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July 1, 2014

Via Electronic Mail
Oregon Public Utility Commission
Attn: Filing Center
3930 Fairview Industrial Drive SE
PO Box 1088
Salem, Oregon 97308

Re: UM 1622: Report to Commission Staff regarding to Energy Trust of Oregon Request for Approval of Exceptions to Cost-Effectiveness Guidelines

Attached to this letter and certificate of service, please find Energy Trust's Report to Commission Staff, filed pursuant to Order No. 13-256 in Docket No. UM 1622. The attached report is titled "Cost-Effectiveness Review for Specific Gas Measures and Programs."

Thank you for your assistance with respect to this filing. If you have any questions, please do not hesitate to contact me.

Debbie Menashe
General Counsel
503 445 7608
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cc: UM 1622 Service List

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I have this day served the foregoing Report to Commission Staff upon all parties in this proceeding by causing a copy to be sent via electronic mail to the following parties at the following addresses.

Dated at Portland, Oregon, this 1st day of July, 2014

Debbie Goldberg Menashe, OSB No. 89050

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Cost-Effectiveness Review for Specific Gas Measures and Programs

July 1, 2014

PURPOSE & INTRODUCTION

Energy Trust of Oregon submits this filing in response to the Oregon Public Utility Commission (OPUC) Order 13-256 in UM 1622, dated July 2, 2013, which granted Energy Trust an exception to current cost-effectiveness guidelines for all gas efficiency measures and programs through October 18, 2014. The order directed Energy Trust to provide an analysis of the estimated benefit/cost ratios (BCRs), viewed from a utility and societal perspective[1], for those gas measures and programs that are not cost effective or are close to not being cost effective, and to propose gas measures and programs to continue and discontinue based on criteria established in Order 94-590 in UM 551. Order 13-256 also directs Energy Trust, beginning July 2013, to attempt to make gas programs as cost effective as possible, and to develop a plan to modify or eliminate measures that are not cost effective, are not likely to be cost effective in the future and do not meet specific exceptions criteria established in Order 94-590. It also directed Energy Trust to submit a report to Commission staff by July 1, 2014, and identified requirements for the report scope and contents.

This report provides the following information as directed in Order 13-256:

1. Lists steps to make Energy Trust gas programs as cost effective as possible, steps already undertaken and plans to modify or eliminate measures that are: a) not cost effective now, b) not likely to be cost effective in the future and c) do not meet exception criteria in OPUC Order 94-590.

2. Provides the following information:
    a. An analysis of the estimated BCRs for all its remaining gas programs and measures where BCRs are close to or less than 1.0.
    b. Project achievable savings for each gas measure and program with Utility Cost Test and Total Resource Cost Test BCRs of close to or less than 1.0.

3. Identifies programs and measures Energy Trust proposes to continue and those to discontinue, including specific exceptions criteria (A-G) established in Order 94-590 used to justify proposals. Section 3 also includes an initial concept of a Core Residential Program that would provide customer access to certain measures as a basic utility customer service. This is not part of Order 13-256 but was requested by the OPUC for consideration in this section

[1] While the order referenced the societal perspective, the OPUC's guidance in Docket UM 551 and in Energy Trust dialogue with the OPUC makes it clear that in this report Energy Trust is to focus on benefits to the utility system and the participant. The societal perspective is often thought to include these benefits but also additional benefits to the state or society as a whole. To avoid confusion, the rest of this report will reference the Utility Cost Test and the Total Resource Cost Test and not reference the Societal Test.

In addition, the following information is provided for the OPUC in the consideration of Order 13-256:

4. Ideas for improving and streamlining the approval process for future exceptions under UM 551 for prescriptive measures.
5. Ideas for improving and streamlining the approval process for future exceptions under UM 551 for custom measures.
6. A discussion of the role of hedge or risk mitigation value in estimating avoided cost forecasts, which are a critical input to cost-effectiveness analysis and how they may impact the cost-effectiveness decisions that are the subject of this report. An adjustment to the investment criteria for gas efficiency is proposed until the issue is addressed through utility Integrated Resource Plans (IRP).

Two appendices are provided:

Appendix A provides information about participant non-energy benefits from residential weatherization measures.

Appendix B lists measures that are currently cost effective. This information is offered to put the exception requests in perspective.

While Energy Trust has been operating under an exception to current cost-effectiveness guidelines for all gas efficiency measures and programs, most Energy Trust gas savings continue to come from measures and programs that pass the cost-effectiveness tests without employing exceptions. The measures and programs identified in this document as not passing the Total Resource Cost Test (TRC)[2] accounted for only 6.5 percent of all 2013 gas savings. For the Existing Homes program, where meeting the cost-effectiveness guidelines is most difficult, the measures that do not pass the TRC constitute only 18.5 percent of 2013 savings. Nevertheless, these measures and programs are important to customers and contractors, and are of great interest to a variety of stakeholders.

The information and options provided in this report are intended to provide ratepayers with benefits through the cost-effectiveness framework established by Order 94-590 in UM 551, while keeping program costs manageable for customers, Energy Trust and the OPUC. This report does not attempt to incorporate or reflect stakeholder feedback on the data or options it contains. There are a wide range of perspectives and opinions regarding how energy savings and associated benefits are valued under current OPUC cost-effectiveness tests. The OPUC encourages stakeholders to provide input to them directly on this matter through the OPUC's public comment process under Docket UM 1622. Hearing from a range of perspectives will aid the OPUC as it assesses and determines the path forward for the measures and programs affected.

BACKGROUND

Energy Trust follows specific guidelines established by the OPUC regarding the cost effectiveness of measures and programs. In general, Energy Trust is directed to offer incentives

[2] See footnote 1 for explanation of the Total Resource Cost Test.

only to energy-efficiency projects that pass the OPUC's primary investment tests, the Utility Cost Test (UCT) and Total Resource Cost Test (TRC). Measures and programs[3] that do not pass the tests may be included in Energy Trust's portfolio if they meet specific exceptions criteria listed below established in Order 94-590 in UM 551[4]:

A. The measure produces significant non-quantifiable non-energy benefits. In this case, the incentive payment should be set at no greater than the cost-effective limit (defined as present value of avoided costs plus 10 percent) less the perceived value of bill savings, e.g., two years of bill savings
B. Inclusion of the measure will increase market acceptance and is expected to lead to reduced cost of the measure
C. The measure is included for consistency with other DSM[5] programs in the region
D. Inclusion of the measure helps to increase participation in a cost-effective program
E. The package of measures cannot be changed frequently and the measure will be cost effective during the period the program is offered
F. The measure or package of measures is included in a pilot or research project intended to be offered to a limited number of customers
G. The measure is required by law or is consistent with OPUC policy and/or direction

Through UM 1622, the OPUC granted Energy Trust exceptions to current cost-effectiveness guidelines for all gas efficiency measures and programs from July 2, 2013, through October 18, 2014. These exceptions came in response to two separate requests by Energy Trust to the OPUC. The first, filed in September 2012, described multiple residential weatherization measures for gas-heated homes—0.67 Efficiency Factor (EF) water heaters, insulation, multifamily boilers, solar water heating and duct and air sealing for manufactured homes—that no longer passed the OPUC's investment tests with updated gas avoided cost forecasts and the most recent cost and savings evaluation results. The second request was filed November 2012 for temporary exceptions to the gas portion of the New Homes and Products, Existing Buildings, and New Buildings programs, plus a list of specific measures within those programs and commercial solar water heating. Included in each request were proposals for actions Energy Trust would take to help move measures and programs toward cost effectiveness.

Since Order 13-256 was filed, several market and policy changes have taken place that need to be considered in this review:

- In applying to the OPUC for exceptions to cost-effectiveness requirements in 2012, Energy Trust used 2011 Integrated Resource Plan (IRP) gas forward market prices to establish avoided cost forecasts. For cost-effectiveness analysis of 2015 programs, Energy Trust will use the most recent utility IRP assumptions for avoided costs. Forward market prices from NW Natural's 2014 IRP were blended with the most current Cascade Natural Gas forward market prices to develop Energy Trust's updated avoided cost forecasts for Energy Trust as a whole. On average, the new avoided costs are 10 percent lower than the 2011 cost forecasts. These updated avoided costs were used in the analysis presented in this report.

[3] All conditions also apply to programs except item D., as per page 18 of Order 94-590 in OPUC Docket UM 551
[4] OPUC UM 551 (OR 94-590) Section 13
[5] Demand-Side Management, a term which generally encompasses efficiency and load management programs

- Energy Trust uses a real discount rate which is the average of the rates for the four participating utilities, weighted by their revenue contribution. A current review of utility discount rates shows 4.5 percent as the weighted average compared to the 5.2 percent previously used. As of January 1, 2015, Energy Trust proposes to lower its real discount rate assumption to 4.5 percent. This reduction moderates the additional decrease to gas avoided costs for measures with long lives. The 4.5 percent discount rate was also used in the analysis presented in this report.

- In 2014, there is a new Oregon commercial building energy code (OEESC) impacting the baseline assumptions and savings for many measures in Energy Trust's New Buildings program. Because Energy Trust plays a critical role in achieving more efficient building codes through the Northwest Energy Efficiency Alliance and through program activities, Energy Trust will report the resulting savings. However, the increase in market efficiency will make it considerably more difficult to identify further cost-effective measures for new commercial building construction above and beyond the code.

- The Oregon Legislature passed House Bill 2801 in the 2013 state legislative session regarding whole-building energy assessments and creating an option for the OPUC to allow bundling of measures at a facility for cost-effectiveness analysis. Rulemaking is underway to determine conditions under which measures may be bundled for purposes of cost-effectiveness testing. Interactions between these pending rules and UM 551, the cost-effectiveness guideline currently used to deem cost effectiveness, are unknown.

1. STEPS TO MAKE PROGRAMS COST EFFECTIVE

Per OPUC's direction, Energy Trust took several actions, starting in 2012 and continuing through today, to improve the cost effectiveness of gas programs. These actions include:

- Removed the Performance Tested Comfort Systems (PTCS) Duct Sealing[6] incentives for Existing Homes (2013)
- Continued a prescriptive duct sealing pilot (2012-2013), which was then cancelled based on results to date (2014)
- Continued whole-home air sealing until an evaluation can be completed and a pilot test of an alternative approach that integrates air sealing with ceiling insulation is completed (Ongoing)
- Reworked eligibility criteria for residential ceiling/attic and floor insulation (2013)
- Eliminated incentives for custom commercial gas measures that have a TRC of less than 0.7 under the new avoided costs (2013)
- Removed rooftop HVAC unit tune ups (2014)

The relative importance of each of these measures to the programs is shown in the tables in the next section of this report. Additional detail on each of these actions is described here.

[6]Performance Tested Comfort Systems (PTCS) duct sealing requires the contractor to provide air exchange/Blower Door tests pre- and post-measure installation to confirm impacts, increasing the time and expense in most cases.

Duct Sealing in Single-Family Homes

Duct sealing in gas-heated existing single-family homes reflected a TRC of 0.2 in 2012. Although this measure passed the UCT, Energy Trust proposed discontinuing incentives for it as of January 1, 2013. This was proposed because the measure was not likely to become cost effective under the TRC and the measure did not meet exception criteria established in UM 551. A pilot to test a prescriptive approach to duct sealing continued through 2012 and 2013 with the theory that a lower-cost approach targeted at homes meeting specific criteria for high savings potential would create a new more cost-effective approach to access duct sealing savings. In mid-2013, the pilot was reworked after initial difficulty in recruiting test sites and was later discontinued in early 2014. The Portland Metro area did not offer many homes meeting the program's criteria due to high frequency of internal ducts, ducts in the basement and ducts with high levels of insulation—all conditions indicating limited savings potential.

Air Sealing in Single-Family Homes

Whole-home air sealing in gas-heated existing single-family homes had a TRC of 0.3 in 2012. At the time, Energy Trust had limited evaluation results for the measure, and rather than taking quick action to remove incentives for the measure, proposed waiting until a more thorough review could be completed. Additionally, the Existing Homes program made changes with the intent of increasing savings, so Energy Trust has retained incentives for the measure. In November 2013, a preliminary billing analysis of 2011 projects was completed showing a small increase in average therm savings. However, project costs had continued to increase significantly and the combined result was a new TRC BCR of 0.2. Energy Trust proposed removing the measure for the 2014 program year but Energy Trust's Conservation Advisory Council recommended holding off on removal of the measure until the outcome of UM 1622. It is Energy Trust's recommendation that in 2015, incentives for air sealing as a stand-alone measure no longer be offered for single-family homes. An alternative approach is currently being tested where air ceiling is installed at the same time as ceiling insulation for a fixed cost. A decision about the cost effectiveness of this approach would be appropriate once the pilot is complete.

Ceiling/Attic and Floor Insulation in Single-Family Homes

The amount of savings from installing insulation measures depends on how much insulation was previously installed in the home. In many homes, there is minimal but existing insulation. For ceiling/attic insulation, where existing insulation provides an R-value of 11 or greater, the amount of energy savings for the cost resulted in a TRC result of less than 1.0 in gas-heated homes. In 2013, the program established a maximum existing R-value of 11 as an eligibility criterion for incentives. Similarly, where floors have some pre-existing insulation, savings are lower. Effective January 1, 2013, incentives for floor insulation in single-family homes are available if there is no existing insulation. With this narrowing of eligible projects, savings per project are expected to be higher with little change to average project cost, and cost-effectiveness of these measures is expected to improve.

