Blue interviews of furnace vendors in Clark County, Washington service territory.

Table 19. Weighted and Un-weighted Average Percentage of Units Sold in 2004 and in 2008 in Each Efficiency Category in NWN Clark County

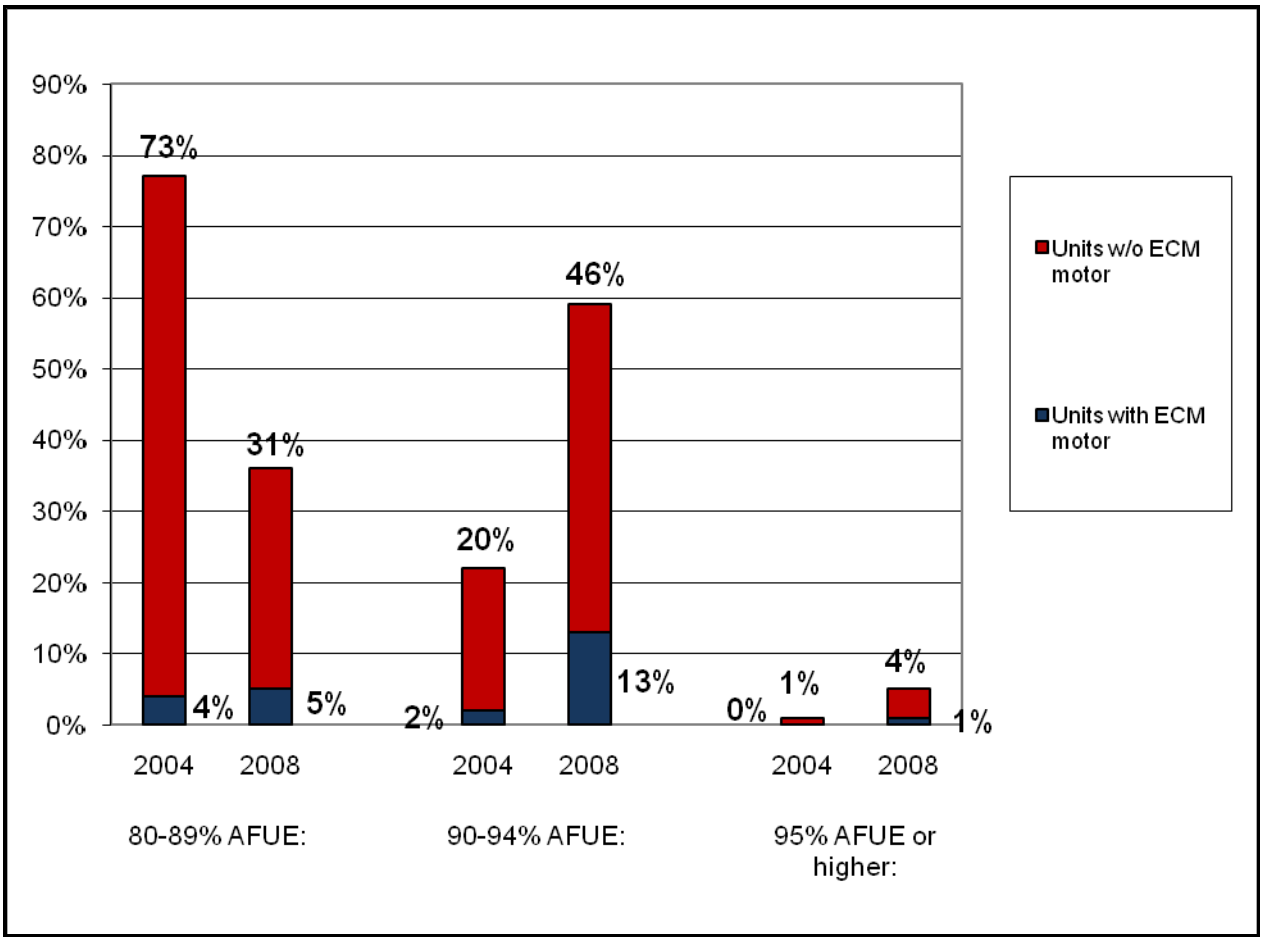
	2004		2008	
Efficiency Category	**Percentage of Total Units**		***Percentage of Total Units***	
Weighted/ Un-weighted Averages	***Un-weighted***	***Weighted***	***Un-weighted***	***Weighted***
80-89% AFUE:	62%	77%	36%	36%
90-94% AFUE:	30%	22%	52%	59%
95% AFUE or higher:	8%	1%	12%	5%

