# Building a Better Mousetrap:
# A Unique Approach to Determining Reliable Savings Potential

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## Abstract

Estimation of remaining energy savings potential is an important step in determining energy efficiency resource allocation for any state or region. The high cost of obtaining customer-specific choices, however, often leads researchers to base these estimates on top-down approaches that utilize assumptions and high level inputs to characterize complex behavioral activities and perceptions regarding customer choices.

An innovative bottom-up approach was implemented in one New England state by RLW Analytics and participating utility companies to estimate statewide market potential based on direct customer responses to information and questions regarding their own economically feasible potential conservation measures.

## Introduction

Estimates of existing or remaining energy and demand savings potentials for a state or region are important in the design or redesign of conservation programs. Such evaluations have been done in abundance throughout the country at every level of coverage. The classical approach to most of these evaluations involves widely accepted assumptions and high level input parameters to characterize complex equipment and customer behavioral activities at the final market potential level. What complicates these analyses is the need to quantify customer choice behaviors in terms of known or perceived market barriers and drivers.

The approach described in this paper mitigates the need to quantify the limiting effects of market barriers by taking the question of willingness to purchase conservation measures directly to the potential customer. The study was limited to 132 single family detached dwellings, including buildings with up to four living units, and 32 measures that are applicable to those dwellings.

Experienced engineers performed detailed on-site audits of residential customer homes. These audits included blower door and duct blaster measurements to determine house infiltration and duct leakage to the outside. The auditors entered site data into a spreadsheet on a laptop computer to calculate energy consumption, savings, installation costs and simple paybacks for the technically and economically feasible conservation measures identified while on-site. They presented the results measure-by-measure to the homeowners and asked whether they would be willing to install the qualifying measures at full cost. If they hesitated or said no, the auditors reduced the homeowner costs to 75%, recalculated the costs and paybacks and asked again, repeating this reduction to 50%, 25% and, finally, no cost until the homeowners said they would definitely proceed, or not. Rebates were not mentioned, only hypothetical costs.

With this information it was possible to calculate real marketing potentials at various utility rebate subsidies. It was also possible to calculate individual measure and total technical and economic potentials from the audit data and economic analyses.

## Methodology

This study was intended to provide the sponsors with an estimate of the technical, economic, market and achievable potential of electric, oil and natural gas savings in the 1-4 unit residential market. This was accomplished via a measure level analysis with four primary tasks, each detailed in turn, as follows:

### Task 1: Identification of Measures

In the potential analysis, conservation technologies and measures were selected for analysis based on the careful consideration of three primary perspectives, including their technological suitability and cost-effectiveness, their practicality in the residential sector of interest based upon engineering experience, and emerging technologies appropriate for New England and anticipated to be in the marketplace soon. There were 32 measures in the analysis spanning six end-uses including lighting, envelope, water heating, HVAC, refrigeration, and appliances. Many measures were available as replace-on-burnout or retrofit, depending upon specific site conditions observed in the field.

### Task 2: Sampling of Homes.

The performance of on-site audits was the core activity associated with this study. In the process of determining which homes to sample, the key dimensions considered were location, size and heating fuel. Stratifying by location and size in the sampling plan helped to ensure that the sample adequately represented all regions of the state and various sizes of homes. Stratifying by heating fuel type ensured that adequate data were available to estimate potential for each fuel in the final analysis. The sample frame consisted of homes contacted in a market survey via random digit dialing.

In the sampling process, it was estimated that there were about 1.5 million qualifying owner-occupied households in the state. After statistically selecting the sample based upon two size strata (2,000 square feet or smaller and greater than 2,000 square feet), three heating fuels (electricity, oil and natural gas) and location by three geographic regions, RLW offered $100 incentives for customers willing to have our auditors invade their homes. The recruitment rate was very good, as approximately 24% of the homes that were called and 38% of the homes that were contacted scheduled an audit. The sampling matrix below shows the final sample audited. Following the on-site data collection, some comparisons of sample demographics to census data were made, and these indicated that the sample was representative of the general population.