Energy Trust used engineering calculations to adjust its estimate of average savings per square foot from ceiling insulation measures to reflect the new ceiling insulation eligibility criteria described above. This revised calculation is used in this report and shows slight improvement in energy savings. After the change to the floor insulation requirements, the level of savings was not re-estimated, but the improvement is expected to be very small. Both measures continue to have a TRC BCR of less than 1.0. The first full year with the changes is 2013, and a year of

post-installation data is required for an impact evaluation. Therefore, evaluation results are not expected until 2015. These results are not expected to dramatically change savings estimates from those used in this report.

Custom Commercial

Custom commercial gas projects completed through the Existing Buildings program in 2011, which would not have been cost effective with the updated avoided costs, were 5 percent of total program therm savings. As a way to limit disruption to the market and to explore the possibility that some projects meet criteria for UM 551 exceptions, the program has continued to approve custom gas projects with a TRC BCR greater than 0.7. By the end of 2013, only a handful of projects fit into this category and constituted 6.5 percent of the program annual therm savings. A review of project types and impacted market segments did not offer grounds for an exception within UM 551criteria. Starting in 2015, Energy Trust proposes that all custom projects will need to pass the TRC and the UCT to qualify for an incentive offer unless a site-specific reason for an exception that meets the UM-551 criteria is justified. Then the site-specific procedures suggested in Section 5 of this report might be applied Some of the projects that do not pass these criteria will likely be re-engineered by the contractor to create a lower-cost package that passes the test.

Rooftop HVAC Unit Tune-ups

A 2013 analysis revealed that rooftop HVAC unit tune-ups no longer passed the TRC with new avoided costs. A 2013 impact evaluation of more recent projects showed lower average savings than expected, further lowering cost-effectiveness of the measure. Furthermore, HVAC contractors were bringing fewer projects to the Existing Buildings program as they had already offered the service to all of their established customers. As a result, the Existing Buildings program decided to no longer offer the measure starting in late 2013. Energy Trust is investigating alternative technical and market approaches for tuning-up rooftop controls. These may prove more cost effective and appeal to additional customers.

2. ANALYSIS OF BENEFIT/COST RATIOS AND SAVINGS FOR MEASURES AND PROGRAMS

Tables 1-8 provide summary analysis of the BCRs for the gas portion of each program, other than Production Efficiency, and for each measure with a BCR through the TRC or UCT of less than 1.0. Production Efficiency, which serves Industrial and Agricultural customers, is not included in these tables because all measures as well as the gas portion of that program as a whole are cost effective. Tables labeled “as a whole” provide BCRs that incorporate not only the cost of measures, but also the cost of program management and an allocated share of Energy Trust’s overall administrative cost. For the programs, UCT ratios are provided only for the Existing Homes program. Other programs readily pass the UCT.

For context, information is provided on the share of the savings from each of these measures as a portion of the program’s overall gas savings in 2013. This proportion ranges from 0.02 percent for the New Homes program to 18.5 percent for the Existing Homes program. The tables also include Energy Trust’s assessment of the future potential resource from each measure. For selected measures, where change has occurred since Energy Trust’s initial cost-effectiveness filing, the initial BCRs are offered in brackets.

The BCRs in the table reflect current conditions, including project costs and savings with current eligibility requirements, updated avoided costs and the 2015 discount rate of 4.5 percent. Additional context related to the measures and programs presented in the tables is provided in the subsequent section.

Table 1. Gas Measures in the Existing Homes Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings (annual therms)	% of 2013 Program Savings	Future Resource Potential
Single Family Ceiling Insulation:					
-*Standard track only*[7]	0.7 [0.7][8]	2.2	39,866	3.8%	Moderate
- *All Tracks*	0.5	2.2	81,653	7.7%	Moderate
Single Family Wall Insulation:					
-*Standard track only*	0.3 [0.4]	1.5	11,041	1.0%	Small
- *All Tracks*	0.2	1.5	36,626	3.5%	Small
Single Family Floor Insulation:					
- *Standard track only*	0.3 [0.4]	1.2	19,393	1.8%	Small
- *All Tracks*	0.2	1.2	36,628	3.5%	Small
Single Family Duct Insulation- *All Tracks*	0.2	1.0	4,293	0.4%	Small
Whole-Home Air Sealing- *All Tracks but Manufactured Homes*	0.2	1.4	17,176	1.6%	Small
Air Sealing as Added Requirement for Ceiling Insulation	NA	NA	NA	NA	Small
Manufactured Home Air Sealing	0.5	0.5	161	0.02%	Small
Manufactured Home Duct Sealing	0.4	0.4	1,946	0.2%	Small
TOTAL Weatherization			178,483	17%	
0.67 & 0.70 EF Water Heaters	0.6	1.0	15,697	1.4%	Moderate
Solar Water Heating	0.12	1.0	581	0.05%	Small
Spa Covers	0.5	1.6	1,066	0.1%	Small
TOTAL Equipment			17,344	1.7%	

[7] "Standard Track" refers to installations that are not part of the Home Performance Track or Savings Within Reach tracks of the Existing Homes program. This data was presented in Energy Trust's initial filing to request this docket to show measures in a "best case" environment. For this report we are also showing overall averages, including all three tracks to present the entire situation.

[8] BCRs in brackets are values from Energy Trust's initial filing to initiate this docket. They help show how BCRs have evolved since that filing.

TOTAL			195,826	18.5%	

Table 2. Existing Homes Program as a Whole—Benefit/Cost Ratios

Year	BCRs – Gas Portion		BCRs – Electric Portion		Combined BCRs		Avoided Cost Version
	TRC	UCT	TRC	UCT	TRC	UCT	
2011	1.7	1.6	2.5	2.6	2.1	2.3	2009
2012	0.9	1.1	2.8	2.8	1.8	2.2	2013
2013	0.8	0.7	1.4	1.9	1.2	1.4	2013
2014*	1.5	0.7					2015

*2014 forecasts of TRC and UCT are based on current planned expenditures and mix of measures to meet 2014 savings goals

Table 3. Gas Measures in the New Homes and Products Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings	% of 2013 Program Savings	Future Resource Potential
Builder Option Package with 0.67 water heater	0.6	1.1	2,176	0.02%	Small

Table 4. New Homes and Products Program as a Whole—TRC Benefit/Cost Ratios

Year	BCR – Gas Portion **TRC**	BCR - Electric Portion **TRC**	Combined BCR **TRC**	Avoided Cost Version
2011	4.5	1.9	2.2	2009
2012	1.8	2.0	2.0	2013
2013	2.4	2.4	2.4	2013

Table 5. Gas Measures in the Existing Buildings Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings	% of 2013 Program Savings	Future Resource Potential
Select Custom Projects	0.7-0.94	>1	109,645	6.5%	Moderate
Condensing Tank Water Heaters in low-use facilities	0.4	>1	3,509	0.2%	Low
Convection oven	0.8	4.7	5,436	0.3%	Low
Dishwasher, office ENERGYSTAR residential	0.8	2.0	2	0	Low
Multifamily Ceiling insulation	0.4	1.2	205	0.01%	Low
Multifamily Wall Insulation	0.4	1.3	94	0.01%	Low
Multifamily Floor Insulation	0.3	1.1	92	0.01%	Low
Multifamily Duct	0.3	1.0	6	0.004%	Low

insulation					
Multifamily Windows	0.2	1.3	2,020	0.12%	Moderate
TOTAL			121,008	7%	

Table 6. Existing Buildings Program as a Whole—TRC Benefit/Cost Ratios

Year	BCR – Gas Portion TRC	BCR – Electric Portion TRC	Combined BCR TRC	Avoided Cost Version
2011	1.6	1.6	1.6	2009
2012	1.0	1.9	1.7	2013
2013	1.3	1.4	1.3	2013

Table 7. Gas Measures in the New Buildings Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings	% of 2013 Program Savings	Future Resource Potential
Air to Air heat exchangers	0.5	6.1	4,264	0.9%	Low
Commercial vent hoods w/VSDs	0.2	>1	2,804	0.6%	Moderate
Condensing Tank Water Heater at low use sites	0.4	1.8	12,042	2.4%	Moderate
Condensing Unit Heater for non-Multifamily	0.5	>1	273	0.06%	Low
Gas convection ovens	0.8	4.7	2,114	0.4%	Low
Demand control ventilation	0.6	>1	1,007	0.2%	Low
Dishwasher, res, office	0.8	2.0	0	0	Low
Market Solutions air barrier elective (gas)	0.8	4.5	0	0	Moderate
Market Solutions “Very Best” package (gas radiant)	0.8	2.1	0	0	Moderate
Market Solutions Multifamily “Good to Better” and “Better to Best” package increments	0.6	1.0	0	0	Moderate
Market Solutions tankless water heater in Offices	0.8	>1	0	0	Moderate
TOTAL			22,504	4.6%	

Table 8. New Buildings Program as a Whole—TRC Benefit/Cost Ratios

Year	NB BCR – Gas Portion TRC	NB BCR – Electric Portion TRC	Combined BCR TRC	Avoided Cost Version
2011	1.2	2.0	1.8	2009
2012	1.2	2.8	1.5	2013
2013	1.6	3.0	2.7	2013

3. MEASURES TO CONTINUE/DISCONTINUE AND THE APPLICATION OF EXCEPTIONS

Since the OPUC first approved temporary exceptions in Order 13-256 within UM 1622 in July 2013, Energy Trust has continued to review gas measures and programs for cost effectiveness, considering new cost and performance data as well as new avoided costs.

The following tables and discussion focus on the measures which presented cost-effectiveness issues in the previous section, and also on the gas portion of the Existing Homes program as a whole. The gas portion of the Existing Homes program is addressed here because it is the only program that does not pass the UCT or the TRC without consideration of exceptions. The tables duplicate the data presented above, with the addition of Energy Trust's initial proposals for consideration by the OPUC. The text further explains the analysis and the recommendations. In these tables, it is proposed that each measure follow one of the following four paths:

- Discontinue
- Continue under UM 551 exception provisions
- Rework to improve cost effectiveness
- Incorporate in a Core Residential Program as a basic utility customer service established by the OPUC outside of the framework of cost-effectiveness

Existing Homes Gas Measures

Table 9 summarizes the gas measures for the Existing Homes program with a TRC BCR of less than 1.0. For 2013, these measures supplied 18.5 percent of the total gas savings for the program or 3.7 percent of the total Energy Trust portfolio of gas savings. In the future these measures have small to moderate resource potential although they provide other significant value. The TRC BCRs listed within brackets are the original 2012 cost-effectiveness test results from our exception request, which use avoided costs from 2012, and prior costs and savings assumptions.

The majority of Oregon homes are heated with gas. According to the 2012 Residential Building Stock Assessment (RBSA) from the Northwest Energy Efficiency Alliance (NEEA), a substantial percentage of homes have been retrofitted with additional insulation, suggesting a declining resource potential for insulation. Just 15 percent of homes in the region have R-15 or less for ceiling/attic insulation, only 30 percent of homes with crawlspaces have no floor insulation and only 13 percent have no wall insulation. Adding insulation is still an important energy efficiency measure for the region. There has been significant progress to date and therefore the additional potential for future installations is diminished.

The decline in gas avoided costs heavily impacted residential gas weatherization measures—more than any other market sector or measure category. These measures have also seen rising project costs and fewer realized savings than early gas analyses predicted. It is the combination of these three factors that caused the dramatic shift in cost-effectiveness for these measures. Weatherization measures that continue to have a BCR below 1.0 on the TRC include ceiling, wall, duct, and floor insulation and air sealing.

Table 9. Gas Measures in the Existing Homes Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings (annual therms)	% of 2013 Program Savings	Future Resource Potential	Proposed Action
Single Family Ceiling Insulation:						Continue under Core Residential Program (as described in this section
-*Standard track only*	0.7 [0.7]	2.2	39,866	3.8%	Moderate	
- *All Tracks*	0.5	2.2	81,653	7.7%	Moderate	
Single Family Wall Insulation:						
-*Standard track only*	0.3 [0.4]	1.5	11,041	1.0%	Small	
- *All Tracks*	0.2	1.5	36,626	3.5%	Small	
Single Family Floor Insulation:						
- *Standard track only*	0.3 [0.4]	1.2	19,393	1.8%	Small	
- *All Tracks*	0.2	1.2	36,628	3.5%	Small	
Single Family. Duct Insulation- *All Tracks*	0.2	1.0	4,293	0.4%	Small	
Whole-Home Air Sealing- *All Tracks but Manufactured Homes*	0.2	1.4	17,176	1.6%	Small	Discontinue, consider new prescriptive measure in 2015 pending results of pilot
Air Sealing as Added Requirement for Ceiling Insulation	NA	NA	NA	NA	Small	Complete pilot under exception criterion F-pilot or research project
Manufactured Home Air Sealing	0.5	0.5	161	0.02%	Small	Continue through existing exception C
Manufactured Home Duct Sealing	0.4	0.4	1,946	0.2%	Small	Continue through existing exception C
TOTAL Weatherization			178,483	17%		
0.67 & 0.70 EF Water Heaters	0.6	1.0	15,697	1.4%	Moderate	Continue through 2015 under exception criterion C, while reworking design to increase volume and prepare market for new standard in mid-2015
Solar Water Heating	0.12	1.0	581	0.05%	Small	Exception criterion A-non-energy benefits
Spa Covers	0.5	1.6	1,066	0.1%	Small	Exception criterion C, consistency with other programs in the region
TOTAL Equipment			17,344	1.7%		
TOTAL			195,826	18.5%		

These measures are offered through three tracks: the Existing Homes Standard track, the Savings Within Reach (moderate income) track, and the Home Performance with ENERGY STAR track. The latter track is implemented in Oregon both by Energy Trust and Clean Energy Works. The cost-effectiveness and total savings of measures shown in the rows labeled as "all tracks" in Table 9 (above) reflect the measure performance across those three tracks. Savings are deemed similarly in each of the tracks—by square footage for insulation and by home for air sealing. Costs have trended higher in the Home Performance track. For the 2012 exception request, Energy Trust presented the cost-effectiveness of these measures for the Existing Homes Standard track only (without the Home Performance sites included) as an indication that these measures do not pass the TRC even with lower measure costs. To give a sense for how the cost-effectiveness of Existing Homes Standard track measures have changed since 2012, Table 9 also shows the 2012 TRC BCR in the original exception request in brackets to compare to the 2014 TRC for Existing Homes measures. Since all delivery tracks serve important segments of the market, these measures are also presented using updated costs for the three tracks combined.