**The percentages of units sold with an ECM motor are shown in Table 4 and 5 of the Appendix.*

Source: Summit Blue interviews of furnace vendors in NWN Clark County service territory.

Figure 15 shows the percentage of total market units in 2008 sold/installed with and without an ECM motor in NWN Clark County service territory. Both the increase in the sale of high efficiency units and the great jump in number of units sold with ECM motors is substantial.

Figure 15. Percentage of Total 2004 and 2008 Units With and Without an ECM Motor in NWN Clark County*



**The sum of the percentages in each column add to the percentage in each category in* Table 11.*

Source: Summit Blue interviews of furnace vendors in NWN Clark County service territory.

While in 2004 the weighted average percentage of units in the 80-89% AFUE category was 77% of total sales, by 2008, this decreased substantially to 36% in 2008. Higher efficiency units (90-94% AFUE) sold/installed increased from 22% in 2004 to around 59% of total sales in 2008. In NWN Oregon, this percentage for 2008 was at 53%. The percentage of units sold in this category in NWN Clark County is 6% higher than in NWN Oregon. Finally, the percentage of 95% AFUE units increased from 1% of total sales in 2004 to around 5% in 2008. For NWN Oregon, this percentage for 2008 is at 11%.

The data indicates that the two territories have achieved similar energy efficiency penetration rates. While Energy Trust offered incentives for NWN customers living in Oregon, incentives were not available for NWN customers living in Clark County, WA. Nevertheless, percentages tell only part of the story, since the NWN Oregon market is an order of magnitude larger than the NWN Clark County area. It is important to elucidate that all respondents conducted business in both service territories.Their responses for NWN Clark County sales might have been biased by their sales in NWN Oregon. Since the majority of their sales come from this area, they might be more familiar with these numbers. This is supported by the fact that when distributors were asked about the efficiency level of the standard or typical unit that their contractors purchased, they have all stated that this number was the same in both areas.

It should be also stated that the percentage of units sold with an ECM motor in NWN Clark County is substantially below NWN Oregon levels; 20% below for the 90-94% efficiency category, and 40% below the 95% of higher efficiency category. Thus, from 2004 to 2008, while sales of units with ECM motors remained low in Clark County in the absence of the tax credit, sales of high efficiency units increased sharply even though Energy Trust incentives were not available. Therefore, the Residential Energy Tax Credit seems to have a greater influence than the Energy Trust incentive.

The Team re-surveyed distributors in order to verify the breakdown of units sold in Oregon and Clark County. Distributors were asked to provide exact sales numbers for 2008. Two of the respondents have been surveyed previously, the third respondent has not. Table 20 lists these responses. The volume of sales varies between distributors from small to large. In all three cases, a larger percentage of units sold were high efficiency in Oregon than in Clark County; however, the percentage of units sold in the two efficiency categories (low and high efficiency) is highly variable.

- One distributor has nearly 50/50 split between the efficiency categories and between Clark County and Oregon.
- Another distributor has a 50/50 sales distribution in Clark County, with a 20 low/80 high distribution in Oregon.
- Finally, the third and highest volume distributor is highly weighted to high efficiency sales, with about a 15/85 distribution both in Oregon and in Clark County.

Table 20. Distributor Exact Sales Breakdown for 2008

Respondents	Percentages	Clark County	%	Oregon	%
Respondent 1	AFUE 80-89%	11	52%	2	40%
	AFUE 90+%	10	48%	3	60%
Respondent 2	AFUE 80-89%	137	45%	132	18%
	AFUE 90+%	168	55%	583	82%
Respondent 3	AFUE 80-89%	200	17%	250	11%
	AFUE 90+%	1000	83%	2000	89%

Source: Summit Blue interviews of furnace vendors in Clark County, Washington service territory.