**Table 1.** Final On-Site Sampling Matrix

<table>
<tr><th>House Size</th><th>Region</th><th>Electric</th><th>Natural Gas</th><th>Oil</th><th>Total</th></tr>
<tr><td>Large</td><td>1</td><td rowspan="2">2</td><td>8</td><td>14</td><td>22</td></tr>
<tr><td>Large</td><td>2</td><td>15</td><td>9</td><td>26</td></tr>
<tr><td>Large</td><td>3</td><td>1</td><td>4</td><td>13</td><td>18</td></tr>
<tr><td>Small</td><td>1</td><td rowspan="2">1</td><td>13</td><td>6</td><td>19</td></tr>
<tr><td>Small</td><td>2</td><td>11</td><td>10</td><td>22</td></tr>
<tr><td>Small</td><td>3</td><td>3</td><td>9</td><td>13</td><td>25</td></tr>
<tr><td></td><td>Total</td><td>7</td><td>60</td><td>65</td><td>132</td></tr>
</table>

**Task 3: On-site Assessments and Analysis of Potential**

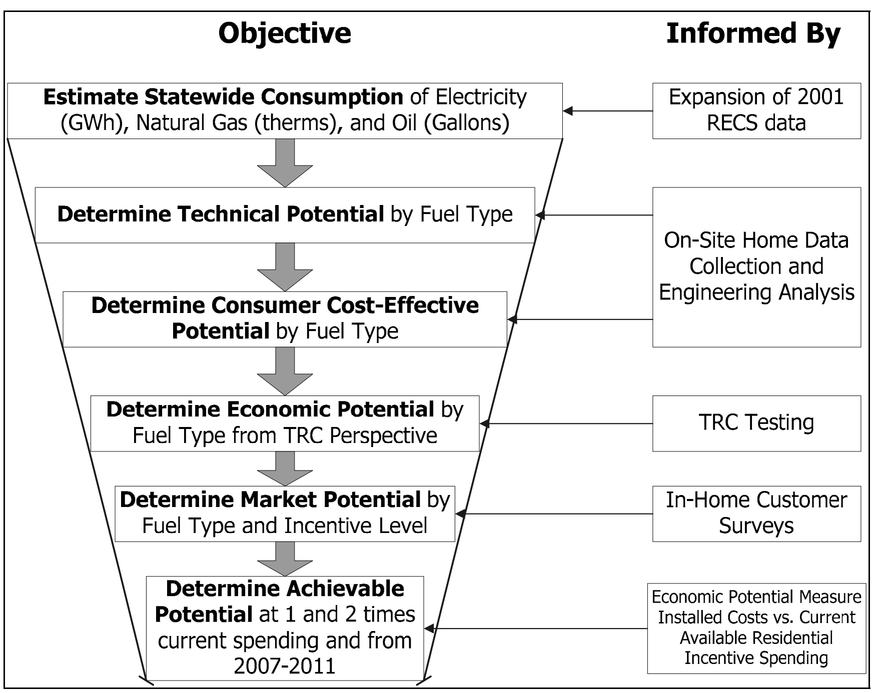
The on-site data collection consisted of detailed physical inspections of the sample households. Specifically, qualified residential auditors visited each home, conducted a detailed audit of the home and entered the information into a spreadsheet designed to identify technically and economically feasible measures and to calculate usage, savings, installation costs and simple payback for each qualifying measure. Then they conducted a survey with the homeowner based on the potential measures identified in the spreadsheet.

Data collection included the following:

- General information (areas of walls windows and conditioned spaces).
- Envelope features (insulation R-values, window types, etc.).
- Heating and cooling equipment (type, fuel, capacity, and efficiency).
- Water heating equipment (type, fuel, size, and efficiency).
- Duct insulation (location, type and R-value).
- Appliance information, including secondary appliances in use at the home.
- Main area lighting fixtures, including controls.
- Blower door testing on all homes and duct blaster testing on homes with cooling or heating ducts.
- Information from the homeowner on measures they would install at the various cost levels, as offered to them with savings, first cost and simple payback information.

Following the on-site data collection, the analysis of remaining potential was performed. Figure 1 graphically summarizes the objectives of the potential analysis including the activities performed and data sources used to inform each stage of potential refinement. These stages are further described following the figure.

**Figure 1.** Evaluation Objectives and Supporting Activities



The on-site data collection activities provide the foundation to inform most of the objectives. RLW applied a custom spreadsheet analysis tool that was developed specifically for this study to produce on-site the information necessary for each homeowner to make informed choices regarding energy conservation measures that would apply specifically to his or her home. The audit data and their responses provided the information needed in this study. The analytical approach to each step in the table above is described as follows:

**Estimate Statewide Consumption of Each Fuel Type.** 2001 Residential Energy Consumption Survey data were used to estimate the average consumption of electric (kWh), gas (therms), and oil (gallons). These estimates were expanded to the estimated statewide population based upon their appropriate sample case weights.

