



# COMMENTS OREGON UM1622

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September 15, 2014

Oregon Public Utility Commission  
3930 Fairview Industrial Dr SE  
Salem, OR 97302-1166

PO Box 1088  
Salem, OR 97308-1088

**RE: Second Round Comments –UM1622 Gas Cost Effectiveness Measures**

Commission Staff,

Clean Energy Works continues to appreciate the invitation for input on the important decisions before the Commission within Docket UM1622.

The public discussion around this issue has included significant of debate about the use of the Total Resource Cost (“TRC”) Test. However, Commission Staff has advised that discussions stay close to the matters of this docket. It has been emphasized that through the exceptions as provided via UM551, there are reasonable mechanisms in place to make good decisions on the issues before the Commission now.<sup>1, 2</sup>

Our organization is focused on deep single-family home energy retrofits. Consequently, our comments are limited to the home weatherization measures addressed in the docket.<sup>3</sup>

The Cost Effectiveness standard is used broadly across all customer classes and measures. However the scale, rationale and measurability vary significantly between commercial/industrial and residential efficiency purchasing decisions. While business investments can be understood primarily in terms of

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<sup>1</sup> Public Utility Commission of Oregon, Staff Report: Energy Trust of Oregon (Docket No. UM1611) : Request approval for exceptions of energy efficiency cost effectiveness guidelines, September 30, 2014

<sup>2</sup> Public Utility Commission of Oregon, Order 94-590, April 04, 1994

<sup>3</sup> Measures; Single family residential ceiling insulation , Single family wall insulation, Single family floor insulation, Single family duct insulation, Air sealing as added requirement for ceiling insulation

investment and return, homeowner purchases are motivated by a number of other factors including many direct and indirect benefits.

## **UM551 EXCEPTIONS**

The existing exceptions provided through UM551 show extraordinary anticipation of the issues we face on home weatherization measures in the docket.

### ***Exception A. - Produce significant non-quantifiable non-energy benefits.***

Largely considered the reference on cost testing, the California Standard Practice manual defines TRC as, “the measurement of the net benefits and costs that accrue to society, which is defined as a program administrator (usually a utility) and all of its customers.”

Oregon’s UM 551 states that the “TRC of a measure or program is the present value of retail revenue requirements plus the participants costs for the measure(s) including operating costs, less quantified non-energy benefits and cost savings.”

UM 551 further states that “a utility should calculate cost savings and other non energy benefits if they are significant and there is a reasonable and practical method for calculating them.”

It is quite clear that there are significant benefits beyond energy efficiency accruing to homeowners from their investments in weatherization. Stimulated in part by the attractive incentives at issue in this docket, thousands of Oregon homeowners have invested in deep energy retrofits of their own homes. In addition to energy savings their rationale includes comfort, noise reduction, safety, health, home value and more. Additional societal benefits include jobs, economic development, and greenhouse gas emission reduction.

In recent years multiple studies have been completed nationally to value non-energy benefits. As a resource for this docket, CEW, The Northwest Energy Efficiency Council & Home Performance Guild of Oregon, have commissioned a report to review the application of these studies to Oregon. The report is attached as an Exhibit to this submission.

Based on ratepayer provided values to non-energy benefits, the summary findings conclude that the 10% adder currently used to value non-energy benefits (NEBs) in Oregon falls substantially short. Further, the report demonstrates that consumers value these benefits across an extremely broad range. The Draft Staff Report<sup>4</sup> shows little appetite to quantify these benefits. We contend that research clearly indicates the NEB values are *significant*. And they can be quantified. If these significant NEBs are quantifiable, they should be quantified in context for Oregon. If not, the exception should be applied.

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<sup>4</sup> Public Utility Commission of Oregon, Staff Report: Energy Trust of Oregon (Docket No. UM1611) : Request approval for exceptions of energy efficiency cost effectiveness guidelines, September 30, 2014

***Exception B. May lead to market transformation and reduced costs.***

Eighty four percent of Oregon homes were constructed prior to 2000 and built to inefficient energy codes. The R2011 NEEA Residential Stock Assessment (RBSA) reports that substantial progress has been made in areas like ceiling insulation. The report also reveals that the vast majority of homes in Oregon suffer from draftiness and excessive heat loss. Oregon lawmakers have advanced new legislation like HB2801 and EEAST to help in the transformation of the building stock. Legislators and homeowners are signaling that they value efficient homes. Multiple listing services now allocate data fields for home ratings and home performance. It is more common to see energy use referenced in real estate listings. However, this market is not yet transformed. Broader participation is needed to before demand can function without incentive. Diminishing incentives at this time will stifle this transformation.

***Exception C. The measure is needed for consistency with other DSM programs in the region***

A unique characteristic of the residential ratepayer class is simply consumer behavior. Communicating with consumers and channel partners is a costly and challenging pursuit. The information gap between utility offerings and consumers is a well-accepted market challenge. With more than 40 power utilities and other interested entities in Oregon, sharp differences in utility programs has an impact on adoption and costs of delivering energy efficiency in homes. A significant decline in gas weatherization incentives will result in market confusion and increased administrative burden for all other measures affecting both fuel types. Policy should strive for consistency in residential efficiency programs regionally and across fuel types. The absence of which results in reduced adoption and higher costs.

***Exception D. Keeping the measure helps to increase participation in a cost-effective program.***

The loss of incentives for home and duct sealing and insulation (except ceiling) will have an immediate detrimental impact on both market capacity and demand.

Analyzing just our own case reveals that 99% of CEW gas projects in 2013 would have experienced reduced incentives without the current exception. Thirty eight percent of all gas projects would have received no incentive at all.

By our own analysis, we believe that, over the next four years, the loss in incentives may mean 5900 Oregonians may choose not to retrofit their homes. This 35% drop in expected deep retrofit projects would result in nearly 600 Oregon jobs lost or not created<sup>5</sup> and as much as \$70,000,000 in economic activity unrealized.<sup>6</sup>

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<sup>5</sup> Job creation: Historical CEW data indicates that for every ten projects, one worker gets hired. 5900 fewer projects / 10 = 590 jobs

<sup>6</sup> Economic development: Average project size (\$12,000) x 5900 projects (35% drop in forecast over the period 2015-2018) = \$70,080,000

Staff draft recommendations contend that, “By maintaining ceiling insulation (the most cost effective of the insulation measures) the relationships and communication lines between Energy Trust and weatherization contractors will be maintained.”<sup>7</sup> This view dramatically underestimates the impact on the contractor base.