Insulation—Ceiling, Wall, Floor and Duct

In addition to adjusting the existing insulation eligibility screens for ceiling and floor insulation to capture projects with highest savings potential, Energy Trust took actions to influence reductions to measure costs. A new customer-facing online tool helps customers assess the financial case for their project by calculating the simple payback of measures using bid costs. The average energy savings per square footage, based on prior Energy Trust evaluations that analyze energy bills, is used to calculate projected annual bill savings. This information may inspire some customers to ask for alternative bids, and may have some impact on reducing measure cost. This possible impact is not yet discernible in Energy Trust program data because the tool is just coming into widespread use. This new capability has been rolled out in a staged fashion, starting with Clean Energy Works projects and then moving online to Energy Trust's website where customers in all tracks can use it.

Participant non-energy benefits are widely acknowledged for insulation, and include thermal comfort and noise reduction.[9] UM 551 lists the presence of significant participant non-energy benefits as the first exception criteria to cost effectiveness requirements. Although Energy Trust has not attempted to quantify these benefits, we have studied their significance in the decisions of customers to participate in our programs through process evaluations.[10]

If customers are provided with energy payback analysis of their investment in insulation, and they continue with projects with long paybacks, it is reasonable to assume that non-energy benefits are a significant influence on their financial decision.

Wall, floor and duct insulation TRC BCRs are much lower than for ceiling insulation—between 0.3 and 0.2. At these levels, to be cost effective, roughly 75 percent of the benefits would be

[9] The phrase "participant non-energy benefits" pertains to those directly enjoyed by the program participant and distinguishes them from broader benefits to Oregonians or society as a whole, which are outside of the scope of this report.

[10] Further discussion of the difficult-to-quantify participant non-energy benefits is provided in Appendix A to this document. The appendix identifies how other states and organizations similar to Energy Trust have been considering non-energy benefits in cost effectiveness tests and provides further documentation and discussion of non-energy benefits.

from non-energy sources. Because these measures are a valuable part of overall customer service, Energy Trust proposes defining a Core Residential Program within which these and other residential measures play a role. Further discussion of the Core Residential Program concept is included in this section of the report.

Whole-Home Air Sealing

As shown in Table 9, whole-home air sealing had a TRC BCR of 0.3 in 2012. Updated draft billing analysis completed in late 2013 revealed that savings had increased slightly but that project costs had also continued to increase. The combined result was a lower TRC BCR of 0.17. With 2015 avoided costs and the new discount rate, the TRC BCR is now 0.14. Energy Trust proposes to continue to offer this measure through 2014 but in 2015, to discontinue the stand-alone measure.

Energy Trust is currently testing a prescriptive protocol to provide air sealing for the ceiling along with ceiling insulation. This pilot will be evaluated in mid-2015. If it is successful it may result in a proposal to rework air sealing as a requirement for ceiling insulation.

Energy Trust proposes an exception to delay cost effectiveness requirements to allow completion of a pilot measure that couples air sealing with ceiling insulation. Completion of the pilot is expected in spring, 2015. This is consistent with UM 551 criterion F.

Exception Criterion F: Pilot or research project.

Manufactured Home Duct and Air Sealing

Duct and air sealing for gas-heated manufactured homes continues to not be cost effective under the TRC (0.4 and 0.5) and UCT (0.4 and 0.5). Energy Trust offers incentives for both measures for gas- and electric-heated manufactured homes at full cost of the measure to encourage participation. The majority of the projects are seen for electrically-heated homes where the TRC BCRs are 2.7 and 2.4. Narrowing eligibility to only electrically-heated manufactured homes creates confusion and may impact acquisition of electric-heated home projects. These measures provided just 0.22 percent of total program savings under an existing exception to cost effectiveness.

Energy Trust proposes to continue an existing exception for both measures in gas-heated homes for marketing consistency with the higher volume coming from cost-effective electric-heated home measures. This is consistent with UM 551 criterion C.

Exception Criterion C: For consistency with other programs in the region.

0.67 and 0.70 EF ENERGY STAR Gas Water Heaters

ENERGY STAR efficient gas water heaters have been slow to catch on in the market. Initially offered in 2011, Energy Trust had hoped that the volume of ENERGY STAR water heaters would rise quickly soon after. The original TRC BCR was close to 0.5, although for some vendors who sold high volumes it was close to 1.0. There was significant variance in incremental cost between water heater brands and contractors. The hope was that with increased market volume, costs would moderate across the market and cost effectiveness would improve quickly. Although listed only as a measure within the Existing Homes program in the table, this measure and cost effectiveness challenge extends to the Existing Multifamily program where volume is currently less than 0.1 percent of program savings.

Through 2013, the Existing Homes program volume remained low for this measure. For 2014 the program is planning a range of upstream tactics to improve sales. The longer term goal is to transition the market to wider acceptance of the ENERGY STAR efficiency level before the federal standards are scheduled to change in mid-2015. After the standard is in effect in the market, 0.65 water heaters will be the baseline and Energy Trust will need to reconsider its strategy for efficient gas water heaters. Because the market is still struggling, Energy Trust believes it is reasonable to continue efforts to drive more sales toward the higher efficiency level at this time. This may lead to more effective and rapid adoption of the standard. Also, Energy Trust is working in concert with other programs around the country. This may lead to higher acceptance by distributors and manufacturers, thus decreasing the risk that the U.S. Department of Energy will retreat from implementing the planned standard.

Energy Trust proposes that 0.67 and 0.70 EF Water Heater measures be included in the Existing Homes and Multifamily program offerings to encourage market acceptance and lead to reduced costs. This is consistent with UM 551 exception criterion B.

Exception Criterion B: Inclusion of the measure will increase market acceptance and lead to reduced costs.

Solar Water Heating

This measure has not been cost effective without employment of a proxy for quantifying non-energy benefits since first offered by Energy Trust. The prior use of the proxy was based on market research showing that most solar water heating customers invested based on a combination of energy savings and other values, which vary from customer to customer but are very strong. These include environmental values and a desire to build a new industry, be a technology leader, and achieve energy autonomy.

Solar water heating is also offered to commercial and industrial customers, where it constitutes a tiny fraction of a percent of the program's annual gas savings and is delivered as a custom measure. Thus far no commercial or industrial projects have been proposed in 2014. Solar investments in commercial buildings are similarly driven by a combination of energy savings and other perceived benefits.

Energy Trust proposes continuing to offer solar water heating to residential and business customers, recognizing the significant non-energy benefits participants assigned to the financial case for their investment, consistent with UM 551 exception criterion A.

Exception Criterion A: Produces significant non-quantifiable non-energy benefits.

Spa Covers

Although this measure is a very small part of the Existing Homes program (0.1 percent of 2013 savings) and has a TRC BCR of 0.5 for gas-heated systems, Energy Trust proposes to continue to offer this measure for gas-heated systems. The majority of residential and small commercial spas are electrically-heated where the TRC BCR is 2.0, and clearly cost effective. When gas and electric installations are considered together the TRC BCR exceeds 1.0.

Because inclusion of this measure will maintain consistency with the electric offer for the region and minimize market delivery confusion, and the overall mix of spa cover projects will be cost effective, Energy Trust recommends an exception for this measure under UM 551 exception criterion C.

Exception Criterion C: For consistency with other programs in the region.

Gas Portion of Existing Homes Program

This section of the report addresses cost-effectiveness for the gas portion of the Existing Homes program in some depth, because it is the most consequential issue raised in this report. Several subsections provide the following:

- A presentation of the overall program performance
- A discussion of the broader context for the program performance
- A discussion of changes made to the program in 2014, how they have positively impacted the TRC, but have not significantly improved the UTC
- A presentation of scenarios to illustrate how different types of changes in the program might impact both BCRs
- A discussion of plans for 2015 program changes
- Introduction of a concept for addressing the key program services and costs that lead to the program not passing the UCT- establishment of a Core Residential Program to offer these measures as a basic utility customer service.

Existing Homes Program Cost-Benefit Performance

Table 10 lists gas and electric TRC and UCT BCR results for the Existing Homes program in 2011-2013 with estimates for the 2014 gas program. The 2014 estimate is based on current forecasted mix of measures, incentives and delivery costs for this current year. The focus of this review is on the gas portion of the program but historic electric results are provided to show more detail for how the overall Existing Homes program looks.

Table 10. Existing Homes Program as a Whole—Benefit/Cost Ratios

Year	Gas BCRs		Electric BCRs		Combined BCRs		Avoided Cost Version
	TRC	UCT	TRC	UCT	TRC	UCT	
2011	1.7	1.6	2.5	2.6	2.1	2.3	2009
2012	0.9	1.1	2.8	2.8	1.8	2.2	2013
2013	0.8	0.7	1.4	1.9	1.2	1.4	2013
2014*	1.5	0.7					2015
Proposal: Continue the program, use OPUC docket to identify a Core Residential Program to continue, and, in parallel, use the Energy Trust budget process to make specific decisions about how to re-scope and reduce costs							

*2014 forecasts of gas program TRC and UCT BCRs are based on current planned expenditures and mix of measures to meet 2014 savings goals

Key take-aways from this table include:

- After two years of not passing the TRC, the gas portion of the Existing Homes program is forecast in 2014 to have a TRC of 1.5 in 2014
- In 2013 and in the 2014 forecast, the gas portion of the program has a UTC of less than 1.0.

Broader Context for Existing Homes Gas Program Cost/Benefit Performance

When new avoided costs and evaluated measure savings results were incorporated into the tests in 2012, the TRC BCR for the gas portion of the Existing Homes program fell to 0.9. In 2013, the TRC BCR slipped to 0.8 and for the first time the UCT for the gas portion of the Existing Homes program fell below 1.0 to 0.7. Historically, Energy Trust has reported program level cost effectiveness at the combined utility level, not fuel specific. Since this docket is focused on gas measure cost-effectiveness, the BCRs are presented separately by fuel type. Because the UCT for the gas portion of the Existing Homes program was less than 1.0 for the first time in 2013, and is projected to be below 1.0 for 2014, the following section addresses not only the analytic basis for the TRC BCR being less than 1.0 but also the drivers behind the UCT BCR issues. Additional information on the measure mix of the program is presented to help provide a foundation for discussing program-wide TRC and UCT result improvements. The UCT performance issue for the gas portion of the Existing Homes program was discovered in May 2014 in developing the analysis for this report. This section of the report provides only preliminary thinking on this issue.

The following information may be useful to put the impact of the UCT BCR of less than 1.0 for the Existing Homes program in perspective:

- Additional measures for existing homes are included in the New Homes and Products program as well as the Existing Homes program.[11] If the two programs are combined, the gas portions of the combined programs and, separately, the electric portions, pass the UCT and the TRC.
- If the electric and gas portions of the Existing Homes program are combined, they also pass both the UCT and the TRC.

The measure mix, the portion of the program savings from different types of measures, impacts the costs and savings from the program, as does quantified non-energy benefits from water-saving measures. There are four main categories of measures in the Existing Homes program:

- Equipment: water heaters and space heating equipment
- Weatherization: insulation, air sealing, and windows
- Kits: gas savings from showerheads and aerators
- Behavior: currently Opower

Equipment incentives provide individual TRC BCRs >1.0[12] with moderate measure lives (12-18 years). Weatherization provides long savings lives but, given the absence of quantified non-energy benefits, has a TRC BCR of less than 1.0. Kits are low cost with large energy savings and quantified non-energy benefits, and have very favorable BCRs. These temper the impacts of weatherization on the overall program's BCRs. Behavior is borderline cost effective with the measure life currently assumed. Depending on the results of a persistence test for Opower, a behavioral initiative, the measure life may be extended, leading to significantly more favorable UCT and TRC BCRs.

Figures 1 and 2 show how the four primary gas savings categories have varied as a percentage of total program savings across the years.

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[11] Measures in the New Homes Program for existing homes include appliances other than water and space heat, refrigerator retirement, and lighting.