As for the distinction between new construction and retrofit work, one distributor stated that none of the units (neither standard nor high efficiency) went into new construction in either Clark County or in Oregon. Another distributor stated that 90% of lower efficiency units (<=89 AFUE) went into new construction in Clark County, while 95% in Oregon. For 90+ AFUE units, 0% went into new construction for Clark County and 5% for Oregon. The third distributor did not provide this information. While this information is also inconsistent it appears that *lower efficiency units are primarily installed in new construction, while high efficiency units are mostly installed in retrofit work.*

Standard Efficiency Marketed to Customers

The interviewees were also asked about the efficiency of the *standard or typical unit* they marketed to customers in 2004 and in 2008. With the exception of one respondent, the efficiency level of the standard

unit marketed to customers remained the same, at around 91%. The efficiency level of the standard unit marketed by the outlier respondent changed from 80-89% AFUE in 2004 to 90-94% AFUE in 2008. However, the lack of change in the efficiency level of the standard unit does not indicate that the baseline has not changed, since while contractors might have marketed high efficiency units to their customers for many years, the unit the customers purchased in the end might have been a lower efficiency unit. This reasoning seems supported by the increase in the proportion of units sold in the higher efficiency categories described above. Most contractors note that the high efficiency market has gone up by about 10-30% in the past five years in Clark County, but distributors state that it has gone down by about 10-20%. A contractor and a distributor claim that there has not been any changes. Only distributors were asked about changes in sales in NWN Oregon territory. Two of them stated that there have been no changes, and one said there has been a 20% decrease in sales of high efficiency gas furnaces.

One distributor explains the decrease in high efficiency and total furnace sales he has experienced by lack of drivers (i.e., incentives) in Clark County. Since the market there is more price-driven, the energy savings vs. price of gas calculations that people make have moved the market towards heat pumps. For part of 2007, tax credits from the federal government were drivers for installing high efficiency gas furnaces (or heat pumps?). A portion of high efficiency gas furnace sales in 2008 were also boosted by these federal incentives. "Now these incentives are back for 2009; so we'll see what happens."

Importance of Incentives

Since incentives are not available in Clark County, respondents were asked to discuss their experience with the Energy Trust incentive in Oregon. When asked how influential the Energy Trust incentive has been on the efficiency level of the standard furnace that they market to customers, all but one respondent replied "Very Influential." The outlier respondent said "Somewhat Influential." *One distributor said that if incentives are reduced in NWN Oregon, it will drive sales to entry level [i.e., standard efficiency] equipment. A contractor agreed, saying that with incentives, the cost differential is closer between standard and high efficiency units, and he could not sell high efficiency units without them.* The responses were the same for the question, "How influential would Energy Trust incentives be if they were offered in Clark County?" This indicates that while efficiency levels in NWN Washington are comparable to NWN Oregon levels, respondents still believe that more high efficiency units could be sold if incentives were available.

Customers Asking About High-Efficiency Units and Receiving Incentives

Overall, 94% of customers asked about high efficiency units in Oregon, while 84% do the same in Clark County, as seen in Table 21. *One distributor said that typically customers in Oregon are as knowledgeable as the salesmen are regarding energy efficiency and this is in large part due to Energy Trust education, and because the program is easy to use and access.* Contractors credit the high awareness in Oregon to overall "green marketing" and frequent discussions about energy efficiency in the media. These factors should affect awareness equally in Clark County because southwest Washington shares its media market with Oregon. Therefore, Energy Trust's incentive program is making a difference in the level of awareness in both Oregon and in Clark County, WA.

Table 21. Weighted Average Percentage of Customers Asking About High-Efficiency Furnaces

Question	Average Response for NWN Oregon	Average Response for NWN Clark County
Percent of customers asking about high-efficiency furnaces:	94%	84%

Source: Summit Blue interviews of furnace vendors in NWN Clark County service territory.