**Determine Technical Potential by Fuel Type.** On-site data were collected to assess efficiency opportunities relative to threshold values and target efficiencies. Technical potentials for each measure were determined by inspection. For example, if a home was found to already have an Energy Star furnace, the technical potential for that measure in that home would be zero.

**Determine Consumer Cost-Effective Potential by Fuel Type.** On-site data for each technically feasible measure were used to assess the potential savings of measures that would pay back the installation costs with energy savings within the measure lifetime. Measures that failed to pass this screen were not considered for the next step.

**Determine Economic Potential by Fuel Type from TRC perspective.** Through use of TRC testing, we calculated which measure savings were cost effective on a total resource cost basis, including the avoided capacity benefits and avoided energy benefits in the numerator and including utility administration and measure installed costs in the denominator. Measures that failed to pass this simple test were not included in the total statewide potential summaries.

**Determine Market Potential by Fuel Type and Incentive Level.** On-site data were collected to assess the likelihood that the measures in the economic potential will be installed at various homeowner costs, including 100%, 75%, 50%, 25% and no cost. These estimates were directly based upon the informed customer choices made during the on-site visits.

**Determine Achievable Potential for One Year at Current and Double Current Spending Levels and Over the Next Five Years (2007-2011).** Through use of the calculated installed costs of measures adopted at each cost (converted to rebate subsidy) level and their associated savings, RLW was able to calculate a total rebate spending required for each and all measures that the statewide population of customers would be willing to install at each rebate subsidy level. Using this information with available information on current residential incentive spending, we estimated the energy savings likely to be garnered at 1 and 2 times current spending, as well as energy savings over a 5 year window at current spending levels.

**Task 4: Presentation of Results**

There were three primary questions to be answered in this study. Each of them is outlined below, with its accompanying result. The three primary marketing indicators that were used in this study are defined as follows;

Technical Potential is the potential savings for installation of all measures in applications where they were deemed technically feasible from an engineering perspective, regardless of economic feasibility.

Economic Potential is the potential savings for installation of measures that are cost effective from both the participant and TRC cost effectiveness perspectives.

Market Potential is the estimated savings that are technically feasible and cost effective to achieve, and might actually be installed by utility customers if they are informed and offered utility incentives for applicable measures.

In addition to the three classical and global potential metrics, RLW quantified some Achievable Potentials, which are the estimated Market Potentials that can actually be captured by well designed and operating utility rebate programs at each rebate level and two overall funding levels. Achievable potentials are presented for one year at different rebate levels and over five years under different utility program funding scenarios.

## Answering the Three Primary Questions

**Question 1**: What are the remaining electric, oil and natural gas energy-efficiency opportunities in the owner-occupied 1-4 unit residential sector as might be treated by a portfolio of programs targeting this statewide utility customer sector?

**Figure 2** below presents the estimated remaining electric potential savings in the owner-occupied 1-4 unit residential market. The savings in this figure presents the energy savings of measures that passed customer level cost effectiveness testing as calculated on-site as well as the TRC cost effectiveness testing. The table shows total statewide kWh consumption, followed by technical and economic potentials and achievable potentials at different rebate funding levels.

The zero rebate funding level savings represent what homeowners would be willing to do in the absence of any utility rebate offerings. They only needed to know what measures were applicable to them, what those measures might cost and how long it would take to recover their investment. These were predominantly low cost measures, and most of them had relatively short payback times. An educational component of a utility conservation program could probably capture more savings than those shown (770 GWh), but it was suspected that many of these applications would be free-riders. In fact, free-rider estimates were calculated at every rebate level and deducted from the gross savings, so that only the net savings were counted in this study.

The study estimated that 3,422 GWh of energy savings was technically available in electric savings, or 22% of the estimated consumption of this class of customers. The potential listed as economically feasible (the Economic Potential) is 3,157 GWh, or an estimated 20% of total consumption. Market Potentials at each of five rebate levels, including no rebate, are also shown.

The primary reservoirs of electric Economic Potential savings were determined to be in the lighting end-use with 36% of the potential savings, water heating (27%), HVAC (19%), and appliances (13%).