[12] One exception- the ENERGY STAR water heater is estimated to currently have a TRC of about .5. Grounds for a measure-specific exception have already been discussed in this report.

Figure 1. Existing Homes program annual gas savings by measure category

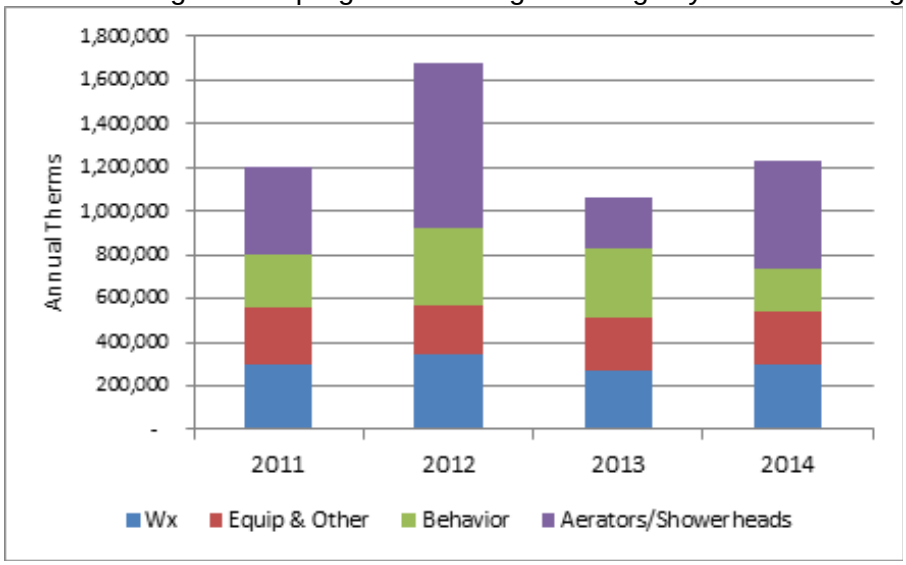
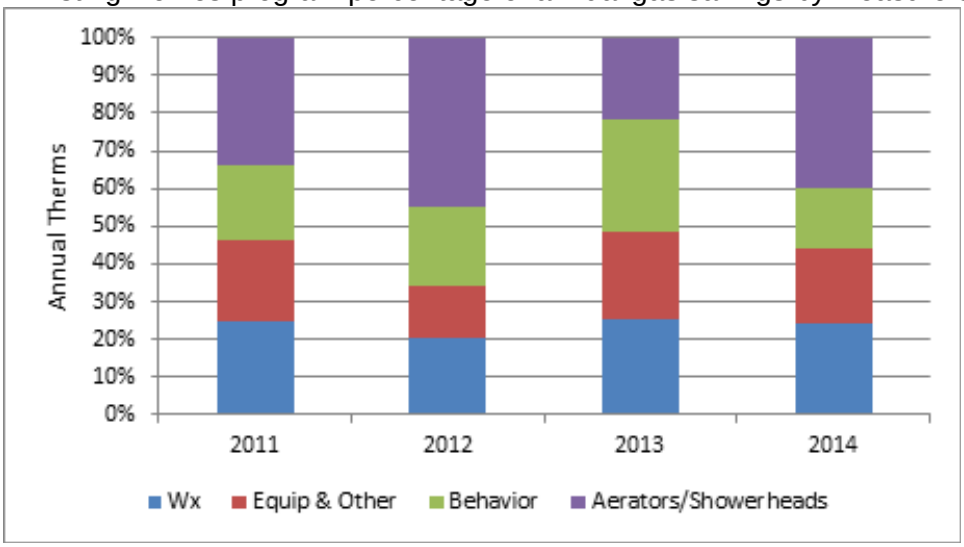


Figure 2. Existing Homes program percentage of annual gas savings by measure category



In 2013, in recognition that the market for efficient showerheads may be nearing saturation within a few years, the program shifted away from heavy use of showerheads (227kthm of savings vs. 750kthm from 2012), intending to make up that savings differential with weatherization and equipment savings. This strategy proved more challenging to implement than anticipated and the volume of weatherization measures grew more slowly than planned. As a consequence of this and other factors, Energy Trust did not meet 2013 Existing Homes program savings goals. Kit savings measures are a very quick, low cost way to acquire savings while growing the core measure savings of equipment and weatherization takes more time to ramp up delivery market channels. The result was lower annual savings and a TRC and UCT

BCR below 1.0[13]. The causes of low BCRs are different for each test. The reduction in non-energy benefits due to fewer kits lowered the TRC. The overall decrease in savings without similar reduction in delivery and incentive costs lowered the UCT.

Changes in 2014

To address the TRC BCR issue in the gas portion of the Existing Homes program in 2014, the program focused on lowering the incentives paid per therm saved, lowering the total resource cost of measures, increasing the non-energy benefits (NEBs) and increasing overall therms. With this focus, the resulting measure mix includes a higher percentage of kits. Up to 40 percent (490kthm) of savings are planned to come from kits with a total expected increase of 200,000 therms over 2013 program savings. With this adjustment in measure mix, Energy Trust is expecting the gas portion of the program to produce a TRC BCR of 1.5 in 2014.

The strategy for 2014 focused primarily on issues with the TRC result, not the UCT.

Applying this strategy for more than a few years may be unsustainable for a few reasons. After several years of deploying showerheads, Energy Trust has seen the average efficiency of showerheads that are in place prior to the Energy Trust installation increase. It may soon be necessary to decrease the estimate of average savings per newly installed showerhead to reflect this improvement. Alternatively, we may limit retrofits to the oldest, most inefficient showerheads. Either way, the savings from showerheads in the future may be limited.

There are other future complications. A few key equipment measures may see per unit savings assumptions decline. As Energy Trust plans for 2015 program offerings, the market baseline for residential windows and high efficiency direct vent hearths, both currently cost effective, are being reviewed. This summer Energy Trust may need to rework those measures to establish new baselines, possibly resulting in fewer therms saved per measure in future years.

Scenario Analysis: Impacts on TRC and UCT

To illustrate how potential changes to the program mix and savings may impact future BCRs for the gas portion of the program, five scenarios were created. These are parametric scenarios to assess the relationship between specific cost levels and the UCT and TRC and do not represent program plans. Table 11 presents these scenarios. Information on each is provided below.

Table 11. Cost-Effectiveness Scenarios for Gas Portion of Existing Homes

Scenario	Benefits ($M)				Costs ($M)			BCRs	
	Avoided cost value (UCT)	Avoided cost value w/out Market Effects (TRC)	NEBs	Tax Credits	Program. Delivery. Cost	Incent -ives	Measure Total Resource Cost	Gas Program UCT	Gas Program TRC
Base – 2014 estimate	6.27	7.13	11.5	0.33	4.58	4.00	8.45	0.7	1.5
% increase/decrease from Base									
S1 – 25%	6%	6%	-25%	23%	0%	14%	20%	0.7	1.1

[13] Program level electric and gas combined TRC and UCT for 2013 were above 1.0, only the gas portion results were below 1.0

reduction to kits									
S2 – 50% reduction to kits	11%	11%	-50%	46%	0%	28%	41%	0.7	0.9
S3 – 25% kit reduction plus 25% savings reduction for specific measures	7%	7%	-25%	72%	0%	11%	44%	0.7	1.0
S4 – NEBs Excepted measures not in BCRs	-26%	-26%	0%	-10%	0%	-31%	-70%	0.6	2.5
S5 – Addition of 20% gas risk avoidance and 15% reduction to incentives and delivery	20%	20%	0%	0%	-15%	-15%	0%	1.0	1.7

Scenarios 1 and 2

Scenarios 1 and 2 modify the measure mix being used in 2014 to illustrate that BCRs could be impacted with lower installation percentages of kit measures. Scenario 1 assumes a 25 percent reduction in kits from 2014 levels. Scenario 2 assumes a 50 percent reduction. In both cases, the equivalent savings losses are assumed to be "made up" by spreading them evenly across remaining measures. *The result as summarized in Table 11 is that the increase or decrease of kits as a percentage of Existing Homes gas savings impacts the TRC BCR but has little impact on the UCT BCR.*

Scenarios 1 and 2 show how in future years Energy Trust can start planning to reduce its reliance on kits through program design, provided the savings can be made up with other measures. Even a 25 percent reduction in kits still results in a TRC BCR of greater than 1.0. Energy Trust estimates that a few more years of similar sized kit effort can be executed before a large scale reduction would be needed.

Scenario 3

Scenario 3 builds on Scenario 1 by assuming a 25 percent decline in kits from 2014 levels coupled with introducing possible reductions to equipment measure savings. Scenario 3 captures the possibility of a savings per measure decline with a 25 percent reduction to select equipment savings (avoided cost benefits decreased) while adjusting incentive costs upward to meet savings goals. *If window and hearth baselines and program designs do change for 2015, Scenario 3 provides a broad assessment of possible impacts coupled with a reduction in kits. The result is a program that just passes the TRC.*

Scenario 4

In Scenario 4, the costs and benefits of measures with exceptions are pulled out of the cost effectiveness tests. This shows an alternative to the base case program level cost effectiveness calculation. In the base case, although not cost effective, the costs and benefits of solar water heating and weatherization are included. Scenario 4 shows what the program cost effectiveness is like without the current excepted measures included. *This scenario results in a strong TRC*

BCR of 2.5. This demonstrates how much of a downward pull the excepted measures have on the TRC for the gas Existing Homes program.

Scenario 5
Finally, Scenario 5 looks for UCT improvements through the combination of a reduction in delivery and incentive costs plus a risk avoidance factor of 20 percent. The risk factor percentage is an assumption and not a permanent value proposal. With this increase in calculated avoided costs for risk it would still take a utility cost reduction of 15 percent in incentives plus program delivery to achieve a UCT BCR of 1.0. *This scenario provides a high level review of the magnitude reduction needed to move the UCT BCR and not necessarily how Energy Trust would recommend proceeding with the program.*

2015 Planning

For the UCT BCR to be greater than 1.0, the avoided energy costs must be greater than the combined cost of delivering the program and providing incentives. It is possible that in 2015 or 2016 a risk avoidance value could be added to Energy Trust's calculation of avoided costs to increase benefits; this topic is addressed in the last section of this report. Another way to improve UCT results is to lower program delivery and incentive expenses. This would require a rework of the program structure and approach.

In addition to guidance offered through this docket by the OPUC, Energy Trust plans to continue to pursue several actions which would increase future year BCRs:

- Review program measure specifications to identify and remove any requirements that may add costs in ways that do not provide commensurate quality assurance or savings benefits; this may lower costs
- Provide average project cost, savings and payback information to participants, along with information about other benefits of efficiency; if this motivates consumers to get more bids or negotiate more on costs, this might lower measure costs
- Target high energy users to increase savings per site
- Continue to better understand contractor invoicing practices and create ways to more clearly document energy-related costs and distinguish from other costs

Transition to a Core Residential Program for Gas Measures

While Energy Trust predicts that the gas portion of the Existing Homes program may have a TRC BCR of greater than 1.0 in 2014, for reasons described in detail above, that projection is not certain, and a TRC BCR of greater than 1.0 may not be sustainable for more than a few years. Furthermore, a UCT BCR of 1.0 may be difficult to achieve without significant changes to the program design that will decrease service, volume and quality management. Energy Trust proposes that in collaboration with the OPUC a Core Residential Program could be defined that would provide customer access to certain measures as a basic utility customer service. This would focus on the insulation measures in the Existing Homes program which are most challenged for cost effectiveness. This Core Residential Program would provide customers with a basic level of service provided independently of cost-effectiveness determinations. Energy Trust suggests that this offer has the following advantages:

Fairness: The people who have not insulated their homes thoroughly in the last 35 years most likely include a disproportionate share of disadvantaged households—low-income, households

with language barriers and renters. These ratepayers have been paying the cost of efficiency programs through their utility bills for decades, dating back to utility programs before Energy Trust came into existence. Providing opportunities especially for these households to participate has equity benefits.

Customer Service: Customers will continue to call their utility or Energy Trust for information to help them make decisions about insulation and weatherization. The OPUC may view that some level of service to these customers is a basic utility service that should be provided outside of the resource acquisition framework. If these costs were not considered in the UCT, the UCT BCR would improve. The size of these costs depends on the scope of services that the OPUC may require.

Uncertainty: A 30 percent increase in forecasted avoided costs would create a UCT BCR of 1.0 for Existing Homes. This is well within the range of historic forecast variation. To significantly diminish the capacity of Energy Trust and the contractor infrastructure to deliver broad weatherization measures and services and then rebuild it would involve significant time and expense and considerable market momentum would be lost. In addition to simple price uncertainty, there is regulatory and policy uncertainty. For example, if the current proposed EPA regulation of carbon emissions from gas plants led to a carbon market that included gas efficiency savings, a number of factors enhancing the value of gas efficiency savings would likely occur. Another example is that the State of Oregon could adopt new policy supporting state carbon reduction goals, and achievement of the Governor's 10-year energy action plan goals.

Compatibility with Other State Supported Efforts: A greatly diminished focus on insulation measures would create less common ground between the ratepayer-supported Existing Homes program and related state-supported efforts to achieve a broader array of social, economic and homeowner objectives through Clean Energy Works. If Energy Trust reduced its investments in outreach, marketing, program management and delivery for insulation, all significant components of program costs, fewer referrals and opportunities would likely result for Clean Energy Works. In addition, Clean Energy Works relies upon and leverages Energy Trust incentive dollars and the loss of such funds would most likely have detrimental impact on their business model and stability.