Sales Expectations for 2009

While contractors and distributors were not asked about their high efficiency sales expectations for 2009, they have noted that in the current economic downturn, incentives are even more important for selling high efficiency units.

When asked, for those customers that received an incentive in Oregon, what furnace would they have selected had the incentives not been available, two contractors said the "same exact furnace," and one said "lot less efficient furnace." When asked what their customers in Clark County would select if incentives would be available, all three contractors said, "a high efficiency furnace." *One contractor said, if there were more rebates in Clark County, there would be more remodeling, and these customers would also want high efficiency units.*

Summary

This analysis is based on a sample of small to medium contractors and medium to large distributors who do business in Oregon and Clark County of NWN. Questions were asked to identify changes in high efficiency unit sales from a temporal perspective (changes in 2004-2008) and also to differentiate between high efficiency furnace sales in the two areas. The two-fold purpose of this memo is: 1) to provide a baseline for NWN Oregon absent of Energy Trust program based on responses for Clark County (control group), and 2) to help inform a potential Energy Trust program extension into Clark County.

This survey effort led to four main observations for establishing a baseline for NWN gas service territory. While there is evidence pointing towards the conclusion that in absence of Energy Trust incentive, the baseline in Oregon would have been fairly close to current levels of high efficiency furnaces, some confounding variables reduce the strength of this conclusion.

- All three contractors stated that customer demand had the most influence on his/her company's marketing of high efficiency furnaces in Clark County.

Since there are no incentive or education programs available in Washington, this might indicate that even without the incentives, customers would ask for high efficiency units (perhaps because of green media and marketing). Further indication for this reasoning is that two of the three contractors stated that had the incentives not been available, their customers in NWN Oregon would have chosen the same exact gas furnace. Furthermore, while 94% of customers in NWN Oregon ask about high efficiency furnaces, an also very high 84% of customers do the same in NWN Clark County. This indicates that while Energy Trust's program has an important role in educating customers about high efficiency units, the same level of awareness could have been achieved in absence of the incentive. On the other hand, Clark County shares media, vendors, and distributors with Northern Oregon. Thus, Energy Trust might have a substantial effect on customers in another state and might have induced the increase in high efficiency unit sales through its education component. Because of these confounding variables, the use of Clark County as a control group leaves some questions behind.

- From 2004 to 2008, the efficiency level of the standard unit marketed to customers has also remained the same for these contractors, at an already high level of 91%.

Again, this number should be taken with caution, since conflicting evidence surfaces from respondents from Cascade service territory and those contractors that were surveyed for the NWN Oregon memo. They have stated that back in 2004, the average unit that they marketed was in the 80% efficiency category. This was specifically due to the boom in new construction around this time. This high number might also be due to social desirability bias.

Overall, there have been more than 1000 high efficiency furnaces sold (out of 1,700 total) in the NWN Clark County gas service territory in 2008 by the interviewees. These same interviewees sold over 2000 high efficiency units (out of 3000) in NWN Oregon area. The percentage of total units sold that are high efficiency have increased significantly over the past five years, along with an increase in the number of units sold with an ECM motor. The percentage of units sold in each efficiency category is fairly similar, and in the case of 90-94% efficiency units, it is even higher than in the NWN Oregon territory. This is an interesting finding, since Oregon already has had the Energy Trust incentive program in place for a few years now, however, Washington has not. The order of magnitude in market size should also be taken into account, since in NWN Oregon, the average contractor sells hundreds of furnaces annually, while in NWN Clark County, average sales are in the tens. The percentage of units sold with an ECM motor is substantially smaller in NWN Clark County than in NWN Oregon; probably due to the absence of the tax credit. However, the same cannot be said for high efficiency units in general. While there were no incentives available in Clark County for high efficiency units, sales of these units increased nearly at the same rate as in NWN Oregon. Again, Energy Trust's marketing and education was probably partially responsible for this increase in Clark County.