From the 2011 NEEA Residential Stock Assessment we can assess that ceiling insulation is the measure of least remaining need in the state. The Assessment further reveals that some 300,000 homes in the state have less than R20 insulation, but 900,000 homes are excessively leaky, and 700,000 have insufficient wall insulation.

The impact is an effective reduction of nominal opportunities by a factor of 200% and revenue opportunities by more than as much as four times.<sup>8</sup> It simply breaks the back of the industry.

The Energy Trust findings show that the combined Existing Homes program is cost effective. Elimination of most measure incentives destroys the supply and demand currently present in the market. Eliminating the incentives lowers energy savings that can be achieved and raises the cost of acquisition of energy savings moving forward. Finally, it delivers an adverse economic impact to the State.

## **RECOMMENDATION**

Clean Energy Works respectfully submits that sufficient evidence has been delivered to the Commission to find that existing exceptions can apply to home weatherization measures as part of the Existing Homes program. Such a decision fits within the current allowable framework and is good for the State.

Oregon has a culture of conservation and there is momentum in the State across all utility customer classes and jurisdictions. Residential energy efficiency represents the largest class of service and 40% of the gas savings in the state. Residential energy efficiency delivers the highest return per dollar in Oregon energy acquisition, and the Commission is exceeding its own target by over 18%.

The Existing Homes program is cost effective at the program level, and the staff recommendation, if adopted, puts the brakes on energy efficiency deployment in Oregon and is simply unnecessary.

## **FUTURE OF ENERGY EFFICIENCY POLICY**

As we have worked on this docket we have come to believe that the TRC is an ill fit for assessing cost effectiveness for whole home programs. Trends nationally bear this out. Adders and discounts do not

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<sup>7</sup> Public Utility Commission of Oregon, Staff Report: Energy Trust of Oregon (Docket No. UM1611) : Request approval for exceptions of energy efficiency cost effectiveness guidelines, September 30, 2014 – Page 10 P1

<sup>8</sup> Wall insulation has a market cost twice that of ceilings. If available market for wall insulation is 2.3 times that of ceilings the potential in dollars is four times.

adequately scale with fuel price changes. We support proposals for further study on the alternative use of Utility Cost Test for existing homes programs.

We do not believe it is well advised that the Commission chooses to regulate at the measure level in the existing homes program. Understanding the externalities of measures in a system is better suited to science than regulation. Energy Trust was created to provide this oversight and should be empowered to do so. We advocate regulating existing homes at the program level.

Through the course of this Docket there has been insufficient time to explore the concept of an incentive cap for home weatherization. We can envision a program that allows a scientific approach to home weatherization based on the needs of the structure, while limiting the incentive to be cost effective at the program level. We support the idea of further investigation and would encourage the extension of waivers until at least that discussion has occurred.

Respectfully submitted

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# **Exhibit A**

## **Valuation of Non-Energy Benefits in Oregon**

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September 15, 2014

**Prepared For;**  
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# Executive Summary

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Non-energy benefits is a term used in the energy efficiency sector to describe impacts that accrue to people or businesses that install energy efficiency measures for which there are impacts beyond energy and cost savings alone. These benefits are also referred to as non-energy impacts and other program impacts. Clean Energy Works along with interested stakeholders, Northwest Energy Efficiency Council and Home Performance Guild of Oregon have commissioned this paper which presents evidence that the 10% of benefits added to the TRC currently in place to value non-energy benefits as well as all other uncertainties in Oregon undervalues the real non-energy benefits perceived by homeowners who undertake weatherization measures. We believe that NEBs related to greenhouse gas emissions (GHG), hedge value of gas, reduced arrearages, and economic impacts are also significant and are very likely over 10% of benefits. We will show from a review of literature that comfort, noise reduction, and health benefits NEBs from weatherization measures are often valued at hundreds of dollars per year by homeowners. We will refer to literature and precedent from other states on NEBs that indicates participant benefits vary dramatically but are significant and are often found to be far in excess of 10% of all benefits currently accounted for in the TRC.

## Current Practice

There are a growing number of states that directly allow comfort, noise reduction, and health benefits into their cost-effectiveness tests. In our analysis of the literature, we found four states that quantify comfort, noise reduction, and health impacts directly (CA<sup>1</sup>, MA<sup>2</sup>, NY<sup>3</sup>, RI<sup>4</sup>). The states of Massachusetts and New York have commissioned studies to quantify comfort, noise reduction, and health benefits as well as other NEBs. California and Rhode Island rely on secondary sources to value these NEBs. California commissioned a study by Lisa Skumatz that summarized dozens of studies that value NEBs and Rhode Island uses results from the Massachusetts study to value comfort, noise reduction, and health NEBs. California and New York only allow comfort, noise reduction, and health benefits into the cost-effectiveness screenings for low-income programs. Maryland is currently in the process of valuing NEBs and

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<sup>1</sup> Skumatz, Lisa. “Non-energy benefits: Status, Findings, Next Steps, and Implications for Low-Income Program Analysis in California” SERA Inc. May 2010.

<sup>2</sup> Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-energy benefits (NEB) Evaluation. Tetra Tech and Nexus Market Research. August 2011.

<sup>3</sup> “Non-energy benefits (NEB) Evaluation” Prepared for NYSERDA. Summit Blue LLC. and Quantec LLC. June 2006.

<sup>4</sup> Rhode Island Technical Reference Manual, 2012 Program Year.

is likely to use a recent study from Massachusetts to place values on comfort, noise reduction, and health NEBs.