Impacts on the Electric Efficiency Portion of the Program: If Energy Trust were to eliminate most insulation measures for gas homes, it would negatively impact the efficiency and effectiveness of delivering those measures for electrically-heated homes, where the measures are cost effective.

Customer Engagement and Visibility: Energy Trust believes customer engagement in insulation and weatherization helps build awareness of the availability of other efficiency and conservation opportunities and services Energy Trust provides. These include no and low-cost improvements, efficient appliances, refrigerator and freezer retirement and replacement, solar energy opportunities, new home purchases and access to an array of business and other programs. It is difficult to quantify this impact, as customers sometimes take multiple years to move from one investment to the next and are influenced by many factors. However this channel remains a part of introductory and direct communication with customers about the comprehensive value of services Energy Trust provides.

The reasoning to continue to offer this broad portfolio of measures, including insulation measures, is as follows. For 35 years this region has offered energy-saving programs for

existing homes customers. As a result, residential customers are accustomed to looking to utilities and Energy Trust for assistance with saving energy and lowering their utility bills. The region is currently experiencing low energy prices of unknown duration, and challenging program economics from a utility perspective. However, customers are still looking to utilities and Energy Trust for energy-saving information, support and incentives regarding a wide range of efficiency options. Insulation measures are a major area of opportunity that interests customers for reasons of energy savings, and for other benefits that are discussed in Appendix A to this report. Customers will continue to have this expectation and Energy Trust believes that a Core Residential Program can meet those needs.

Initial thinking is that the level of outreach, contractor engagement and customer service with respect to this Core Residential Program would be significantly reduced, and with it, the program management costs.

The possibility of moving the equipment portion of the program (furnaces, water heaters, hearths) to an upstream approach can also be explored to reduce costs, working primarily through distributors to influence contractors, and through them, customer investments

Not all portions of the Existing Homes program are challenged for cost effectiveness. For this reason Energy Trust proposes that customer service as a basis for continuation is applied as a rationale where it is needed; largely for insulation measures. Other measures would remain outside of the Core Residential Program, including:

- Retain incentives for all cost-effective measures as part of the energy efficiency resource. This includes single family space conditioning and water heating measures, showerheads, aerators and manufactured home measures. These measures present a limited management burden to the program, so do not contribute significantly to the program-level Utility Cost Test issue

- Approve the proposed exceptions for manufactured home measures, gas ENERGY STAR water heaters, the pilot test for integrating air sealing with ceiling insulation, and solar water heaters under the UM 551 criteria discussed for each of those measures in this report.

Further details of what would constitute this Core Residential Program remains to be defined. Energy Trust will engage in discussions with the OPUC to define this approach through this cost-effectiveness docket. Given the timing, which is coincident with Energy Trust's 2015 budget development process, some of the details will also be considered there. These discussions will encompass the role of incentives, the appropriate level of program management, contractor engagement, training, quality control, customer assistance and promotion for this program. Discussions will also focus on the objective to move the gas program as a whole significantly closer to a UCT BCR of 1.0.

New Homes and Products Gas Measures

Table 12 presents the single gas measure in the New Homes and Products program that presents a cost-effectiveness issue and the proposed resolution.

Table 12. Measures in the New Homes and Products Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings	% of 2013 Program Savings	Future Resource Potential	Proposed Action
Builder Option Package with 0.67 water heater	0.6	1.1	2,176	0.02%	Small	Request exception under criteria B and C

The impact of reduced gas avoided costs on the New Homes and Products program measures is very small. One builder option package which is rarely applied is not cost effective. Energy Trust recommends applying exception criterion C.

Exception Criterion C: For consistency with other programs in the region.

Existing Buildings Gas Measures

Table 13 presents the measures in the Existing Buildings program, including Existing Multifamily measures, with a TRC BCR of less than 1.0, along with recommendations for each. For 2013, these measures supplied 7 percent of the total gas savings for the program. Following the table is a brief description of each measure and proposed actions.

Table 13. Gas Measures in Existing Buildings Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings	% of 2013 Program Savings	Future Resource Potential	Proposed Action
Select Custom Projects	0.7-0.94	>1	109,645	6.5%	Moderate	Require TRC and UCT >1. Or if site- specific UM 551 criteria fit, propose a site-specific exception.
Condensing Tank Water Heaters in low-use facilities	0.4	>1	3,509	0.2%	Low	Reworked. Cost-effective on average, no exception needed.
Convection oven	0.8	4.7	5,436	0.4%	Low	Reworked with better cost data. No exception needed.
Dishwasher, office ENERGYSTAR residential*	0.8	2.0	2	0	Low	Remove in 2015
Multifamily Ceiling insulation	0.4	1.2	205	0.02%	Low	Continue under Core Residential Program (as described in section 1b, below)
Multifamily Wall Insulation	0.4	1.3	94	0.01%	Low	
Multifamily Floor Insulation	0.3	1.1	92	0.01%	Low	
Multifamily Duct insulation	0.3	1.0	6	0.004%	Low	
Multifamily Windows	0.2	1.3	2,020	0.1%	Moderate	Request exception under criterion A

TOTAL		121,008	7%	

Select Custom Projects

During 2013, Existing Buildings custom projects with a TRC BCR >0.7 were approved for incentives on an interim basis to limit market disruption. 6.5 percent of the program annual therm savings came from custom projects with TRCs less than 1.0. Many of these are a combination of controls and other hardware for heating. During review of the project types and market segments impacted, no real trends lending themselves toward UM 551 exception criteria were revealed. Starting in 2015, all custom projects will be required to have a TRC BCR >1 for an incentive offer. For those projects that do not pass these criteria, Energy Trust would work with the contractors to re-engineer lower-cost packages to pass the test.

If there are specific, significant non-energy benefits or other circumstances that fit UM 551 exception criteria, Energy Trust could in the future propose a project-specific exception under the custom exception procedures discussed in Section 5 of this paper.

Condensing Tank Water Heater

Water heater measures are in the process of being updated in accordance with the 2014 code update, which will reduce both savings and incremental cost. These measures are cost effective in high-water use building types such as restaurants, lodging and laundry facilities. The program will claim a weighted average savings based on the building types that have installed this measure in 2013. The weighted average is cost effective. Program marketing materials and staff will inform participants that lower savings can be achieved in facilities with low to moderate hot water use, but not restrict participation for particular market types. This consistency in program delivery approach will lessen the possibility of customer confusion. In general, most existing businesses know if they don't use much hot water and will not be interested in the measure based on their use. Based on 2013 program activity, just 0.2 percent of savings resulted from condensing water heat at low-use sites.

Because it is typical to judge a prescriptive incentive on average savings, it is Energy Trust's recommendation to continue this measure without an exception.

Commercial Convection Ovens

ENERGY STAR electric convection ovens, both full and half size, are borderline cost effective when using updated avoided costs. As part of the gas cost effectiveness review, Energy Trust is in the process of reconsidering the cost assumptions for all commercial cooking equipment measures and has evidence that the equipment is less costly than assumed.

It is Energy Trust's recommendation to continue offering convection ovens through 2014 and update the measures as needed for 2015.

Dishwasher, ENERGY STAR for Offices

This measure was modeled based on a previous offer for residential dishwashers in the New Homes and Products program that has since transitioned away from these products. Providing this incentive for offices has been a nice extension for participants. However, this offer has been sparsely used, with no uptake in 2013. The measure is no longer cost effective.

Without a clear link to an exception justification, it is Energy Trust's recommendation to remove this measure for the Existing Buildings, Multifamily and New Buildings programs in 2015.

Multifamily Insulation

Similar to single family insulation measures in the Existing Homes program, ceiling, wall, floor and duct insulation in the Existing Multifamily program are also not cost effective, with TRC BCRs ranging from 0.3-0.4. Just 0.3 percent of 2013 Existing Multifamily program savings were related to gas weatherization measures. However, while the investment decision may be quite different for multifamily compared to single family with the building owner assuming the cost of the tenant improvement, the non-energy benefits of weatherization in a living space are similar between the two programs. Both comfort and noise improvements are widely recognized as being significant. Also, building owners may enjoy the benefits of having a more desirable property for tenants, resulting in potentially lower turnover, higher rents and the ability to promote lower energy costs to prospective renters.

Energy Trust's recommendation is to be consistent with the treatment of these measures across the Existing Homes and Existing Multifamily programs, and to consider these measures as part of a Core Residential Program.

Multifamily Window Retrofits

Windows in the multifamily market are a retrofit measure with an existing condition baseline. Multifamily window replacements have long been recognized for the non-energy benefits they provide for building owners and tenants. Surveys of multifamily property owners suggest that few window projects would take place without Energy Trust incentives.[14] Since 2010, Energy Trust has calculated non-energy benefits of multifamily windows based on a proxy. Surveys of property owners indicated that the primary reasons for window retrofits included non-energy benefits, such as increased property value and aesthetics. However, it is difficult to quantify those benefits. This measure meets the threshold previously employed for the use of proxy calculation of non-energy benefits, as they are clear, significant, but difficult to quantify. Windows provided just 0.5 percent of the Existing Multifamily program savings in 2013, but were a significantly larger share in Energy Trust's early years. Volumes dropped significantly with the redesign of state tax credits. Multifamily windows have a TRC BCR of 0.2 without application of a proxy and without inclusion of state tax credits. Energy Trust has been offering multifamily window replacements based upon exception criterion A for non-energy benefits.

Energy Trust proposes that multifamily window replacement measures be included in the program based on the recognition of significant non-energy benefits.

Exception Criterion A: measure produces significant non-quantifiable non-energy benefits

New Buildings Gas Measures

Table 14 lists all measures within the New Buildings program, including new multifamily, major renovations and tenant improvements, with a TRC BCR <1.0. For 2013, these measures supplied 4.6 percent of the total gas savings for the program. Following the table is a brief description of each measure and Energy Trust's proposed action.

[14] This belief is supported by Energy Trust market research and evaluations. Research also tells us the opposite for single family windows. For single family we do not influence many decisions to purchase new windows, but do influence the efficiency of the window purchased.

Table 14. Gas Measures in the New Buildings Program with Cost-Effectiveness Issues

Measure	TRC BCR	UCT BCR	2013 Savings	% of 2013 Program Savings	Future Resource Potential	Proposed Action
Air to Air heat exchangers	0.5	6.1	4,264	0.9%	Low	Removal in 2015
Commercial vent hoods w/VSDs	0.2	>1	2,804	0.6%	Moderate	Request exception under criterion D
Condensing Tank Water Heater	0.4	1.8	12,042	2.4%	Moderate	Building-type specific offers. Request exception under criterion D for schools
Condensing Unit Heater for non-Multifamily	0.5	>1	273	0.06%	Low	Rework to suit specific building types
Gas convection ovens*	0.8	4.7	2,114	0.4%	Low	Rework with updated cost data
Demand control ventilation	0.6	>1	1,007	0.2%	Low	Removal in 2015
Dishwasher, res, office *	0.8	2.0	0	0	Low	Removal in 2015
Market Solutions air barrier elective (gas)	0.8	4.5	0	0	Moderate	Request exception under criteria D,E
Market Solutions "Very Best" package (gas radiant)	0.8	2.1	0	0	Moderate	Request exception under criteria A,B,E
Market Solutions Multifamily "Good to Better" and "Better to Best" package increments	0.6	1.0	0	0	Moderate	Request exception under criterion D
Market Solutions tankless water heater in Offices	0.8	>1	0	0	Moderate	Rework to suit code changes. Request exception under criterion D
TOTAL			22,504	4.6%		

*description and proposed actions addressed under Existing Buildings program

Air to Air Heat Exchangers

Most projects using heat recovery go through the Special Measures track rather than the use this prescriptive measure. The Special Measures track is a semi-custom track where measures are evaluated in the context of a specific building and are tested for cost effectiveness in each application. Heat recovery is impacted by code updates and this measure will need to be reevaluated with a new code baseline.

The measure will be a part of the HVAC calculator only through the end of 2014, and will be offered only as a custom measure in 2015. The cost-effectiveness qualification will be a UCT and TRC BCR of 1.0 or greater, moving forward. This measure may be reinstated as a prescriptive measure if it is cost effective with a new baseline.

Commercial kitchen vent hood (schools, restaurants, and groceries), 2 and 2.5 HP variable speed drives (VSDs)

This particular application of variable speed drives saves both electricity and gas, because it influences the exhaust rate from spaces that are often gas-heated. Energy Trust currently offers incentives for vent hoods with a range of VSDs including those for 0.5 and 1.0 HP motors. While most pass the TRC, the 0.5 and 1.0 motor VSDs do not. Other sizes have in the past been cost effective. These smaller motor VSDs were included for ease of implementation and interpretation in the marketplace. For the same reason, it is requested that the 2 HP and 2.5 HP sizes remain eligible for incentives. Of 50 vent hoods incentivized in 2013, the average HP rating is around 3.6, which means that most are cost effective. This falls within the UM 551 exception criterion D and will help to increase participation in a cost effective program. The horsepower sizes for commercial vent hoods typically range from 2 to 5 HP with most projects using 3-5 HP. Size 2 and 2.5 HP units are not cost effective but see limited uptake and are a part of a range of sizes available.