**Figure 2:** Owner Occupied 1-4 Unit Electric Potential Savings

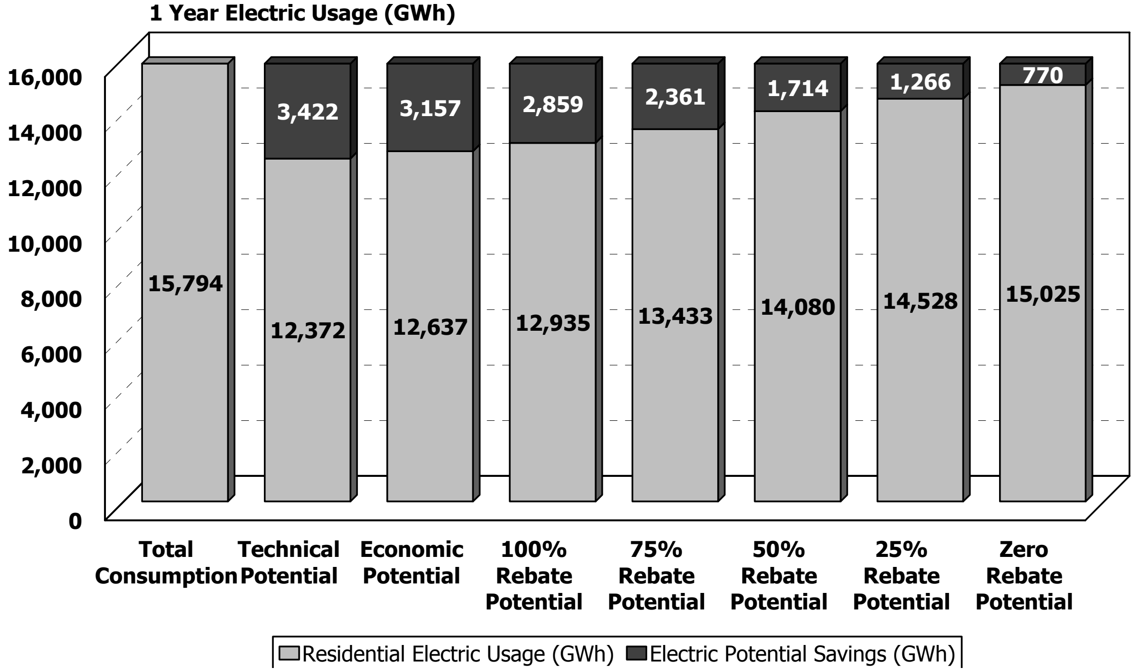



**Figure 3** below presents the estimated remaining natural gas potential savings in the owner-occupied 1-4 unit residential market. Like the electric savings above, the Economic and Market Potential estimates in this figure presents the energy savings of measures that passed customer level cost effectiveness testing and TRC cost effectiveness testing.