## Literature Review

The literature on comfort, noise reduction, and health benefits is found in studies that value a larger array of NEBs from energy efficiency measures. There is extensive literature on NEBs that dates back over 20 years, but few studies actually quantify the impacts in dollar terms that are useful for valuation at the program or measure level. The most recent and highly regarded study on valuation of NEBs was conducted for Massachusetts<sup>5</sup> program administrators and indicates that weatherization program participants value comfort, noise reduction, and health benefits into the hundreds of dollars per year. Tables 1 and 2 show the NEBs values from the Massachusetts study for thermal comfort, noise reduction, and health. Table 1 shows the average values reported by survey participants and Table 2 shows the highest values reported. The NEB values are in relation to a reference savings value (\$673) of the average bill savings expected by a Massachusetts participant who undertook a substantial weatherization retrofit. In total, participants value comfort, noise, and health NEBs at least 24% of energy bill savings to a maximum of 128% of energy bill savings.

**Table 1: Average NEB Values from Massachusetts Study**

	<b>NEB Annual Value (Average)</b>	<b>NEB Value as % of Annual Bill Savings</b>	<b>Annual Bill Savings Reference</b>
<b>Thermal Comfort</b>	\$125	18.6%	\$673
<b>Noise</b>	\$31	4.6%	\$673
<b>Health</b>	\$4	0.6%	\$673
<b>Total</b>	\$160	23.8%	\$673

**Table 2: Highest NEB Values from Massachusetts Study**

	<b>NEB Value (High)</b>	<b>NEB Value as % of Bill Savings</b>	<b>Bill Savings Reference</b>
<b>Thermal Comfort</b>	\$279	41.5%	\$673
<b>Noise</b>	\$252	37.4%	\$673
<b>Health</b>	\$330	49%	\$673
<b>Total</b>	\$861	127.9%	\$673

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<sup>5</sup> Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-energy benefits (NEB) Evaluation. Tetra Tech and Nexus Market Research. August 2011.



Several other studies also show significant values for comfort, noise reduction, and health benefits. Two Energy Trust of Oregon evaluations<sup>6</sup> show that 27% of Home Performance participants viewed NEBs as more important than energy savings and 64% of existing homes participants viewed NEBs as more important than energy savings. A NYSERDA study<sup>7</sup> also finds NEBs values from weatherization that go into the hundreds of dollars per year. Prominent NEBs practitioner Lisa Skumatz has reviewed dozens of studies that show significant values for many different kinds of NEBs.<sup>8</sup>

## **Long Term Recommendations**

Oregon needs a dedicated NEBs study. The absence of an Oregon or Northwest NEBs study only continues to create an atmosphere of uncertainty on the NEBs issue. OPUC should consider to allow Energy Trust and other stakeholders to take the next step and conduct a study to place dollar values on NEBs that can be used in the TRC.

OPUC should consider moving away from criteria that looks at cost effectiveness at a measure level. Momentum is growing for assessing cost effectiveness at the program level and allowing certain measures to fail the cost effectiveness screening.<sup>9</sup> OPUC should also consider the merits of moving to the Program Administrator Cost (PAC) test also called the Utility Cost Test (UCT).<sup>10</sup> The PAC test does not include participant costs and therefore does not include participant benefits in which case NEBs become a moot point.

### **1. Introduction and Current Practice**

Non-energy benefits is a term used in the energy efficiency sector to describe impacts that accrue to people or businesses that install energy efficiency measures for which there are impacts beyond energy and cost savings alone. These benefits are also referred to as non-energy impacts and other program impacts. Understanding of non-energy benefits (NEBs) is a crucial element to quantify and include in any total resource cost (TRC) test. The level of rigor is often very high in all of the other elements of the TRC, however the level of rigor used nationally to quantify

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<sup>6</sup> Energy Trust of Oregon comments to OPUC "Re: UM 1622: Report to Commission Staff Regarding Energy Trust of Oregon Request for Approval of Exceptions to Cost-Effectiveness Guidelines"

<sup>7</sup> "Non-energy benefits (NEB) Evaluation" Prepared for NYSERDA. Summit Blue LLC. and Quantec LLC. June 2006.

<sup>8</sup> Skumatz, Lisa. "Non-energy benefits: Status, Findings, Next Steps, and Implications for Low-Income Program Analysis in California" SERA Inc. May 2010.

<sup>9</sup> Woolf, Tim and Erin Malone, Kenji Takahashi, William Steinhurst. "Best Practices in Energy Efficiency Program Screening" Synapse Energy Economics prepared for National Home Performance Council. 2012.

<sup>10</sup> Haeri, Hossein and Sami Khawja. "Valuing Energy Efficiency: The Search for a Better Yardstick" Public Utilities Fortnightly. July 2013

NEBs has often been little or none, and Oregon is no exception. Not quantifying NEBs has caused the TRC in practice to be biased towards participant and administrator costs, and away from participant benefits. This has caused certain measures to have benefit cost ratios that are significantly biased downwards. In the past it has not been necessary to quantify NEBs as most weatherization measures were clearly cost effective. However, decreasing gas prices have caused gas weatherization measures to become not cost effective and the absence of NEBs values in the TRC is a critical element pulling down benefit cost ratios. A proper accounting of non-energy benefits can reduce the bias towards costs and make the TRC a fair measure of cost effectiveness.

NEBs are often not quantified in many states because they cannot be measured directly and there are significant uncertainties around values that are quantified. However, measurement difficulty and uncertainty are not reasons to not value these impacts. There is significant uncertainty around other inputs to the TRC such as forward looking avoided costs (as is evidenced by the unexpected fall in gas prices) but regulators have historically been willing to accept those values along with the uncertainties. Recent research has shown that NEBs can be quantified using proven survey methods to elicit dollar values for NEBs. Research and advocacy on NEBs have resulted in a number of states (MA, RI, NY, CA) spending effort and money to study the value of NEBs and include those values in their cost effectiveness tests. NEBs are turning the corner in states that have progressive energy efficiency policies.

Clean Energy Works, Northwest Energy Efficiency Council (NEEC) and the Home Performance Guild commissioned this paper that intends to illustrate that the 10% adder currently used in Oregon to value NEBs significantly undervalues NEBs from weatherization related energy efficiency measures. We will show from a review of literature that comfort, noise reduction, and health benefits NEBs from weatherization measures are often valued at hundreds of dollars per year by homeowners. We will refer to literature and precedent from other states on NEBs that indicates participant benefits vary dramatically but are significant and are often found to be far in excess of 10% of all benefits currently accounted for in the TRC.