Because each size is one specification within a range of sizes that are cost effective, Energy Trust proposes that these measures continue to be included for consistency in the market with other cost effective equipment sizes. This is consistent with UM 551 exception criterion D.

Exception Criterion D: Inclusion of this measure will increase participation in the program.

Condensing Tank Water Heater

Water heater measures are in the process of being updated in accordance with the 2014 code update, which will reduce both savings and incremental cost. These measures are cost effective in high-hot water use building types such as restaurants and laundry facilities, but are not cost effective in low water use buildings. Beginning in 2015, the program will claim savings for this measure separately based on building type, and will exclude the lowest saving buildings from the offering. This is a different approach than will be used for this measure in the Existing Buildings program due to differing outreach models between the programs. The only building type that remains of concern is schools. Condensing tank water heaters were not cost-effective in 2013 in schools because a number of water heaters went in new schools with limited hot water use. Energy Trust proposes to perform more outreach to designers and developers to explain the situations where the extra cost is justified by the savings. These higher hot water use situations include high schools with locker room facilities and full service cafeterias. With this more targeted approach to higher use sites, Energy Trust expects the average cost-effectiveness in schools to improve.

This is consistent with UM 551 exception criterion B.

Exception Criterion B: Inclusion of the measure will increase market acceptance and is expected to lead to reduced cost of the measure.

Condensing Unit Heater for Non-Multifamily Buildings

Condensing unit heaters are not cost effective for many building types. They are not a common HVAC choice, often limited to warehouses and other large open non-ducted spaces.

Energy Trust intends to rework this measure to better align it with a similar Production Efficiency measure. It will be removed from buildings where it is not cost effective.

Demand Control Ventilation (DCV)

Most projects using DCV go through the Special Measures track rather than use this prescriptive measure. The Special Measures track is a semi-custom track where measures are evaluated in context of a specific building and are tested for cost effectiveness in each

application. Heat recovery is impacted by code updates and this measure will need to be reevaluated with a new code baseline.

The measure will be a part of the HVAC calculator through the end of 2014 and will be offered only as a custom measure, and only where cost-effective, moving forward.

Market Solutions Measures

Continuation of Existing Exceptions

In October of 2012 the OPUC granted an exception[15] to the New Buildings program to offer the following non-cost effective measures which were part of combined gas and electric measure packages offered as "Market Solutions" for small new buildings: radiant heating and cooling in offices, air barriers in offices, fan static pressure reduction in offices and retail, and phantom plug load reduction in offices. Lower avoided costs have dropped the cost effectiveness of these electric and gas measures further, while the long lead time for new construction projects has not allowed enough volume of these measures to either influence cost reductions through market activity or better understand costs of new technologies.

The measures that are part of the Market Solutions package are currently under review due to new code adoption, and there may be changes to the savings or costs of these measures as a result of that work. However, at this time Energy Trust expects the measures included in this offer may continue to not be cost effective for the next few years. Energy Trust has already proposed continuing the electric measures under a separate report to OPUC staff. Energy Trust proposes to continue the exceptions for gas measures. For reference, the two specific gas exception categories linked to each measure from the 2012 exception are provided here.

Market Solutions—Air Barriers in offices elective

As Market Solutions gains greater market acceptance, this measure is important to have from the beginning to combine with other measures for the following reasons: (1) to increase the potential for mechanical system downsizing, which could lower costs, possibly rendering the measure cost-effective on a net cost basis, and (2) because with market acceptance the cost will decline (or be found to be lower than our initial estimate). Energy Trust will revisit the measure within two years to assess how costs evolve.

Exception Criterion D: Inclusion of this measure will increase participation in the program, specifically the "Best" track.

Exception Criterion E: The package of measures cannot be changed frequently and the measure will be cost effective during the period the program is offered

Market Solutions—Radiant heating and cooling in offices under the "Best" Track

Projects looking to significantly reduce HVAC system energy consumption must consider de-coupling the heating and cooling system from the ventilation system and a radiant floor is one way to do that. Energy Trust has started to see radiant floors or panels in innovative projects

[15] OPUC Docket No. 1622. October 9, 2012.

with aggressive energy goals. About 30 to 40 percent of the buildings in the Path to Net Zero pilot installed radiant systems in office and school buildings. The cost for radiant heating and cooling can vary significantly. With increasing market acceptance, we expect the installation cost to moderate and become cost effective on average. In addition, there are known significant non-energy benefits associated with this measure that are hard to quantify such as increased leasable space and increased floor to ceiling height resulting in potential for increased rent. As the initiative continues, it's important to have an offer in the market that won't change often and includes promising core measures that have a good opportunity to become cost effective over the next two years.

Exception Criterion A: Measure produces significant non-quantifiable non-energy benefits

Exception Criterion B: Inclusion of the measure will increase market acceptance and is expected to lead to reduced cost of the measure

Exception Criterion E: The package of measures cannot be changed frequently and the measure will be cost effective during the period the program is offered

Newly Impacted Market Solutions Measures

The cost effectiveness testing of the Market Solutions bundles is complicated by the 2014 commercial building code update which will change the baseline, savings, costs, and therefore cost effectiveness of many measures within these bundles. All of the Market Solutions packages will need to be updated because of the code change impacting 2015 programs. Code increases to shell and HVAC measures will have a ripple effect through these bundles and even the measures not directly affected by the code change must be reanalyzed. Energy Trust proposes keeping all these measures in the current packages at this time since the packages are slated to be updated next year for the code change and updating the packages twice in a short time span is labor intensive and potentially disruptive to the market. The two exceptions proposed below are new based on analysis to-date. Further analysis may result in additional exception requests in the future.

<u>Market Solutions—Multifamily (gas heat) increment between "Better to Best" and "Good to Better"</u>
For each market segment, the more energy efficient packages are intended to push the market higher and to encourage selection of "Best"- the most efficient package. Along the way, the Good to Better and Better to Best increments for Multifamily do not appear to provide *incremental* cost effective savings for the *incremental* cost. When these Better and Best packages are compared to the code baseline, they do pass. Energy Trust tests the increment of the "tiers" for all tiered measures to see if the next step is incrementally better for the participant. In these cases, the incremental BCRs are 0.94 and 0.64, close to 1.0 but economically slightly worse off than the first step.

New Building's multifamily offerings are affected by the 2014 code change. Particularly, new requirements for shell and water heating efficiencies will cause all tiers of the bundles to be re-evaluated and perhaps redesigned. The program expects the increments between the tiers to be cost-effective in the future. However, it is possible that the increment will be slightly less than 1.0 due to the complexity of designing the bundles.

Energy Trust recommends keeping the current offering while the updates are in progress and if necessary to accept future borderline cost effectiveness for otherwise cost-effective bundles in alignment with UM 551 exception criterion D.

Exception Criterion D: Inclusion of the measure helps to increase participation in a cost-effective program

Market Solutions—Tankless water heat in offices. Tankless water heaters are cost effective in most building types. However, they're not cost effective as modeled in the office market solutions offering.

Energy Trust recommends keeping the current offering while the updates are in progress and if necessary to accept future borderline incremental cost effectiveness for otherwise cost-effective bundles in alignment with UM 551 criterion D.

Exception Criterion D: Inclusion of the measure helps to increase participation in a cost-effective program

4. Streamlining Approval for Prescriptive Measure Exception Process

Prescriptive measures or bundles of measures are measures that have a fixed value or formula for savings, and a fixed value or formula for incentives. They are approved as cost effective based on typical or average conditions, derived from engineering studies and, when available, evaluation results. Prescriptive bundles of measures are approved in situations where combining measures has technical or marketing advantages. Some are approved for mass market adoption, while others are approved for pilot efforts, to better understand costs and savings, refine delivery systems and/or improve the technical products.

Energy Trust incorporates hundreds of new prescriptive measures and bundles in programs each year, representing dozens of distinct technologies in a range of settings and sizes. The OPUC has directed Energy Trust to request approval whenever these new measures are not cost effective based on a simple TRC calculation but appear eligible for exceptions under the categories listed in UM 551. This includes pilot efforts to learn or improve cost effectiveness, but where cost effectiveness is not expected at the start.

The OPUC currently uses a two-pronged approach when considering such exceptions:

a. Minor exceptions requests, where the size and scope are limited, are reviewed and may be approved by OPUC staff. Energy Trust has an excellent working relationship with OPUC staff regarding these exceptions, and appreciates this channel. This approach has made it possible to address time-sensitive opportunities and has reduced the number of exception requests going to OPUC Commissioners.
b. Major exception requests, where requests for exceptions go to staff and then to the Commission. This docket is an example.

As new efficiency technologies, opportunities and ideas arise, there will likely be more UM 551 exceptions. Some will be time-sensitive with respect to market opportunities and Energy Trust's progress toward energy savings goals. Retaining a timely and efficient process to address exceptions on an ongoing basis is important to achieving utility IRP targets for energy savings.

Energy Trust fully understands that it is the OPUC's purview, role and responsibility to consider and grant UM 551 exceptions. Through the experience gained by working with OPUC staff, Energy Trust has identified opportunities where administrative changes to the review process could simplify both Commission and OPUC staff roles, while at the same time reducing delays, management time and costs at Energy Trust. Here are some suggestions for consideration:

- Maintain the two processes described above, and ***more clearly describe the difference between "minor" and "major" exceptions***.
- Have the OPUC elect to ***not review or require formal exceptions for limited-duration pilot activities***. Energy Trust has a well-established pilot process for assuring that the term "pilot" is only used where there is a research design to assess results, and a high enough priority to dedicate resources from the several Energy Trust business groups that must support a pilot. Energy Trust believes the OPUC can influence the overall innovation process through comments on Energy Trust's strategic plan, action plan and budget, and also through establishment of Energy Trust's annual minimum performance measures. OPUC's decision regarding this recommendation could specify that pilots must have approved business briefs and pilot and evaluation plans completed in accordance with Energy Trust's pilot process.

5. Streamlining Approval for Custom Measure Exception Process

Custom measures are efficiency measures where savings, costs, cost-effectiveness, and in some cases incentives, are determined based on a site-specific calculation. For a specific class of custom measures (e.g., customized controls on existing commercial buildings, or custom lighting for new buildings) some projects at specific sites may have a TRC value greater than 1.0 while other sites with the same measures may have a TRC of less than 1.0. Among custom measures there are some specific situations which meet the criteria for UM 551 exceptions. However, due to the site-specific technical analysis, the multiple communication levels between the OPUC and the site project analysis team[16], and the required speed of decision-making, Energy Trust has never requested an exception for an individual custom project.

Several years ago Energy Trust implemented the Path to Net Zero pilot for new buildings with advanced efficiency goals. Approval was provided by Energy Trust planning staff, based on UM 551 exception criteria, for measures where more was needed to be learned about costs and savings or where it was assumed that further applied experience, market familiarity, and volume would lead to cost effectiveness. This occurred during a period where staff communications with the OPUC were less robust due to OPUC staff transitions. Once OPUC staff clarified their need to review all exceptions, this process stopped.

The Path to Net Zero Pilot was highly successful in demonstrating the feasibility of advanced building design practices to save energy. This success was in part facilitated by the ability to identify and approve appropriate exceptions based on UM 551 criteria with a single phone call and email documentation to a planning engineer describing the measures. The Energy Trust engineer and program staff were well trained in applying the UM 551 exception criteria.

[16] Typically a request for an exception must go through numerous staff at Energy Trust, its program implementer and the OPUC.

Energy Trust believes that innovation in new building design, deep retrofit, and in some cases industrial process design can be aided through refined procedures for applying UM 551 exceptions for custom projects. Energy Trust offers the following process suggestions for OPUC consideration:

- In some cases Energy Trust can identify pilots for promising custom measures prior to when opportunities arise in specific building design. Energy Trust could create a list of measures where further experience can help identify costs and savings, and/or further practical experience is likely to lead to increased savings and lower costs. The list would be necessarily limited because the program would need to commit to an evaluation plan for the measures. Energy Trust could use this list to request an OPUC exception covering the measures on list. If the OPUC approved this list, exceptions could be pre-arranged in advance of the press of construction schedules. This could address some, and not all opportunities for exception, without any administrative or rule changes from the OPUC.

- For other situations, Energy Trust recommends a process that emulates the successful experience with the Path to Net Zero program approach, permitting Energy Trust planning staff to review and approve custom project exceptions. One suggested modification would be to provide the OPUC staff with a structured process for reviewing what exceptions Energy Trust made quarterly, and for OPUC staff to provide guidance as experience is gained. Based on the quarterly reviews, OPUC staff could also decide to take this authority back from Energy Trust.

- Other ideas have been offered as part of the bundling docket which is underway simultaneously with this docket, to align the cost-effectiveness determination process with the building simulation and design process. If those concepts are not addressed in the bundling rule, they could still be considered in this docket. They include:
    - Measures may be analyzed for cost effectiveness as part of a bundle if the individual savings or costs are difficult to quantify and they constitute less than 30 percent of the incentives for the bundle.
    - Bundling provisions should apply to one-time simulations of energy efficiency measure packages used to qualify bundles for prescriptive incentives for many sites.

