# Economic Impacts From Energy Trust of Oregon 2013 Program Activities

## Final Report

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## Acknowledgements

This report was prepared by Pinnacle Economics for the Energy Trust of Oregon. Alec Josephson, senior economist, was the lead economist and author of this report. Mr. Josephson has directed and/or conducted all of the previous economic impact analyses of Energy Trust programs, as well as similar analyses for the Bonneville Power Administration, Consumers Energy of Michigan, the Hawaii Public Utility Commission, the U.S. Department of Energy, and the American Council for an Energy-Efficient Economy ("ACEEE").

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# 1. INTRODUCTION AND SUMMARY

Pinnacle Economics ("Pinnacle") was retained by Energy Trust of Oregon ("Energy Trust") to estimate the economic impacts of its energy efficiency and renewable energy programs in 2013 on the Oregon economy.[1] These impacts include changes in output, wages, business income, and employment in Oregon that resulted from 2013 program spending and activities. Each year, Energy Trust programs generate energy efficiency gains (i.e., energy savings) and renewable energy generation that continue into the future. As a result, Pinnacle also analyzed the economic impacts from the current program year that accumulate in following years.

For this analysis, *gross impacts* are calculated and then compared against a Base Case spending scenario, which assumes that funds that were paid to Energy Trust are returned and spent by Oregon ratepayers in the Oregon service territories of Portland General Electric (PGE), Pacific Power, Northwest Natural, and Cascade Natural Gas. The difference in economic impacts between the gross economic impacts attributed to Energy Trust program spending and the Base Case scenario is referred to as *net impacts*.[2]

In 2013, Energy Trust spending totaled $130.3 million. This spending was primarily focused on program implementation, with $118.1 million for energy efficiency programs and $7.9 million for renewable energy programs. In addition, the Energy Trust incurred $4.3 million in administrative and program support costs during the 2013 program year. On an annual basis, Energy Trust achieved energy efficiency savings and renewable energy generation during the 2013 program year totaling 60.7 average megawatts (aMW) of electricity (531,500 MWh) and 5.3 million therms of natural gas.

The gross and net economic impacts for Energy Trust 2013 program activities are shown in Table ES1. The changes in spending and energy savings/generation associated with these programs had the following net economic impacts on the Oregon economy in 2013:

- An increase of $175.1 million in output;
- An increase of $60.4 million in wages and $14.7 million in income to small business owners; and
- 1,091 full- and part-time jobs.

[1] Some of these projects also received financial and/or technical assistance through state and federal tax credit programs. Based on evaluations, Energy Trust believes their participation to be critical to these projects.

[2] An analysis of the *net economic impacts* requires that only economic stimuli that are new or additive to the economy be counted, i.e., net impacts consider both the positive economic impacts from investment in energy efficiency and the negative economic impacts of foregone spending associated with program funding. By making adjustments for program funding, net economic impacts provide a more reliable measure of job and income creation. For example, if an impact of five net new jobs is reported, this means that spending on Energy Trust programs resulted in five more jobs relative to what would have occurred had the money been returned and spent by Oregon ratepayers in the utility service territories.

**Table ES1: Gross and Net Economic Impacts, 2013**

| Impact Measure | Gross Impacts | Net Impacts |
|---|---|---|
| Output | $325,550,000 | $175,089,000 |
| Wages | $106,771,000 | $60,448,000 |
| Business Income | $21,654,000 | $14,705,000 |
| Jobs | 2,312 | 1,091 |

Table ES2 reports the net economic impacts for every million dollars in Energy Trust spending.[3] For the 2013 program year, every million dollars in Energy Trust spending is associated with approximately $1.3 million in new economic activity in Oregon, including $463,800 in wages, $112,800 in business income, and 8.4 jobs.

**Table ES2: Net Economic Impacts Per $1 Million in Energy Trust Spending, 2013**

| Impact Measure | Net Impacts Per $1 Million in Spending |
|---|---|
| Output | $1,343,500 |
| Wages | $463,800 |
| Business Income | $112,800 |
| Jobs | 8.4 |

The remainder of this report documents the analysis that was completed to develop these economic impact estimates.

[3] These are "fully loaded costs" that include Energy Trust program and administrative costs, as well as incentives paid to program participants.

# 2. ENERGY TRUST 2013 PROGRAM ACTIVITIES

## 2.A. 2013 EXPENDITURES

For this analysis, budget information provided by Energy Trust was aggregated into several general categories to facilitate economic impact modeling for similar areas of spending. Table 1 shows the general areas of spending for Energy Trust and reflects actual expenditures for 2013.[4] As shown at the bottom of the table, total spending by Energy Trust in 2013 was $130.3 million.