It is our understanding that the 10% adder in Oregon is meant to include all non-quantifiable impacts into the TRC. There are many impacts related to gas weatherization measures that are currently not quantified in the TRC including GHG emissions, hedge value of gas, reduced arrearages, and economic impacts as well as participant NEBs. It is feasible that the value of the non-quantified impacts excluding participant NEBs could themselves alone be equal to 10%.

Momentum is growing for changes to the way the TRC is applied, and for a move away from the TRC all together. There is a growing criticism of the measure level approach to cost effectiveness. Advocates for a program level benefit cost approach argue that certain measures

should be able to fail if the entire program remains cost effective.<sup>11</sup> There is also growing momentum for a move towards the Program Administrator Cost (PAC) test also called the Utility Cost Test (UCT).<sup>12</sup> The PAC test does not include participant costs and therefore does not include participant benefits in which case NEBs become a moot point. However, this paper will stay within the confines of the way the TRC is currently applied in Oregon and argue that there is evidence that participant NEBs not currently quantified in Oregon are significant and deserve an exception to OPUC cost effectiveness standards.

The OPUC has previously stated that NEBs can be included in the TRC if there is a "reasonable and practical" way to calculate them. We are proposing a reasonable and practical way to value NEBs using a respected study. Clean Energy Works and its partners have gathered and reviewed the latest research on NEBs and will reference values for certain NEBs related to weatherization that are credible. We reference values for comfort, noise reduction, and health benefits that are based on a study recently conducted in Massachusetts<sup>13</sup> of a large sample of energy efficiency program participants. We also recognize there are benefits related to increased property value; however, we are not recommending a value because it may amount to some double counting of benefits. The value placed on comfort, noise reduction, and health would inherently be the cause of a rise in property value to a potential buyer of a home. We believe the values referenced here indicate that participant NEBs values are real and significant and are the best values to reference until an Oregon specific study is conducted.

## **Comfort, Noise Reduction, and Health Benefits**

Comfort, noise reduction, and health benefits are perceived by building occupants and thus their value is subjective and varies occupant to occupant. Comfort impacts are the most commonly cited NEBs and are the most highly valued in residential weatherization measures where participants cite increased comfort from reduced heat loss. Noise reduction benefits arise from higher levels of ceiling and wall insulation as well as whole home air sealing. Occupants perceive a quieter indoor environment due to insulation and air sealing blocking out noise from outside the home such as traffic and other neighborhood noise. Health impacts arise from weatherization measures that improve indoor air quality where participants cite reduced allergens and sickness. Installing insulation and air sealing often remediates moisture issues in walls and attics that cause mold and mildew that are unhealthy for home occupants, and the transfer of unclean air from crawl spaces and attics into living spaces. Whole home air sealing can also

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<sup>11</sup> Woolf, Tim and Erin Malone, Kenji Takahashi, William Steinhurst. "Best Practices in Energy Efficiency Program Screening" Synapse Energy Economics prepared for National Home Performance Council. 2012.

<sup>12</sup> Haeri, Hossein and Sami Khawja. "Valuing Energy Efficiency: The Search for a Better Yardstick" Public Utilities Fortnightly. July 2013

<sup>13</sup> Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Tetra Tech and Nexus Market Research. August 2011.

reduce the amount of outdoor allergens that enter a home through air leaks. NEBs such as comfort, noise reduction, and health benefits are often used to market the benefits of home weatherization by many program administrators. Surveys show that these NEBs are important consideration in many people's decision to install weatherization measures in their home.

Comfort, noise reduction, and health benefits are typically measured by surveys of program participants. Methods often used by practitioners include willingness-to-pay, contingent valuation, or various scaling mechanisms. Self-report surveys that ask participants to value NEBs are the subject of some controversy due to the inherent biases that participants may have. However, without revealed preference methods, self-report surveys are the only way to assess participant NEB values despite their biases. Values for these NEBs are likely to vary significantly by measure, and have been shown to have higher values for low-income participants.<sup>14</sup> An effective survey methodology for eliciting the value of NEBs has been pioneered by Lisa Skumatz and used in several studies that value NEBs<sup>15</sup>. This methodology, which is described below, has repeatedly produced results that indicate people value NEBs as much or more than the value of the energy savings from weatherization measures.

### **Value of Non-Participant NEBs Not Currently Valued in TRC**

The value of non-participant NEBs that are not currently valued in the Oregon version of the TRC are significant. NEBs related to greenhouse gas emissions (GHG), hedge value of gas, reduced arrearages, and economic impacts are significant. The value of GHG's is perhaps between 2%-3% of the value of energy savings if the carbon content of a therm of natural gas is assumed to be .0053 metric tons per therm<sup>16</sup> and the most recent Regional Greenhouse Gas Initiative (RGGI) price of a metric ton of carbon dioxide at about \$5.00 is used. The average Clean Energy Works participant saved 173 therms of natural gas according to the most recent Energy Trust of Oregon evaluation<sup>17</sup> which amounts to just under a metric ton of carbon dioxide. The value of GHG's using these inputs is between \$4 and \$5 per year and between 2-3% of energy savings.

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<sup>14</sup> Wolf, Tim, Erin Malone, Jenn Kallay, and Kenji Takahashi. "Energy Efficiency Cost Effectiveness Screening in Northeast and Mid-Atlantic States" Synapse Energy Economics Inc. October 2013. Page 4.

<sup>15</sup> Skumatz, Lisa, Chris Ann Dickerson, and Brian Coates. "Non-Energy Benefits in the Residential and Non-Residential Sectors - Innovative Measurements and Results for Participant Benefits" 2000 ACEEE Summer Study on Energy Efficiency in Buildings.

<sup>16</sup> U.S. EPA. <http://www.epa.gov/cleanenergy/energy-resources/refs.html>

<sup>17</sup> Degens, Phil. Energy Trust of Oregon. "Clean Energy Works Oregon Energy Consumption Analysis 2010-2011"

The hedge value or risk mitigation value for gas energy efficiency is unknown. Energy Trust of Oregon comments indicate that this value for electricity is equal to 16% of forward market prices.<sup>18</sup> The hedge value of gas is likely less than electricity however it is not zero.