6. Inclusion of Hedge or Risk Mitigation Value in Estimating Avoided Cost Forecasts

In integrated resource planning for electric utilities, a value is included for efficiency resources to reflect the avoided risk of high load/high power price scenarios where underinvestment in efficiency has a high penalty, compared to the low penalty for over-buying efficiency in a low load/low price scenario. The Northwest Power and Conservation Planning Council's version of this factor incorporates other efficiency values too, including the impact of efficiency on the marginal cost of power.

There is no current estimate of this value for gas. For perspective, the electric risk avoidance factor currently used in Energy Trust avoided electric costs is 16 percent of the forward market prices when evaluated over the portfolio resource weighted average measure life of 12 years. Massachusetts efficiency programs offer another point of reference on gas risk avoidance value. They cite a 2000 Lawrence Berkeley National Laboratory study on the hedge value of

renewable resources in a portfolio which equated to $0.76/MMBTU, roughly 19 percent of the forward market value used in Energy Trust's current gas avoided costs.

NW Natural has committed to examining this issue as part of their 2015 IRP. Until the gas value is analyzed, Energy Trust suggests that the OPUC direct Energy Trust to add a percent value to the estimated benefits from gas efficiency measures. The OPUC may also consider the absence of this value in granting exceptions or proxies. This proposed adder is not an estimate of the value, but simply a provision to avoid premature program changes until the value is considered.

APPENDIX A

DISCUSSION OF PARTICIPANT NON-ENERGY BENEFITS FROM WEATHERIZATION OF EXISTING HOMES

This appendix:

- Describes the participant non-energy benefits that may occur with weatherization
- For Existing Homes weatherization measures, recommends a focus on a short list of benefits for deeper consideration
- Explains why certain benefits were recommended
- Reviews the evidence for non-energy benefits in homes

Introduction

Participant non-energy benefits are, by definition, enjoyed primarily by the participant and not by the utility system or by society as a whole. For residential shell measures, including insulation, windows, air sealing and duct sealing, this category of benefits includes comfort, noise attenuation, benefits to health as a consequence of reduced drafts and reduced mold problems, increased property values, and an overall belief or feeling that a house is a “quality home”. Many of these benefits are difficult to quantify.

There are difficult to quantify non-energy benefits associated with other efficiency measures and other types of customers beyond residential, such as insulation or cooling system commissioning in commercial buildings. In discussing these benefits, Energy Trust is focusing on the home shell measures because many are not cost-effective for gas homes based solely on energy savings, together they constitute a significant amount of savings, and Energy Trust believes that the benefits are clearly significant. Energy Trust may seek further exceptions on this basis if similar issues arise for other measures in the future.

What makes these non-energy benefits difficult to quantify is the variation in value from home to home, person to person and study to study. Perceived comfort may be high in one home and low in another prior to weatherization. One participant can perceive very different values from the same measure as another participant. The analysis required to attempt to assign values is costly, and experience elsewhere has shown that different studies arrive at widely divergent valuations. This is not to say that the values are not important and, for many participants, high. But they are difficult to quantify.

Energy Trust already considers non-energy benefits that can readily be quantified in the TRC. Examples include water, detergent, and municipal waste treatment savings from washing machines and reduced replacement costs from longer-lived lights. To give a sense of magnitude of non-energy benefits’ influence, in 2012, 22 percent of the total benefits in the TRC for the residential sector were from these specific quantifiable non-energy benefits. These benefits help raise the overall TRC BCR for the programs and portfolio. However, these benefits do not apply to the gas home shell measures, which are currently experiencing difficulty passing cost-effectiveness tests.

While UM 551 provides for consideration of difficult-to-quantify non-energy benefits, there is not currently an arrangement between Energy Trust and the OPUC regarding how this could be done in the case of shell measures and their specific benefits. If the Energy Trust cannot consider these benefits, the TRC is employed in a way that is “asymmetric”—meaning that all

costs to the consumer are considered, but not all benefits. Those participant benefits could be considered in the cost effectiveness review for the measures through application of exception criterion A of UM 551, citing significant non-energy benefits that cannot be quantified.

Participant Benefits to Consider in Measure Cost Effectiveness of Home Shell Measures

Energy Trust suggests that a subset of non-energy benefits for Existing Homes shell measures receive primary consideration because they are widespread, clearly understood, distinctly positive, and do not overlap with efficiency value. These are comfort and reduced noise benefits of insulation and air and duct sealing.

Though other benefits may also remain important drivers for consumers, each has ambiguity or lack of clarity when it comes to quantifying how important these factors were in motivating decision-making and action. These include health benefits, property values and quality of service and installation. Each is discussed further below.

- ***Health benefits***. While properly sealing a home and/or ducts can reduce drafts, and in some cases mold problems, it also may increase exposure to indoor pollutants by reducing air changes. Because conditions in homes vary, Energy Trust expects that the potential positive and negative impacts vary by home. Energy Trust has not seen thorough, balanced research specific to homes in the Northwest's distinctive damp, mild winter climate to understand the relative magnitude of each effect across a wide variety of homes, and to undertake this research would be a significant investment. As a consequence, Energy Trust is hesitant to emphasize this value or judge whether the aggregate impact on health is more negative or positive. The research most often cited on health impacts is from New Zealand, and for low-income households[17]. Energy Trust acknowledges that the health benefits are likely most pronounced for low-income households. However, weatherization services for this customer group are primarily provided through Housing and Community Services and CAP agencies and funded through channels separate from the OPUC and Energy Trust.

- ***Property values.*** While property values may be an important market motivator for efficiency, from a cost-effectiveness perspective they are neither a distinct non-energy benefit, nor a very reliable tool to estimate the value of non-energy benefits. Property values improve after efficiency investments in part because the buyer is purchasing the energy efficiency investments in the home. This is a way that the energy savings benefit is reflected in markets. Property value increases may additionally reflect other end-values, including those discussed elsewhere in this section. However, it is analytically difficult to parse out the increase in property values due to energy savings compared to other drivers.

- ***Service.*** Some customers value a contractor who provides a higher-than-typical level of analytic, communication, and project facilitation services that simplify project execution and completion. Such services are offered by Home Performance with ENERGY STAR contractors in general and Clean Energy Works in particular. Other contractors also take pride in their level of service, and Energy Trust quality control reviews and evaluations assure a good level of quality for the program as a whole. Some customers also place

[17] https://www.iea.org/publications/insights/insightpublications/name,26319,en.html

high value on referral to one or a few contractors. These as important marketing or sales approaches that reduce market barriers by increasing customer confidence and ease of participation. However, they are not efficiency benefits, per se, but aspects of program design to make participation easy and effective.

Estimates of Non-Energy Benefit Importance and Value

To summarize this section, attempts by Energy Trust to ascertain the importance of these values in efficiency investment decisions have shown that non-energy benefits are a significant consideration for many households. It is, however, not clear from the research whether, or the degree to which, they play a major role in driving investment decisions.

Energy Trust assessed the role of participant non-energy benefits in two independent third-party evaluations of residential retrofit programs, the Home Performance with ENERGY STAR Process Evaluation (2011) and the Existing Homes Process Evaluation (2012). Non-energy benefits were assessed through surveys of program participants; the questions asked of respondents were slightly different between the two surveys.

In the evaluation of the Home Performance program, 30 respondents were asked what non-energy benefits they expected before completing the home improvements, what they experienced after the work was performed, and whether those benefits were more important than reduced energy bills in motivating them to make the improvements. Most respondents expected and experienced a change in the comfort of their home, their environmental footprint, and their ability to pay their energy bills. Of the non-energy benefits listed by the interviewer, comfort was most commonly cited by participants (93% of all respondents), followed by ability to pay bills (70%), environmental impact/carbon footprint (60%) and health/indoor air quality (43%). 73 percent of respondents said that the energy savings were more important than non-energy benefits in leading them to make the improvements; 27 percent said that the non-energy benefits were the more important factor.

For the survey of Existing Homes participants, questions allowed for more variation in the "size" of participant non-energy benefits, and only asked about what was actually experienced after installation, rather than what was originally expected or motivated the measure installation(s). Of the 453 respondents, 92 percent reported that the sum of all the non-energy benefits (both positive and negative from the participant's perspectives) were positive; 22 percent said the value of the non-energy benefits was of the same value to them as the energy savings and 64 percent said that the non-energy benefits were more valuable than the energy savings. Of the non-energy benefits listed "resident satisfaction" was cited most often by respondents (87%)[18], followed by comfort (82%), equipment performance (78%), ease of selling home/home value (75%) and "environmental effect" (70%). There were several other benefits cited less frequently as well. The survey results were unable to show if benefits motivated customers to act more or less than the expected energy savings.

Energy Trust concludes that: (1) most consumers retrofitting existing homes consider non-energy benefits to some degree, and (2) the strength of the motivation (did this really influence their investment decision) and the proportion of consumers who are so influenced is not clear.

[18] Energy Trust is not sure what this means; appears to encompass everything.

Similar survey efforts have been undertaken elsewhere and are numerous and diverse in their findings. One of the most exhaustive efforts to look at non-energy benefits occurred in Massachusetts. After conducting an extensive study and looking at a range of evidence, Massachusetts arrived at the estimates shown in Table 1 for the values of several benefits across a range of residential home retrofit programs, including low-income, and business programs.

Table 1. Estimates of Value of Non-Energy Benefits in Massachusetts.[19]

Example NEB	Annual Per Participant Value
Thermal Comfort	$4-$125
Noise Reduction	$1.42-$40
Health Benefits	$0.13-$19
Safety	$45.05
Improved Home Durability	$1.54-$149
Property Value Increase	$62.65-$1,998

In addition to these participant non-energy benefits, Massachusetts assigned one time values of $5.10/MMBTU or $0.04/kWh to increased economic benefit due to energy savings as well as a price hedging value of $0.76/MMBTU or $0.005/kWh. The source for the economic benefit is a 2009 Macroeconomic Modeling Assessment and the source for the hedge value is a 2002 paper from Lawrence Berkeley National Laboratory. Massachusetts program administrators currently include all these values in TRC tests.

The Massachusetts approach has the advantage of providing specific answers that are supported under a utility ruling. The disadvantages include the expense of the analysis and concern that the specific values are debatable, as various research provides different results. In Massachusetts, with strong regulatory support, the costs of study were covered by rates, and the assigned values have not been strongly challenged.

Non-Energy Benefits Covered in Oregon's TRC

Does Oregon's existing 10 percent conservation advantage already address difficult-to-quantify non-energy benefits? While it may be impossible to categorically answer that question, Energy Trust believes, based on the research described above, that many households place a higher value on difficult-to-quantify non-energy benefits than the 10 percent value would suggest.

Other states use different adders to address non-energy benefits in the TRC. Examples include:

- Fortis (British Columbia): 30 percent adder for low-income, 15 percent for other energy efficiency programs

[19] Massachusetts Program Administrators: Final Report - C&I Non-Energy Benefits, June 29, 2012

- Efficiency Vermont (Vermont): 30 percent adder for low-income, 15 percent for other energy efficiency programs
- Investor-Owned Utilities (Colorado): 20-30 percent

APPENDIX B

LIST OF COST EFFECTIVE GAS MEASURES BY SECTOR AND PROGRAM

Sector	Program	Measure Description	% of 2013 Savings
COM	Existing Buildings	Commercial Clothes Washer, Gas Water Heat	0.02%
COM	Existing Buildings	Condensing Tank	0.09%
COM	Existing Buildings	Custom Boiler	1.78%
COM	Existing Buildings	Custom Building Controls	5.32%
COM	Existing Buildings	Custom Building Controls DDC Tune-Up	0.20%
COM	Existing Buildings	Custom Demand Control Ventilation	0.02%
COM	Existing Buildings	Custom Gas	1.38%
COM	Existing Buildings	Custom Heat Recovery	0.32%
COM	Existing Buildings	Custom HVAC	2.88%
COM	Existing Buildings	Custom Other	0.59%
COM	Existing Buildings	Custom Thermostat	0.06%
COM	Existing Buildings	Custom VFDs	0.12%
COM	Existing Buildings	Domestic Tankless/Instanaeous Water Heater with Electronic Ignit	0.03%
COM	Existing Buildings	EIS for BPTaC	0.79%
COM	Existing Buildings	EMS for BPTaC	0.07%
COM	Existing Buildings	Gas Fryer	3.75%
COM	Existing Buildings	Gas Steam Cookers	0.07%
COM	Existing Buildings	Gas-fired Condensing Boiler < 300 kbtuh 0.9 AFUE	0.02%
COM	Existing Buildings	Gas-fired Condensing Boiler > 2500 kbtuh 0.9 EC	0.74%
COM	Existing Buildings	Gas-fired Condensing Boiler >= 300 kbtuh, <= 2500 kbtuh 0.9 ET	0.95%
COM	Existing Buildings	High Efficiency Condensing Furnace	0.07%
COM	Existing Buildings	Insulation Attic Gas	0.45%
COM	Existing Buildings	Insulation Roof Gas	0.80%
COM	Existing Buildings	Insulation Wall Gas	0.13%
COM	Existing Buildings	Ozone Laundry Gas DHW	0.10%
COM	Existing Buildings	Pipe Insulation	0.07%
COM	Existing Buildings	Radiant Heating	0.17%
COM	Existing Buildings	Rooftop Unit Service - Add DCV Control & Thermostat	0.00%
COM	Existing Buildings	RTU Economizer DCV Control	0.87%
COM	Existing Buildings	RTU Tune Up DCV Control	0.09%
COM	Existing Buildings	Single Tank Conveyor - High temp - Gas hot water	0.01%
COM	Existing Buildings	Single Tank Door/Upright- Gas water heat	0.03%
COM	Existing Buildings	Steam Traps, Small Commercial, <12 hrs/day, small-med pressure	0.02%
COM	Existing Buildings	Tune up Complete RTU Package	0.08%
COM	Existing Buildings	Undercounter - high temp - Gas water heat	0.02%
COM	Existing Buildings	Vent Hood - Gas Heat	0.10%
COM	Existing Buildings Multifamily	1.0 gpm Bath Aerator Gas, Direct Install	0.36%
COM	Existing Buildings Multifamily	1.5 gpm Kitchen Aerator Gas, Direct Install	0.19%
COM	Existing Buildings Multifamily	Clothes Washer MEF >=2.0	0.00%
COM	Existing Buildings Multifamily	Clothes Washer MEF >=2.2	0.00%
COM	Existing Buildings Multifamily	Cold Water Detergent, Gas	0.00%
COM	Existing Buildings Multifamily	Commercial Clothes Washer, Gas Water Heat	0.01%
COM	Existing Buildings Multifamily	Custom Other	0.10%
COM	Existing Buildings Multifamily	Floor Insulation, Gas Heat $0.30 2013	0.00%
COM	Existing Buildings Multifamily	Gas Fryer	0.02%
COM	Existing Buildings Multifamily	Gas Furnace $150 Incentive	0.02%
COM	Existing Buildings Multifamily	MF Boiler Installation, Gas - Commercial Size	0.15%
COM	Existing Buildings Multifamily	MF Custom Gas	0.08%
COM	Existing Buildings Multifamily	Rim Joist Insulation/SQFT, Gas Heat 2013	0.00%
COM	Existing Buildings Multifamily	SF Tankless Water Heater, Gas	0.00%
COM	Existing Buildings Multifamily	Shower Wand Gas, DHW - Direct Install 1.5 gpm	0.87%
COM	Existing Buildings Multifamily	Showerhead, Gas DHW 1.5 GPM - Direct Install	0.62%
COM	Existing Buildings Multifamily	Water Heater, Condensing tnak Commercial size	0.01%
COM	Operations and Maintenance	Building Operator Certification	0.18%