- In sum, these last two findings provide the strongest evidence in the argument: without the Energy Trust incentive, the percentage of furnaces sold in each efficiency category is almost identical in the two areas. If the strong positive effect of the Oregon Residential Tax Credit is taken into consideration, the influence of the Energy Trust incentive is reduced even further. Energy Trust education and marketing efforts have most likely had an influence on the increase in sales of high efficiency furnaces in Clark County. However, this finding might indicate that the Energy Trust incentive was not as important as the marketing and education component in increasing high efficiency furnace sales. Since the effects of the marketing and education component and the incentives cannot be separated, a strong conclusion cannot be made.

In Clark County, Washington, there are no tax credits similar to Oregon, and it is the utilities that offer incentives (usually a few hundred dollars for high efficiency furnaces). Contractors stated that any incentive would be beneficial in increasing sales of high efficient furnaces, since at this time, there are no other offers available. Energy Trust should evaluate the potential number of incentives that could be provided through the program (order of magnitude) and determine whether providing these incentives is worth the time, effort, and money from a business perspective.

Supporting Tables

Table 22. Percentage of Units in the AFUE Category in 2004

2004									
Respondent	**Total # of units sold in 2008**	**Percentage of units in each category**				**Percentage of units in each category with an ECM motor**			
		Less than 80%	***80-89% AFUE***	***90-94% AFUE***	***95% AFUE or higher***	***Less than 80%***	***80-89% AFUE***	***90-94% AFUE***	***95% AFUE or higher***
1		?	?	?	?	?	?	?	?
2		0%	30%	55%	15%	0%	0%	30%	30%
3		0%	60%	40%	0%	0%	40%	40%	0%
4		0%	100%	0%	0%	0%	0%	0%	0%
5		0%	70%	30%	0%	0%	5%	5%	0%
6		0%	50%	25%	25%	0%	0%	100%	100%
Average		**0%**	**62%**	**30%**	**8%**	**0%**	**9%**	**35%**	**26%**
Weighted Average		**0%**	**77%**	**22%**	**1%**	**0%**	**5%**	**9%**	**4%**

Note: Numbers for ECM motors are percentages of the percentage of units in that AFUE category.
Source: Summit Blue interviews of furnace vendors in Clark County, Washington service territory.

Table 23. Percentage of Units in the AFUE Category in 2008

2008									
Respondent	**Total # of units sold in 2008**	**Percentage of units in each category**				**Percentage of units in each category with an ECM motor**			
		Less than 80%	***80-89% AFUE***	***90-94% AFUE***	***95% AFUE or higher***	***Less than 80%***	***80-89% AFUE***	***90-94% AFUE***	***95% AFUE or higher***
1	0	?	?	?	?	?	?	?	?
2	25	0%	30%	55%	15%	0%	0%	30%	30%
3	100	0%	20%	70%	10%	0%	10%	60%	100%
4	500	0%	50%	40%	10%	0%	20%	20%	20%
5	1001	0%	30%	70%	0%	0%	15%	15%	0%
6	55	0%	50%	25%	25%	0%	0%	100%	100%
Average	**1,681**	**0%**	**36%**	**52%**	**12%**	**0%**	**9%**	**45%**	**50%**
Weighted Average		**0%**	**36%**	**59%**	**5%**	**0%**	**15%**	**22%**	**16%**

Note: Numbers for ECM motors are percentages of the percentage of units in that AFUE.
Source: Summit Blue interviews of furnace vendors in Clark County, Washington service territory.

APPENDIX B: LIST OF INTERVIEWEES

Cascade:

- Quality Heating
- Air Tech Heating, Air Conditioning & Refrigeration
- Morgan Heating
- Ponderosa Heating & Cooling
- Central Oregon Heating & Cooling, Inc.
- Redmond Heating & Renewables LLC
- PCS Mechanical
- Mar-Hy Distributors
- Gensco

Clark County:

- All Seasons Heating and Cooling Inc
- Trac Construction Company LLC
- Tri-Tech Heating
- Gensco
- Mar-Hy Distributors
- Entek Corporation

NWN Oregon:

- Gagle's Heating
- Sunset Heating & Cooling
- Mike's Heating and Air Conditioning
- Tri-County Temp Control
- Comfort Solutions
- Neil Kelly Company
- Service Now Inc
- Gensco
- Mar-Hy Distributors