There is plenty of evidence for a value for reduced customer arrearages resulting from energy efficiency. Reduced arrearages are a utility benefit that arise from increased ability for a customer to pay their bills resulting from energy efficiency measures. Many studies cite dollar values that range from \$2 to \$32 per participant.<sup>19</sup> Lisa Skumatz recently recommended an arrearage benefit value of 2.5% of participant retail bill savings for Maryland<sup>20</sup>.

The economic impacts of energy efficiency in Oregon are large. A recent Energy Trust of Oregon report indicates that the economic impacts of Energy Trust of Oregon spending amounted to net positive impacts of \$175.1 million in output, \$60.4 million in wages, \$14.7 million in income to small business owners, and 1,091 full time jobs.<sup>21</sup>

These impacts are currently not valued in the Oregon version of the TRC. There is precedent in the literature and from other states who include these impacts in their cost effectiveness tests. The total value of these impacts are unknown but we believe that the preceding evidence suggests that these values alone are worth more than 10% of TRC benefits.

## **Current Practice**

There are a growing number of states that directly allow comfort, noise reduction, and health benefits into their cost-effectiveness tests. In our analysis of the literature, we found four states that quantify comfort, noise reduction, and health impacts directly (CA<sup>22</sup>, MA<sup>23</sup>, NY<sup>24</sup>, RI<sup>25</sup>).

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<sup>18</sup> Energy Trust of Oregon comments to OPUC "Re: UM 1622: Report to Commission Staff Regarding Energy Trust of Oregon Request for Approval of Exceptions to Cost-Effectiveness Guidelines"

<sup>19</sup> Skumatz, Lisa. "Non-Energy Benefits: Status, Findings, Next Steps, and Implications for Low-Income Program Analysis in California" SERA Inc. May 2010.

<sup>20</sup> Skumatz, Lisa. "Non-Energy Benefits / Non-energy benefits and Their Role and Values in Cost Effectiveness Tests, State Of Maryland" SERA Inc. March 2014.

<sup>21</sup> "Economic Impacts from Energy Trust of Oregon 2013 Program Activities". Pinnacle Economics. May 2014.

<sup>22</sup> Skumatz, Lisa. "Non-energy benefits: Status, Findings, Next Steps, and Implications for Low-Income Program Analysis in California" SERA Inc. May 2010.

<sup>23</sup> Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-energy benefits (NEB) Evaluation. Tetra Tech and Nexus Market Research. August 2011.

<sup>24</sup> "Non-energy benefits (NEB) Evaluation" Prepared for NYSERDA. Summit Blue LLC. and Quantec LLC. June 2006.

<sup>25</sup> Rhode Island Technical Reference Manual, 2012 Program Year.

The states of Massachusetts and New York have commissioned studies to quantify comfort, noise reduction, and health benefits. California and Rhode Island rely on secondary sources to value these NEBs. California commissioned a study by Lisa Skumatz that summarized dozens of studies that value NEBs and Rhode Island uses results from the Massachusetts study to value comfort, noise reduction, and health NEBs. California and New York only allow comfort, noise reduction, and health benefits into the cost-effectiveness screenings for low-income programs. There are many states (IA, CO, OR, WA, VT, NY, NH, CT, DC, ID, UT, WY)<sup>26</sup> that have generic NEB adders of which comfort, noise reduction, and health benefits are seen as contained within the adder.

## **State Case Studies**

### **New York**

New York was the first state that formally explored incorporating NEBs into their cost effectiveness tests starting in 2006. NYSERDA commissioned a study<sup>27</sup> (described in literature review below) to value NEBs in six programs. The New York Department of Public Service does not formally allow participant NEBs into the main TRC, however NYSERDA reports three different TRC scenarios to the Department of Public Service to help them make decisions on how to administer the system benefits charge (SBC). NYSERDA reports 1) standard TRC without NEBs 2) standard TRC with NEBs excluding job impacts, and 3) standard TRC with NEBs and job impacts. These scenarios show the effect that including participant NEBs has on measure cost effectiveness. In December of 2013 the Department of Public Service issued an order for a review and restructuring of the TRC. Criticisms of the TRC in New York relate to the need to have every measure pass the test rather than looking at the full program cost effectiveness. However, this process will likely turn to the discussion around valuing NEBs in New York.<sup>28</sup>

### **Vermont**

The growing research on NEBs has influenced the Vermont Public Service Board in 2009 to adopt a 15% adder for NEBs, and an additional 15% (total of 30%) adder for low-income into its

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<sup>26</sup> Skumatz, Lisa. "Non-energy benefits / Non-energy benefits and Their Role and Values in Cost Effectiveness Tests, State Of Maryland" SERA Inc. March 2014.

<sup>27</sup> "Non-Energy Impacts (NEI) Evaluation" Prepared for NYSERDA. Summit Blue LLC. and Quantec LLC. June 2006.

<sup>28</sup> Malmgren, Ingrid, and Lisa Skumatz. "Lessons From the Field: Practical Applications for Incorporating Non-Energy Benefits Into Cost Effectiveness Screening". 2014 ACEEE Summer Study on Energy Efficiency in Buildings.

primary test, the societal test. The service board was persuaded by many interveners citing the literature on NEBs that participant NEBs are real, measureable, and large enough to matter. The Vermont Weatherization Assistance Project provided data that found NEBs valued at \$11,391 on average costs of \$2,259 per participant. The NEBs included in the calculation include reduces arrearages, fewer shut offs, lower collection costs, lower emissions, economic impacts, property value, fewer lost work/school days, and fewer fires. The public service board noted in their decision that 15% was on the low end of NEBs estimates and the board will continue to review the appropriate NEBs values bi-annually.<sup>29</sup>

## **District of Columbia**

The District of Columbia Sustainable Energy Utility (DCSEU) was formed in 2011 to administer the system benefits charge (SBC) in DC. The DCSEU adopted a 10% adder for NEBs in addition to a 10% adder for risk, and 10% adder for avoidance of environmental externalities to its primary test the societal test. The total adder is therefore 30% in the District of Columbia. The benefits included in the NEBs adder include comfort, noise reduction, aesthetics, health and safety, ease of selling, productivity, less illnesses, ability to stay in home, and macroeconomic benefits.<sup>30</sup>

## **Massachusetts**

Massachusetts has taken the most sensible approach to valuing NEBs by commissioning a dedicated study of a large sample of program participants. In 2009, the Massachusetts Department of Public Utilities directed program administrators to "...undertake studies during 2010 that evaluate non-electric, non-resource benefits, including all underlying assumptions, to ensure that updated and more reliable values will be developed in time for inclusion in the cost effectiveness analysis in their subsequent three-year plans".<sup>31</sup> The resulting study is the most detailed and respected study on the valuation of NEBs to date and the resulting values are listed in the Massachusetts Technical Reference Manual (TRM) for use in cost effectiveness tests.