**Figure 3:** Owner Occupied 1-4 Unit Natural Gas Potential Savings

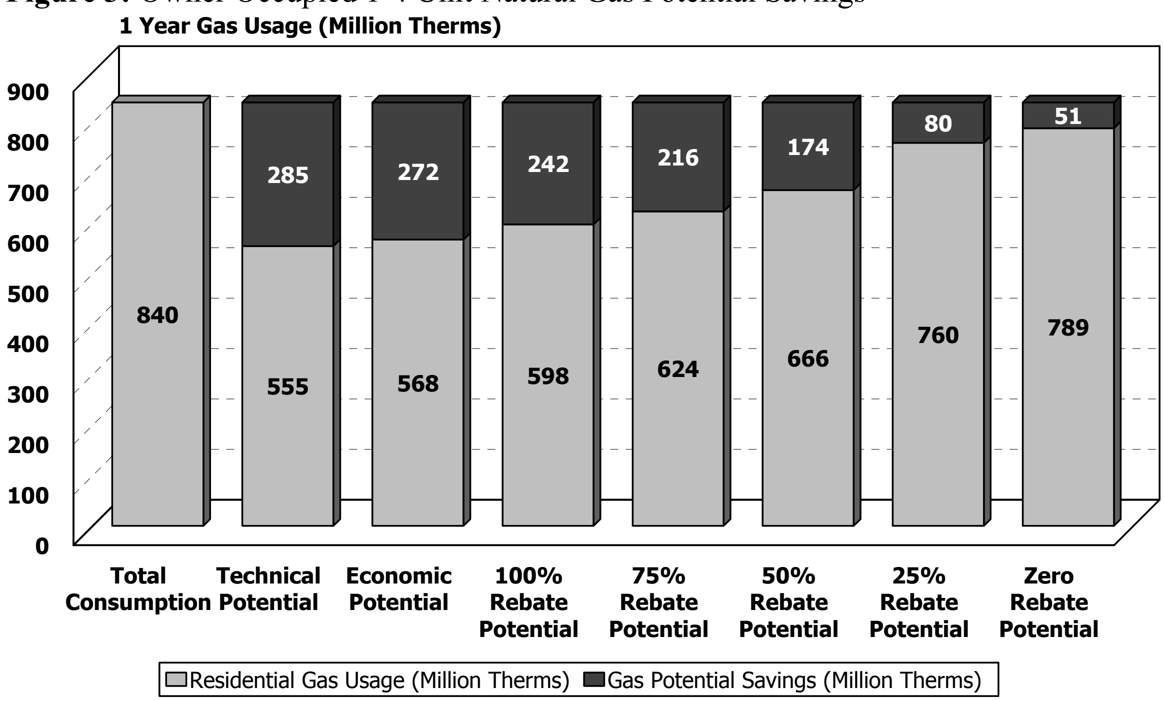


**Figure 4** below presents the estimated remaining oil potential savings in the owner-occupied 1-4 unit residential market. The savings in this figure presents the energy savings of measures that passed customer level cost effectiveness testing and TRC cost effectiveness testing.

The study estimated that 247 million gallons were technically available in fuel oil savings, or an estimated 34% of the consumption of this class of customers. The Economic Potential is estimated to be 212 million gallons, or 29% of total consumption. The primary reservoirs of oil Economic Potential savings were determined to be in the envelope end-use with 73% of the potential savings and HVAC end-use (25%).

**Figure 4:** Owner Occupied 1-4 Unit Fuel Oil Potential Savings

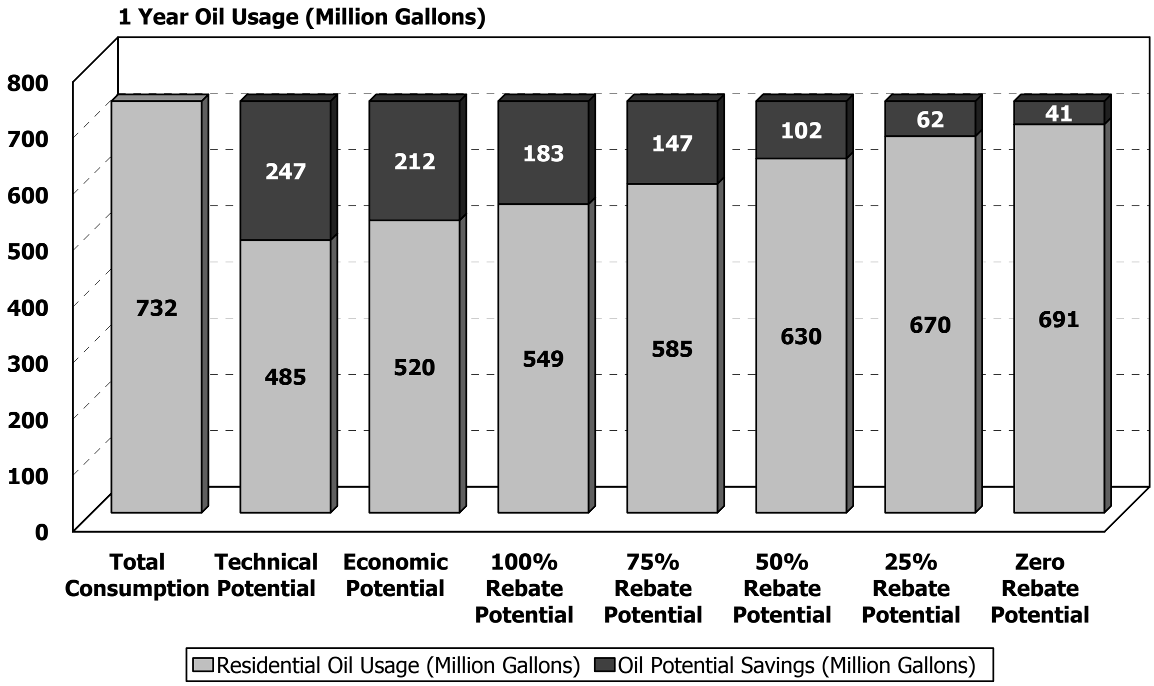



**Table 2** below shows the customer savings potential in millions of dollars. These figures were based on the assumptions that the fuels cost $0.17 per kWh, $1.73 per therm of natural gas, and $2.50 per gallon of oil. Oil has the most technical potential fuel cost savings, at $617.5 M, but Electric has the most cost savings potential with 25% rebate ($217.3 M) and no rebate incentive ($132.2 M).