As a general rule, spending on program incentives goes directly to equipment purchases and labor for installation. Common measures that receive incentives include high efficiency lighting, high efficiency HVAC systems, appliances, industrial process efficiency improvements, and home and commercial weatherization. Energy Trust also incurs non-incentive expenses for program delivery. In 2013, program expenditures[5] for energy efficiency measures totaled $118.1 million (a decrease of $10.2 million or -7.9 percent from previous year). Program expenditures for renewable energy resources totaled $7.9 million (a decrease of $13.9 million or -63.7 percent from 2012).

**Table 1**: **Energy Trust Program Spending ($ millions), 2013**

| Spending Category | Total Program Expenses | Total Support Costs | Total |
|---|---|---|---|
| Energy Efficiency Programs | $118.1 | | $118.1 |
| Renewable Energy Programs | $7.9 | | $7.9 |
| Other Admin & Program Support | | $4.3 | $4.3 |
| **Total** | **$126.1** | **$4.0** | **$130.3** |

**Source:** Energy Trust of Oregon, "Statement of Functional Expenses"
**Note:** Energy Trust program spending includes $1.2 million in spending on projects in Clark County, Washington.

## 2.B. 2013 ENERGY SAVINGS AND GENERATION

Table 2 shows the total net energy saved and generated by Energy Trust programs in 2013. On an annualized basis, a total of 60.7 average megawatts were saved or generated as a direct result of Energy Trust program activities in 2013. This includes energy savings for both residential and commercial-industrial energy efficiency programs, as well as energy generated through Energy Trust's renewable energy program. It also includes the net energy savings attributed to market transformation effects by the Northwest Energy Efficiency Alliance (NEEA).

[4] Energy Trust did not commission a full economic impact study for the 2012 program year. As a result, direct measures of program activity (spending and energy savings) for that year were provided by Energy Trust to provide additional context for this analysis. In addition, the economic impacts for 2012 were estimated by Energy Trust using economic impact results from the 2011 study and the level of program spending in 2012.

[5] Program expenditures are based on incentives and allocated support costs.

**Table 2**: **Annualized Net Energy Savings and Generation, 2013**

| Program Sector | Annual kWh | Average MW (aMW) | Annual Therms |
|---|---|---|---|
| Residential Energy Efficiency | 139,823,822 | 16.0 | 2,079,520 |
| Commercial/Industrial Energy Efficiency | 366,543,982 | 41.8 | 3,230,030 |
| **Energy Efficiency Subtotal** | **506,367,804** | **57.8** | **5,309,550** |
| Renewable Energy | 25,132,210 | 2.9 | 0 |
| **Total Energy Saved or Generated** | **531,500,014** | **60.7** | **5,309,550** |

**Source:** Energy Trust of Oregon
**Notes:** 1) Energy savings are reported on a net basis and have been adjusted by the Energy Trust for free-ridership, i.e., program participants who would have adopted energy efficient measures or renewable energy projects even in the absence of Energy Trust programs. 2) Net energy savings include energy savings attributed to market transformation effects by NEEA.

Electric energy savings form the bulk of net energy savings. In total, on an annualized basis, 506,368 MWh of electricity were saved as a result of energy efficiency programs in 2013. This is approximately 0.3 percent more than in 2012, when Energy Trust energy efficiency programs saved 504,602 MWh of electricity. The mix of electric energy savings across programs was approximately the same as in previous years. In 2013, commercial and industrial energy efficiency programs account for 72.4 percent of total electric energy savings (compared to 70.4 percent in 2012). Residential energy efficiency programs account for 27.6 percent of total electric energy savings in 2013 (compared to 29.6 percent in 2012).

Similar to previous years, the amount of energy generated by the renewable energy program in 2013 is relatively small compared to the energy savings attributed to the efficiency programs. In 2013, renewable energy projects generated approximately 25,132 MWh of electricity. This represents a decline of 41.1 percent from the previous program year.

The efficiency gains shown in Table 2 result in a loss of revenue to Oregon utilities due to lost power sales, and this loss of revenue is included in the gross economic impacts measured in this analysis.[6] If the utility sector had similar economic impact multipliers as other sectors in Oregon's economy, then the energy cost savings in other sectors would roughly cancel out the loss of revenue in the utility sector. For Oregon utilities, much of the spending impact flows outside the state, as Pacific Power is owned by an out-of-state company, and both Pacific Power and PGE have shareholders that are widely distributed throughout the country. Consequently, some of the revenue losses for utilities (and the resulting losses in employment and economic activity) accrue to businesses and households outside of Oregon.

[6] For this analysis, it was assumed that utilities did not sell saved power on the spot market, as estimates of the amount of power sold due to energy efficiency are generally unavailable. If utilities can sell conserved power on the market due to the efficiency programs, then there is an additional benefit in the form of increased revenues to the utility sector. As this was not included in this analysis, the results discussed here represent a lower bound for potential utility sector benefits.