## **Maryland**

The Maryland Public Service Commission is currently in the process of valuing NEBs for use in their cost effectiveness tests. The commission is likely to estimate values for participant health,

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<sup>29</sup> IMalmgren, Ingrid, and Lisa Skumatz. "Lessons From the Field: Practical Applications for Incorporating Non-Energy Benefits Into Cost Effectiveness Screening". 2014 ACEEE Summer Study on Energy Efficiency in Buildings.

<sup>30</sup> IMalmgren, Ingrid, and Lisa Skumatz. "Lessons From the Field: Practical Applications for Incorporating Non-Energy Benefits Into Cost Effectiveness Screening". 2014 ACEEE Summer Study on Energy Efficiency in Buildings.

<sup>31</sup> Massachusetts Department of Public Utilities, Electric Three-Year Plan Orders, Docket 130-131

comfort, and safety, reduced arrearages, and reduced greenhouse gas emissions. The commission is using the Massachusetts study to value residential health, safety, and comfort NEBs. Values from the Massachusetts report are applied to the typical savings of a Maryland program participant to come up with Maryland specific values.

## **2. Literature Review**

The literature on comfort, noise reduction, and health benefits is found in studies that value a larger array of NEBs from energy efficiency measures. There is extensive literature on NEBs, but few studies actually quantify the impacts in dollar terms that are useful for valuation at the program or measure level.

The literature on NEBs dates back at least 20 years. Prominent expert Lisa Skumatz identifies three eras of NEBs research.<sup>32</sup>

**1) Perspectives and Basic Measurement Approaches (1994-1998).** This era is characterized by defining perspectives on who benefits accrue to including participant, utility, and society. Basic measurement approaches for hard to measure NEBs were developed and piloted.

**2) Early Estimations for Programs and exploration of benefit-cost applications (1998-2001).** This era saw estimations of NEB values in many different NEBs categories. Three measurement approaches were developed including engineering or model based estimates, incremental incidence and marginal valuation, as well as survey-based methods. Applications of NEBs were being discovered including use in marketing and targeting and use in benefit-cost tests.

**3) Measurement and Application Expansions (2001 to present).** Today the literature on NEBs is extensive and extends to many different programs. Best practices in measurement were developed. NEBs studies were extended to all sectors including residential, commercial, multifamily, and industrial. Studies began to value NEBs at the measure level. NEBs values are shown to rise up to 300% of bill savings.

### **Relevant Studies**

#### **Energy Trust of Oregon Existing Homes Evaluations**

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<sup>32</sup> Malmgren, Ingrid, and Lisa Skumatz. "Lessons From the Field: Practical Applications for Incorporating Non-Energy Benefits Into Cost Effectiveness Screening". 2014 ACEEE Summer Study on Energy Efficiency in Buildings.



Recent evaluations of the Energy Trust of Oregon Existing Homes program have surveyed participants on their perceptions of NEBs after measure installation. 27% of a survey of 30 Home Performance participants indicated that NEBs were more important than the energy savings in their decision to install the measures. Comfort was the most often cited NEB followed by ability to pay bills, reduced environmental impact / carbon footprint as well as health and indoor air quality. A survey of 453 Existing Homes program participants indicates that 64% of the participants believe that the NEBs were more valuable than the energy savings. 22% indicated that the NEBs were equal in value to the energy savings.<sup>33</sup> It is clear that Oregon program participants who install weatherization measures perceive significant NEBs.

### **Massachusetts Study**

A study conducted for Massachusetts<sup>34</sup> program administrators conducted by Tetra Tech and Nexus Market Research quantified comfort, noise reduction, and health NEBs by surveying program participants. This study surveyed 209 energy efficiency program participants and another 213 low-income program participants about how they value a series of possible NEBs. The survey used a direct query method which asks participants to value impacts relative to the average bill savings for participants in the program. Results indicate that participants value these impacts by as much as 128% of energy savings with average values of \$125 for thermal comfort, \$31 annual value for noise reduction, and \$4 in health impacts relative to annual energy bill savings of \$673. A significant benefit of this research not found in any other study is that the non-energy benefits are mapped to specific measures.

### **NYSERDA Study**

NYSERDA funded a study conducted by Summit Blue and Quantec<sup>35</sup> that surveys participants in six different commercial, industrial, and residential NYSERDA programs to assess non-energy benefits. NYSERDA program participants surveyed in the study include Commercial New construction, Commercial/Industrial Performance Program, Small Commercial Lighting Program, New York ENERGY STAR Labeled Homes, ENERGY STAR Products and Marketing: CFLs, and ENERGY STAR Products and Marketing: Clothes Washers. The study uses both the direct query method and conjoint analysis to assess non-energy benefits. Comfort, noise reduction, and indoor air quality NEBs were perceived impacts by participants of several programs. The study finds that values for comfort, noise reduction, and indoor air quality

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<sup>33</sup> Energy Trust of Oregon comments to OPUC "Re: UM 1622: Report to Commission Staff Regarding Energy Trust of Oregon Request for Approval of Exceptions to Cost-Effectiveness Guidelines"

<sup>34</sup> Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-energy benefits (NEB) Evaluation. Tetra Tech and Nexus Market Research. August 2011.

<sup>35</sup> "Non-energy benefits (NEB) Evaluation" Prepared for NYSERDA. Summit Blue LLC. and Quantec LLC. June 2006.

impacts rise as high as 134% of energy savings for residential and 340% of energy savings for commercial participants. Residential participants valued annual health impacts at \$19, noise reduction at \$72, and comfort at \$191 relative to annual bill savings of \$600. Commercial participants valued comfort at \$4,685 and improved indoor quality at \$6,358 relative to annual bill savings of \$28,800. A weakness of this study for use in residential applications is that results are based on a very small sample of Energy Star homebuyers.