**Table 2:** Consumer Bill Savings Potential by Fuel (Millions of Dollars)

| Potential Level | Electric | Natural Gas | Oil |
|---|---|---|---|
| Technical Potential | $587.3 | $493.7 | $617.5 |
| Economic Potential | $541.8 | $471.2 | $530.0 |
| 100% Rebate | $486.2 | $419.2 | $457.5 |
| 75% Rebate | $405.2 | $374.2 | $367.5 |
| 50% Rebate | $294.2 | $301.4 | $255.0 |
| 25% Rebate | $217.3 | $138.6 | $155.0 |
| No Rebate | $132.2 | $88.3 | $102.5 |

**Question 2**: What measures and savings are cost effective to install from a Total Resource Cost (TRC) benefit/cost perspective (i.e., economic potential)?

RLW performed TRC testing on each measure based upon the information collected on-site, program cost information gathered from the sponsors and estimates of the cost of installation. With all measures combined, the portfolio level TRC benefit cost ratio was calculated to be 2.67, including measures that did not pass the TRC test.

Of the 32 measures evaluated, 28 passed the TRC test, as shown in the Table 3 below.

**Table 3:** Measures Calculated to Pass TRC Testing

| End Use | Measure | Total TRC Benefits (M $) | Total TRC Costs (M $) | TRC B/C Ratio |
|---|---|---|---|---|
| HVAC | Add Fiberglass Batt to Ducts in Attic | $203 | $13 | 15.67 |
| Lighting | Incandescent to Equivalent CFLs | $3,741 | $529 | 7.07 |
| Appliances | Energy Star Room Heat Pump | $463 | $70 | 6.59 |
| HVAC | High Efficiency AC | $3,710 | $798 | 4.65 |
| Envelope | Rim Joist Insulation: Add Fiberglass Batt | $234 | $58 | 4.06 |
| Water Heating | Install Faucet Aerators | $53 | $13 | 4.04 |
| HVAC | CAC Installation Practice | $167 | $48 | 3.50 |
| Envelope | Attic Insulation: Add Loose Fill Cellulose | $489 | $157 | 3.11 |
| Water Heating | Heat Pump Water Heater | $1,362 | $445 | 3.06 |
| Envelope | Door: Steel Door, Urethane w/break | $837 | $280 | 2.99 |
| Envelope | Finished Wall: Add Blown-In Cellulose | $1,547 | $520 | 2.98 |
| HVAC | Programmable Thermostats | $96 | $33 | 2.94 |
| HVAC | Aerosol-Based Duct Sealing | $724 | $249 | 2.90 |
| Appliances | Energy Star Room AC | $462 | $161 | 2.88 |
| Lighting | Exterior Flood Lights, CFL w/Motion Sensors | $79 | $28 | 2.82 |
| Envelope | Add Batt to Floor over Unconditioned Basement | $1,786 | $641 | 2.79 |
| Water Heating | Install Low-Flow Showerheads | $12 | $5 | 2.59 |
| HVAC | AC & HP Tune-Up | $89 | $35 | 2.57 |
| Water Heating | Add R-6 Pipe Insulation | $50 | $28 | 1.78 |
| Envelope | Attic Insulation: Add Fiberglass Batt | $667 | $385 | 1.73 |
| HVAC | ECM Furnace, <300 kBTUh | $1,710 | $1,039 | 1.65 |
| Appliances | Remove Second Refrigerator or Freezer | $40 | $26 | 1.57 |
| HVAC | Steam Boiler, <300 kBTUh | $273 | $174 | 1.57 |
| Appliances | Energy Star Clothes Washer | $279 | $190 | 1.47 |
| HVAC | FA Furnace, <300 kBTUh | $284.1 | $195 | 1.46 |
| Envelope | Weatherstrip windows & doors | $666 | $480 | 1.39 |
| HVAC | HW Boiler, <300 kBTUh | $1,925 | $1,400 | 1.37 |
| Envelope | Caulk windows & doors, etc. | $595 | $445 | 1.34 |

The TRC ratios ranged from a high of 15.7 for duct insulation to 1.34 for caulking windows and doors. Eighteen of the measures indicate a TRC ratio above 2. Four measures did not pass the TRC test, although their ratios were still relatively high. These included tank wrap (0.93), efficient windows (0.88), one kWh/day refrigerator (0.83), and ENERGY STAR dishwashers (0.79).

**Question 3**: What proportions of the estimated remaining opportunities are likely to be installed under the following four scenarios?