RES	Products	1.5 gpm Showerhead	1.39%
RES	Products	1.6 gpm Showerhead	0.94%
RES	Products	1.75 gpm Showerhead	0.94%
RES	Products	2.0 gpm Showerhead	1.45%
RES	Products	2012 Low Income Lighting Kits w/ Kitch Aerator	0.77%
RES	Products	Low Income Lighting Kits	0.02%
RES	Products	MEF 2.4-2.59 Clothes Washer	0.05%
RES	Products	MEF 2.46 Clothes Washer	0.10%
RES	Products	MEF 2.6 Clothes Washer	0.15%
RES	New Manufactured Homes	Energy Star Mfg Home SPIF, Gas Only Z1	0.00%
RES	New Manufactured Homes	Energy Star Mfg Home SPIF, Gas Z1	0.01%
RES	New Manufactured Homes	Energy Star Mfg Home SPIF, Gas Z2	0.01%
RES	New Homes	Air Sealing	0.30%
RES	New Homes	EPS Homes	4.35%
RES	Existing Single Family	1.0 gpm Bath Aerator	0.88%
RES	Existing Single Family	1.5 gpm Bath Aerator	0.44%
RES	Existing Single Family	1.5 gpm Kitchen Aerator	0.05%
RES	Existing Single Family	1.5 gpm Showerwand	0.10%
RES	Existing Single Family	1.75 gpm Showerhead	1.87%
RES	Existing Single Family	2.0 gpm Kitchen Aerator	0.00%
RES	Existing Single Family	Cold Water Detergent, Gas	0.05%
RES	Existing Single Family	GAS Fireplace Intermittent Pilot Light	0.00%
RES	Existing Single Family	Gas Hearth .65-.69 FE	0.46%
RES	Existing Single Family	Gas Hearth .70+ FE	2.30%
RES	Existing Single Family	Living Wise Kit	0.92%
RES	Existing Single Family	MIT MT Gas Furnace AFUE 90+	0.02%
RES	Existing Single Family	SF Boiler Pipe Insulation/Linear FT	0.00%
RES	Existing Single Family	SF Direct Vent Gas Heater	0.00%
RES	Existing Single Family	SF Gas Boiler	0.03%
RES	Existing Single Family	Water Heater Set Back - Gas	0.00%
RES	Existing Single Family	Windows, U .26-30	0.89%
RES	Existing Single Family	Windows, U <= .25	0.43%
RES	Existing Single Family Home Perfor	Gas Furnace Early Retirement (5yrs or More Remaining)	0.64%
RES	Existing Single Family Home Perfor	Gas Hearth .65-.69 FE	0.06%
RES	Existing Single Family Home Perfor	Gas Hearth .70+ FE	0.00%
RES	Existing Single Family Home Perfor	SF Gas Boiler	0.00%
RES	Existing Single Family Home Perfor	Windows, U .26-30	0.01%
RES	Existing Single Family Home Perfor	Windows, U <= .25	0.12%
COM	New Buildings	Aerator Bathroom, Gas 0.5 gpm	0.03%
COM	New Buildings	Aerator Bathroom, Gas Only 0.5 gpm	0.01%
COM	New Buildings	Aerator Kitchen, Gas 1.5 gpm	0.00%
COM	New Buildings	Aerator Kitchen, Gas Only 1.5 gpm	0.01%
COM	New Buildings	Clothes Washer, MEF >=2.46, In-Unit, Gas DHW	0.00%
COM	New Buildings	Code Assistance	0.19%
COM	New Buildings	Commercial Clothes Washer, Gas Water Heat	0.01%
COM	New Buildings	Commercial Infrared Radian heaters, Modulating	0.03%
COM	New Buildings	Commercial Infrared Radiant Heaters, Non-modulating	0.08%
COM	New Buildings	Controls - Custom	0.02%
COM	New Buildings	CP - Office Enhanced	0.06%
COM	New Buildings	CP - School Enhanced	0.02%
COM	New Buildings	Custom	0.28%
COM	New Buildings	Custom Gas	0.04%
COM	New Buildings	Envelope - Shell - Custom	0.11%
COM	New Buildings	Gas Convection Oven - Full Size	0.04%
COM	New Buildings	Gas Fryer	0.35%
COM	New Buildings	Gas-fired Condensing Boiler < 300 kbtuh 0.9 AFUE	0.02%
COM	New Buildings	Gas-fired Condensing Boiler > 2500 kbtuh 0.9 EC	0.91%

COM	New Buildings	Gas-fired Condensing Boiler >= 300 kbtuh, <= 2500 kbtuh 0.9 ET	0.34%
COM	New Buildings	High Efficiency Condensing Furnace	0.04%
COM	New Buildings	High Efficiency Condensing Unit Heater	0.01%
COM	New Buildings	HVAC - Custom	2.64%
COM	New Buildings	HVAC, DCV, 2010 Code Calc	0.16%
COM	New Buildings	LEED - CS	0.00%
COM	New Buildings	LEED - NC	0.15%
COM	New Buildings	Market Solutions Package, Office, Good HVAC 2 Measures	0.00%
COM	New Buildings	Market Solutions Package, Retail, Better HVAC, No	0.06%
COM	New Buildings	Market Solutions, Grocery, Better, 15% Bonus	0.00%
COM	New Buildings	Market Solutions, Restaurant, Better, 20% Bonus	0.05%
COM	New Buildings	Market Solutions, Restaurant, Good, 10% Bonus	0.05%
COM	New Buildings	Shower Wand Gas DHW 1.5 GPM	0.02%
COM	New Buildings	Showerhead Gas DHW (Avg GPM)	0.05%
COM	New Buildings	Single Tank Conveyor - High Temp - Gas Only	0.01%
COM	New Buildings	Single Tank Conveyor, High Temp, Gas hot water	0.01%
COM	New Buildings	Single Tank Door/Upright - High Temp - Gas water heat	0.04%
COM	New Buildings	Single Tank Door/Upright - Low Temp - Gas water heat	0.05%
COM	New Buildings	Tankless/Instantaneous w/Electronic Ignition	0.05%
COM	New Buildings	Undercounter - high temp - Gas water heat	0.02%
COM	New Buildings Multifamily	Aerator Bathroom, Gas 0.5 gpm	0.60%
COM	New Buildings Multifamily	Aerator Bathroom, Gas Only 0.5 gpm	0.01%
COM	New Buildings Multifamily	Aerator Kitchen, Gas 1.5 gpm	0.21%
COM	New Buildings Multifamily	Aerator Kitchen, Gas Only 1.5 gpm	0.01%
COM	New Buildings Multifamily	Clothes Washer, MEF >=2.46, In-Unit, Gas DHW	0.01%
COM	New Buildings Multifamily	Clothes Washer, MEF 2.2-2.45, In-Unit, Gas DHW	0.02%
COM	New Buildings Multifamily	Code Assistance	0.06%
COM	New Buildings Multifamily	Commercial Clothes Washer, Gas Water Heat	0.03%
COM	New Buildings Multifamily	Condensing Tank	0.14%
COM	New Buildings Multifamily	Gas Fryer	0.01%
COM	New Buildings Multifamily	Gas-fired Condensing Boiler < 300 kbtuh 0.9 AFUE	0.01%
COM	New Buildings Multifamily	High Efficiency Condensing Furnace	0.02%
COM	New Buildings Multifamily	HVAC - Custom	0.20%
COM	New Buildings Multifamily	Market Solutions Package, MF, Better (3 Electives)	0.19%
COM	New Buildings Multifamily	Market Solutions Package, MF, Good	0.15%
COM	New Buildings Multifamily	Ozone Laundry Gas DHW	0.04%
COM	New Buildings Multifamily	Shower Wand Gas DHW	0.03%
COM	New Buildings Multifamily	Showerhead Gas DHW (Avg GPM)	0.36%
COM	New Buildings Multifamily	Single Tank Conveyor - High temp - Gas hot water	0.01%
COM	New Buildings Multifamily	Single Tank Door/Upright - High Temp - Gas water heat	0.02%
COM	New Buildings Multifamily	Tankless/Instantaneous w/Electronic Ignition	0.03%
IND	Production Efficiency	Custom Air Abatement	2.67%
IND	Production Efficiency	Custom Boiler	0.10%
IND	Production Efficiency	Custom Fan	0.07%
IND	Production Efficiency	Custom Gas Boiler	1.42%
IND	Production Efficiency	Custom Green House	2.05%
IND	Production Efficiency	Custom Heat Recovery	0.84%
IND	Production Efficiency	Custom HVAC	1.05%
IND	Production Efficiency	Custom O & M	0.14%
IND	Production Efficiency	Custom Primary Process	0.70%
IND	Production Efficiency	Custom Secondary Process	2.38%
IND	Production Efficiency	Domestic Tankless/Instanaeous Water Heater with Electronic Ignit	0.00%
IND	Production Efficiency	Greenhouse Controller	0.30%
IND	Production Efficiency	High Efficiency Condensing Boiler with Electronic Ignition	0.86%
IND	Production Efficiency	Infared Poly for Greenhouses	1.57%
IND	Production Efficiency	Insulation Attic Gas	0.02%
IND	Production Efficiency	Insulation Roof Gas	0.04%
IND	Production Efficiency	Insulation Wall Gas	0.01%

IND	Production Efficiency	Insulation Wall Gas	0.01%
IND	Production Efficiency	NCRAD, Radiant Heating, Modulating	0.19%
IND	Production Efficiency	Pipe Insulation	0.91%
IND	Production Efficiency	Radiant Heating, Non-Modulating	0.10%
IND	Production Efficiency	Solar Hot Water Measure	0.01%
IND	Production Efficiency	Strategic Energy Management	1.91%
IND	Production Efficiency	Thermal curtains for Greenhouses	1.28%
IND	Production Efficiency	Under-bench heating for Greenhouses	1.11%
COM	Strategic Energy Management	Custom O & M	0.21%
COM	Strategic Energy Management	SEM	6.58%
RES	Existing Single Family Pilots	OPOWER Personal Energy Reports	5.93%
COM	Existing Buildings Solar WH	Solar Pool	0.01%
RES	New Homes Solar WH	Solar Pool	0.02%
RES	Existing Homes Solar WH	Solar Pool	0.13%
RES	ETO Market Transformation - Existi	Market Transformation - Furnaces	0.49%
COM	ETO Market Transformation - NBE	Market Transformation - 2010 New Construction Code	0.79%
RES	ETO Market Transformation - New H	Market Transformation - 2008 building code change	5.10%
RES	ETO Market Transformation - New H	Market Transformation - 2011 Building Code Change	3.61%
RES	Existing Manufactured Homes	1.0 gpm Bath Aerator	0.00%
RES	Existing Manufactured Homes	1.5 gpm Bath Aerator	0.00%
RES	Existing Manufactured Homes	1.5 gpm Kitchen Aerator	0.00%
RES	Existing Manufactured Homes	1.5 gpm Showerwand	0.00%
RES	Existing Manufactured Homes	1.75 gpm Showerhead	0.01%
RES	Existing Manufactured Homes	2.0 gpm Kitchen Aerator	0.00%