### **Lisa Skumatz Research**

Lisa Skumatz (SERA Inc.) is well known as a leading expert in valuation of NEBs. Skumatz has authored numerous reports that place values on various NEBs and also extensively reviews existing literature on NEBs valuation. Two recent Skumatz reports are of particular interest. A recent report was authored specifically for Maryland<sup>36</sup> which provides recommended values for health, safety, and comfort NEBs. A similar report was authored for California low-income programs<sup>37</sup> that provided recommended values for NEBs. These reports provide recommendations based on an extensive review of the current literature and use average values from numerous studies.

### **Indoor Air Quality Study**

A study conducted by William Fisk of Lawrence Berkeley National Laboratory<sup>38</sup> cites several estimates of possible health effects of improved indoor air quality resulting from HVAC energy efficiency measures. The study's findings include:

- A reduction in allergy symptoms of 8-25%
- A reduction in sick building syndrome of 20-50%
- Improved productivity from better quality lighting of 1-10%

### **New Zealand Low-Income Home Weatherization Study**

New Zealand initiated a program to improve the energy use of every low-income household in the country over a four-year period. The evaluation of the initial 40,000 homes<sup>39</sup> treated in the first year showed dramatic improvements, including:

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<sup>36</sup> Skumatz, Lisa. "Non-Energy Benefits / Non-energy Impacts and Their Role and Values in Cost Effectiveness Tests, State Of Maryland" SERA Inc. March 2014.

<sup>37</sup> Skumatz, Lisa. "Non-Energy Benefits: Status, Findings, Next Steps, and Implications for Low-Income Program Analysis in California" SERA Inc. May 2010.

<sup>38</sup> Fisk, William J. 2000. "Health and Productivity Gains from Better Indoor Environments and Their Relationship with Building Energy Efficiency", Annual Review of Energy Environment. 2000, 25:537-566.

- 43% reduction in hospital admissions attributable to respiratory ailments
- A 39 % reduction in days lost at work
- A 23% reduction in days lost at school

The composite evaluation of the program showed that the costs of the program were fully covered by energy savings, but the health benefits were nine times greater than the energy benefits.

### **3. Methods Assessment**

#### **Comfort, Noise Reduction, and Health NEB Methodology**

The Massachusetts study<sup>40</sup> by Tetra Tech and Nexus market research is judged to be a credible study for several different reasons. There is precedence for using the Massachusetts study to value NEBs in other states. The Massachusetts study is used in Massachusetts and Rhode Island to value NEBs and the exact values from the study appear in the both state TRMs.<sup>41</sup> Maryland is also likely to adopt NEB values based on results of the Massachusetts study. The study meets several important criteria and standards. The study describes a plausible hypothesis for what causes NEBs. It also entertains the possibility that there may be costs rather than benefits related to the installation of energy efficiency measures. The sample is robust, unbiased, and well designed. The study is recent (2011) and performed by experienced third party consultants who are not advocates or affiliated with any advocacy groups. The study was reviewed by utility clients and their stakeholders before final publication. In addition, another valuable aspect of the study is that it provides credible values of NEBs at the measure level and this is hard to find in the NEB literature.

The Massachusetts study estimates dollar values for seven individual NEBs including thermal comfort, health impacts, noise reduction, property value, equipment maintenance, lighting quality, and durability of home which are derived from surveys of program participants. Survey respondents were asked about the following:

- Whether the participant believed their home, because of the energy efficiency improvements, provides a particular NEB
- Annual value placed on each NEB in relation to energy bill savings. Values could be expressed in dollars or as a percentage of bill savings.

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<sup>39</sup> Barnard et al. (2011). The impact of retrofitted insulation and new heaters on health services utilization and costs, pharmaceutical costs and mortality: Evaluation of Warm Up New Zealand: Heat Smart. Available at: <http://www.healthyhousing.org.nz/research/currentresearch/evaluation-of-warm-up-new-zealand-heat-smart/>

<sup>40</sup> Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-energy benefits (NEB) Evaluation. Tetra Tech and Nexus Market Research. August 2011.

<sup>41</sup> Rhode Island Technical Reference Manual. National Grid. 2012 Program Year.

- Total value of the NEBs
- Changes in household health since the energy efficiency improvements were installed<sup>42</sup>

Within each perceived NEB the study also attributes the portion of each NEB that is due to specific measures.<sup>43</sup> The NEBs are valued in relation to the average annual bill savings of a Massachusetts program participant which was \$673. We assume that the Massachusetts program participants have similar perceptions of NEBs to Oregon program participants. The weatherization measures offered by the Massachusetts and Oregon programs are identical. Therefore the results of the Massachusetts study are applicable to Oregon. Rhode Island also found that the Massachusetts study was applicable for NEB valuation and uses the values in the Rhode Island TRM<sup>44</sup>.

Results of the Massachusetts study indicate that participants value comfort, noise, and health NEBs into hundreds of dollars per year. Tables 1 and 2 show the NEBs values from the Massachusetts study for thermal comfort, noise reduction, and health. Table 1 shows the average values reported by survey participants and Table 2 shows the highest values reported. The NEB values are in relation to a reference savings value (\$673) of the average bill savings expected by a Massachusetts participant who undertook a substantial weatherization retrofit. In total, participants value comfort, noise, and health NEBs at least 24% of energy bill savings to a maximum of 128% of energy bill savings.

**Table 1: Average NEB Values from Massachusetts Study**

	<b>NEB Annual Value (Average)</b>	<b>NEB Value as % of Annual Bill Savings</b>	<b>Annual Bill Savings Reference</b>
<b>Thermal Comfort</b>	\$125	18.6%	\$673
<b>Noise</b>	\$31	4.6%	\$673
<b>Health</b>	\$4	0.6%	\$673
<b>Total</b>	\$160	23.8%	\$673

<sup>42</sup> Massachusetts Study, pg 3-6

<sup>43</sup> Massachusetts Study, table 2-7 and 2-8, pg 2-16, 2-17

<sup>44</sup> Rhode Island Technical Reference Manual. National Grid. 2012 Program Year.