Scenario one, in which program dollars are unbounded but the potential is constrained by TRC cost-effectiveness, cost-effectiveness to the consumer, and consumer willingness to take action at the highest incentive level; scenario two, in which program funds are bounded by the current level of spending; scenario three, in which funds are available for 2 times the current spending; and scenario four, in which funds are bounded by the current annual level and continued over five years (2007-2011).

The answers for scenario one are revealed in Figures 2, 3 and 4 above in the blackened parts of the 100% rebate potential bars. With unlimited funding, the theoretical energy savings potentials are 2,859 GWh of electricity, 242 million therms of natural gas and 183 million gallons of oil. These numbers are also shown in the tables below, where the first four columns in all three tables are the same.

**Table 4:** Achievable Energy Savings in One Year at Current Funding Levels

| Fuel | Total Cost to Install all Measures (M$) | Sponsor Rebate Costs to Install all Measures (M$) | Total Potential Savings (GWh, Therms, Gallons) | Percent of Total Savings Captured Annually | Estimated Captured Savings (GWh, Therms, Gallons) | Rebates Available & Spendable per Year (M$) |
|---|---|---|---|---|---|---|
| 100% Rebate Level | | | | | | |
| Elec | $1,484 | $1,484 | 2,859 | 1.4% | 39 | $20.3 |
| Gas | $2,597 | $2,597 | 242 | 0.3% | 0.6 | $6.5 |
| Oil | $2,127 | $2,127 | 183 | 0.1% | 0.2 | $2.3 |
| 75% Rebate Level | | | | | | |
| Elec | $1,128 | $846 | 2,361 | 2.4% | 57 | $20.3 |
| Gas | $2,106 | $1,579 | 216 | 0.4% | 0.9 | $6.5 |
| Oil | $1,537 | $1,153 | 147 | 0.2% | 0.3 | $2.3 |
| 50% Rebate Level | | | | | | |
| Elec | $634 | $317 | 1,714 | 5.4% | 93 | $17.1 |
| Gas | $1,546 | $773 | 174 | 0.8% | 1.5 | $6.5 |
| Oil | $947 | $473 | 102 | 0.5% | 0.5 | $2.3 |
| 25% Rebate Level | | | | | | |
| Elec | $477 | $119 | 1,266 | 5.4% | 68 | $6.4 |
| Gas | $514 | $128 | 80 | 5.1% | 4 | $6.5 |
| Oil | $481 | $120 | 62 | 1.9% | 1.2 | $2.3 |

Results for scenario two are depicted in **Table 4** above, where the last three columns show the percentage of total savings potentials that may be captured each year, the estimated captured savings and the available and spendable rebate dollars per year. Results are shown for four overall (averaged across all measures) rebate levels and for each fuel. Spendable rebate dollars may be less than available dollars at lower rebate levels due to realistic marketing (advertising and selling) limitations under fixed program budgets, as indicated at the 50% and 25% rebate levels for electric savings.

With a design rebate level of 50% overall (typical of many utility rebate programs), it is assumed that only about 5.4% of the total potential may be captured per year, yielding 93 GigaWatt hours (GWh) of savings annually. Even though the current rebate budget in this scenario is $20.3 million, only $17.1 million will be spendable unless some of the excess rebate budget is reallocated to increase advertising and, possibly, staffing levels.

Results for scenario three are depicted in **Table 5** below. This doubling of current annual funding assumes that rebate monies will more than double and that other administrative costs will not need to be fully doubled. Hence, the rebate budget for this scenario becomes $45.4 million, and the electric savings potential at the 50% rebate level becomes 173 GWh, or 10.1% of the total potential savings of 1,714 GWh. With this massively increased budget, the annual market capture rate is increased but not quite doubled from 5.4% to 10.1%. By theoretical marketing standards this would be a very aggressive marketing goal.

**Table 5:** Achievable Energy Savings at Double Current Funding Levels

| Fuel | Total Cost to Install all Measures (M$) | Sponsor Rebate Costs to Install all Measures (M$) | Total Potential Savings (GWh, Therms, Gallons) | Percent of Total Savings Captured Annually | Estimated Captured Savings (GWh, Therms, Gallons) | Rebates Available & Spendable per Year (M$) |
|---|---|---|---|---|---|---|
| 100% Rebate Level | | | | | | |
| Elec | $1,484 | $1,484 | 2,859 | 3.1% | 87 | $45.4 |
| Gas | $2,597 | $2,597 | 242 | 0.6% | 1.4 | $14.6 |
| Oil | $2,128 | $2,128 | 183 | 0.2% | 0.4 | $5.0 |
| 75% Rebate Level | | | | | | |
| Elec | $1,128 | $846 | 2,361 | 5.4% | 127 | $45.4 |
| Gas | $2,106 | $1,579 | 216 | 0.9% | 2.0 | $14.6 |
| Oil | $1,537 | $1,153 | 147 | 0.4% | 0.6 | $5.0 |
| 50% Rebate Level | | | | | | |
| Elec | $634 | $317 | 1,714 | 10.1% | 173 | $31.9 |
| Gas | $1,546 | $773 | 174 | 1.9% | 3.3 | $14.6 |
| Oil | $947 | $473 | 102 | 1.1% | 1.1 | $5.0 |
| 25% Rebate Level | | | | | | |
| Elec | $477 | $119 | 1,266 | 10.1% | 128 | $12.0 |
| Gas | $514 | $128 | 80 | 10.1% | 8 | $13.0 |
| Oil | $481 | $120 | 62 | 4.2% | 2.6 | $5.0 |

Finally, **Table 6** below shows what could be achieved over five years under current annual program funding levels providing $20.3 million annually for electric measures, $6.5 million for natural gas and $2.3

million (from electric conservation funds) for oil. If the overall average rebate offering is 50%, it is seen that the captured savings over five years is 27.0% of the available market potential, or 463 GWh.

Again, it is not possible to spend the entire annual rebate budget at 50% or less under the current program design, but if the rebate is either decreased to 25% or increased to 75% the estimated captured savings is decreased due to the dynamics of shifting fixed budget dollars between rebate expenses and the associated administrative costs of servicing fewer or more customers whose willingness to participate is also significantly affected. There exists an optimum balance of program funds, and it appears to be just slightly above a 50% overall rebate level.

**Table 6:** Achievable Energy Savings from 2007-2011 at Current Funding Levels

| Fuel | Total Cost to Install all Measures (M$) | Sponsor Rebate Costs to Install all Measures (M$) | Total Potential Savings (GWh, Therms, Gallons) | Percent of Total Savings Captured Over 5 Years | Estimated Captured Savings (GWh, Therms, Gallons) | Rebates Available & Spendable per Years (M$) |
|---|---|---|---|---|---|---|
| 100% Rebate Level | | | | | | |
| Elec | $1,484 | $1,484 | 2,859 | 6.8% | 195 | $20.3 |
| Gas | $2,597 | $2,597 | 242 | 1.3% | 3.0 | $6.5 |
| Oil | $2,128 | $2,128 | 183 | 0.5% | 1.0 | $2.3 |
| 75% Rebate Level | | | | | | |
| Elec | $1,128 | $846 | 2,361 | 12.0% | 283 | $20.3 |
| Gas | $2,106 | $1,579 | 216 | 2.1% | 4.4 | $6.5 |
| Oil | $1,537 | $1,153 | 147 | 1.0% | 1.4 | $2.3 |
| 50% Rebate Level | | | | | | |
| Elec | $634 | $317 | 1,714 | 27.0% | 463 | $17.1 |
| Gas | $1,546 | $773 | 174 | 4.2% | 7.3 | $6.5 |
| Oil | $947 | $473 | 102 | 2.4% | 2.4 | $2.3 |
| 25% Rebate Level | | | | | | |
| Elec | $477 | $119 | 1,266 | 27.0% | 342 | $6.4 |
| Gas | $514 | $128 | 80 | 25.3% | 20.1 | $6.5 |
| Oil | $481 | $120 | 62 | 9.4% | 5.8 | $2.3 |

## Conclusions

Informed by potential utility program participants regarding their willingness to install energy conservation measures under various cost scenarios, it is possible to look into the complex dynamics of utility program design at various rebate levels without having to make assumptions about market barriers, drivers and other variables that affect customer choice behavior. A widely recognized weakness in this approach is the tendency for people to say they will do something because it seems like a good idea at the time, but to not follow through with the necessary action. To minimize this tendency, the auditors coached the responders to answer yes only if they were very certain they would implement the measure within the next six months. This drove many of the responses toward lower levels of installed cost.

This study was a snapshot in time, and results should vary in different regions and under different economic conditions. It is believed that impending fuel price escalation will tend to increase customer participation in conservation programs. The recent spike in fuel prices just prior to and during this study probably drove these estimates up from what they might have been a year earlier.