**Table 2: Highest NEB Values from Massachusetts Study**

	<b>NEB Value (High)</b>	<b>NEB Value as % of Bill Savings</b>	<b>Bill Savings Reference</b>
<b>Thermal Comfort</b>	\$279	41.5%	\$673
<b>Noise</b>	\$252	37.4%	\$673
<b>Health</b>	\$330	49%	\$673
<b>Total</b>	\$861	127.9%	\$673

### **Application of Values**

The NEB values presented here are unique to the Massachusetts program, participants, housing stock, and climate and are not directly applicable to Oregon. These values could however be applied to Oregon by using an Oregon specific bill savings reference value similar to the method used in Maryland. The percentage value of each individual NEB in relation to the reference bill savings value could be applied to the average bill savings for a whole home weatherization participant in Oregon. These dollar values could then be applied to the TRC and any societal version of the TRC for the expected lifetime of the measures. These values could be added as net benefits after incorporation of any net-to-gross factors for the expected useful lifetime (EUL) of the measure. It is important that any NEBs be added after incorporation of net-to-gross factors because NEBs are a common driver of free ridership. If free riders are identified and their savings accordingly discounted before these benefits are added, the benefit accrues to participants who are not free riders or to the portion of savings not associated with free ridership.

## **4. Key Assumptions**

### **Oregon Participants Perceive NEBs Similar to Massachusetts Participants**

Use of secondary research to calculate anything is never the preferred method. However, until Oregon or some Northwest entity conducts primary research to value NEBs, secondary research is the only method in the short term. We believe that the program participants surveyed in Massachusetts would have similar perceptions of NEBs to Oregon program participants. After review of the Massachusetts program we believe that the program designs are sufficiently similar with an identical list of weatherization measures. There is no reason to believe that the perceptions and valuations of NEBs from participants in Massachusetts should be significantly different than those of Oregon program participants.

## Long Term Recommendations

Oregon needs a dedicated NEBs study. The absence of an Oregon or Northwest NEBs study only continues to create an atmosphere of uncertainty on the NEBs issue. Energy Trust of Oregon Existing Homes process evaluation results already indicate that a majority of their participants value NEBs more than the value of energy savings. OPUC should consider allowing Energy Trust and other stakeholders to take the next step and conduct a study to place dollar values on NEBs that can be used in the TRC.

There are a number of reasonable and cost effective options to study the value of NEBs in Oregon in a large sample of program participants. The most cost effective option is to include survey questions on NEB values in regular impact and process evaluation surveys. Cost savings may be realized by fielding a stand alone NEBs survey as part of an impact or process evaluation or added to regular impact or process evaluation surveys if possible. Another cost effective solution would be to partner with regional entities such as NEEA, BPA, RTF, and utilities in Washington and Idaho to fund a regional NEBs study whose results can be shared by the Northwest region.

OPUC should consider moving away from criteria that looks at cost effectiveness at measure level. Momentum is growing for assessing cost effectiveness at the program level and allowing certain measures to fail the cost effectiveness screening.<sup>45</sup> OPUC should also consider the merits of moving to the Program Administrator Cost (PAC) test also called the Utility Cost Test (UCT).<sup>46</sup> The PAC test does not include participant costs and therefore does not include participant benefits in which case NEBs become a moot point. Advocates for the PAC test believe it is a fairer and more straightforward way to assess the effectiveness of spending of ratepayer dollars energy efficiency. Consumer education and return on investment (ROI) tools can serve the function of protecting the consumer that the TRC currently serves.

## 5. Conclusion

Clean Energy Works and its partners NEEC and Home Performance Guild has presented evidence that NEBs should be valued more than the current 10% of benefits adder which dates back to the Northwest Power Act of 1980. We know much more about the value NEBs than we did in 1980 and our policy should reflect that reality. We believe that other elements currently not quantified in the TRC including GHG emissions, hedge value of gas, reduced arrearages, and economic impacts are themselves worth at least 10% of quantified benefits. We believe that the

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<sup>45</sup> Woolf, Tim and Erin Malone, Kenji Takahashi, William Steinhurst. "Best Practices in Energy Efficiency Program Screening" Synapse Energy Economics prepared for National Home Performance Council. 2012.

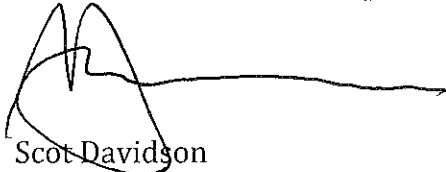
<sup>46</sup> Haeri, Hossein and Sami Khawja. "Valuing Energy Efficiency: The Search for a Better Yardstick" Public Utilities Fortnightly. July 2013

precedent from other states and extensive NEBs literature going back over 20 years will not allow OPUC to continue to ignore the real value of NEBs. Four states (CA, MA, RI, NY) that have aggressive energy efficiency policies have already quantified NEBs and are including the benefits in their cost effectiveness tests. The most comprehensive NEBs study to date indicates that residential weatherization NEBs are valued at least 24% of energy bill savings and rise as high as 128% of bill savings. We believe that this shows that NEBs are significant enough to warrant an exception to cost effectiveness standards in the short term. Our long-term recommendation is to dedicate resources to fund a study of a large sample of energy efficiency program participants to find out how they value NEBs in relation to energy savings.

## CERTIFICATE OF SERVICE

I hereby certify that I have this day caused Comments of Clean Energy Works regarding OPUC Docket No. UM 1622 to be served by electronic mail to those parties whose email addresses appear on the attached service list, and by First Class Mail, postage prepaid and properly addressed, to those parties on the service list who have not waived paper service.

DATED this 15<sup>th</sup> day of September, 2014.

A handwritten signature in black ink, appearing to read "Scot Davidson", with a long horizontal line extending to the right.

Scot Davidson  
VP Strategy and Market Development  
Clean Energy Works  
Portland, Oregon



## Service List UM1622 as of September 15, 2014

<b>W=Waive Paper service</b>	<b>C=Confidential HC=Highly Confidential</b>	
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