There is an additional long-term benefit from the efficiency gains, as they delay the need for building new power generation. Power generated from new sources will almost certainly be more expensive than existing power resources due to increased costs of capital and issues associated with siting new power plants. In this sense, efficiency gains can be viewed as a means for prolonging the use of lower-cost resources and delaying the need for switching to higher cost power supplied by new generation. By enabling the efficient use of lower cost resources, these programs help the entire Oregon economy run more efficiently. This benefit was not explicitly modeled for this analysis because it is directly addressed in the Energy Trust's benefit/cost analysis. It is nevertheless an important issue and is one of the primary tenets underlying conservation and demand-side management programs.

## 3. ANALYSIS METHODS

Estimating the economic impacts attributable to Energy Trust programs is a complex process, as spending by Energy Trust—and subsequent changes in spending by program participants—unfold over a lengthy period of time. From this perspective, therefore, the most appropriate analytical framework for estimating the economic impacts is to classify them into the following categories:

- *Short-term* economic impacts associated with changes in business activity as a direct result of changes in spending by Energy Trust programs and participants.

- *Long-term* economic impacts associated with the subsequent changes in factor costs and optimal use of resources.

This analysis estimates the short-term economic impacts of Energy Trust program activities during the 2013 program year. The short-term economic impacts are those attributed to additional dollars accruing to Oregon businesses and households as a result of these programs. The economic modeling framework that best measures these short-term economic impacts is called input-output modeling. Input-output models provide an empirical representation of the economy and its inter-sectoral relationships, enabling the user to trace the effects (economic impacts) of a change in the demand for commodities (goods and services).

Because input-output models generally are not available for state and regional economies, special data techniques have been developed to estimate the necessary empirical relationships from a combination of national technological relationships and county-level measures of economic activity. This modeling framework, called IMPLAN (for IMpact Analysis for PLANning), is the technique that Pinnacle Economics has applied to the estimation of impacts.[7]

[7] IMPLAN was developed by the Forest Service of the US Department of Agriculture in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management of the US Department of the Interior to assist federal agencies in their land and resource management planning. Staff at Pinnacle Economics used IMPLAN and the same modeling framework for all of our previous impact analyses for Energy Trust, as well as similar analyses conducted for the Bonneville Power Administration, Consumers Energy of Michigan, the Hawaii Public Utility Commission, the U.S. Department of Energy, and the American Council for an Energy-Efficient Economy ("ACEEE").

This analysis relies on 2012 IMPLAN data for the Oregon economy—the most current data available.

Input-output analysis employs specific terminology to identify the different types of economic impacts that result from economic activities. Expenditures made through Energy Trust programs affect the Oregon economy *directly*, through the purchases of goods and services in this state, and *indirectly*, as those purchases, in turn, generate purchases of intermediate goods and services from other, related sectors of the economy. In addition, the direct and indirect increases in employment and income enhance overall economy purchasing power, thereby *inducing* further consumption- and investment- driven stimulus. This cycle continues until the spending eventually leaks out of the local economy as a result of taxes, savings, or purchases of non-locally produced goods and services or "imports."

The IMPLAN model reports the following economic impact measures:

- *Total Industrial Output (Output)* is the value of production by industries for a specified period of time. Output can be also thought of as the value of sales including reductions or increases in business inventories.
- *Employee Compensation (Wages)* includes workers' wages and salaries, as well as other benefits such as health and life insurance, and retirement payments, and non-cash compensation.
- *Proprietary Income (Business Income)* represents the payments received by small-business owners or self-employed workers. Business income would include, for example, income received by private business owners, doctors, accountants, lawyers, etc.
- *Job* impacts include both full and part time employment. Over time, job impacts are referred to as person-years of employment.

All of the economic impacts measured in this analysis are transitory and depend on program spending and energy savings in each year. That is, economic impacts for each program year are generated by changes in final demand (spending) that can be directly or subsequently linked back to Energy Trust programs. The mix and level of program spending may change from year to year, or could end in any given year. This means that the economic impacts will also vary from year to year, or could end in any given year. This is particularly important when discussing employment impacts. Although employment impacts are reported as a mix of full- and part-time jobs, they are jobs that occur as spending occurs and should be considered person-years of employment. In addition, it is highly likely that some of the employment benefits accrue to the same individuals over time.

Within this modeling framework, the following terms are used to classify impacts:[8]

- *Gross Impacts* reflect the economic impacts with no adjustment made for impacts that might have occurred in the Base Case scenario. Gross impacts include:
    - *Program operations spending* as Energy Trust purchases labor and materials to carry out its energy efficiency and renewable energy programs.
    - *Incremental measure spending* by participants in Energy Trust programs.
    - *Reductions in energy consumption* and the associated lower operating costs to businesses and increases in household disposable income.[9]
    - *Reductions in utility revenues* as households and businesses consume less electricity and natural gas.

- *Net Impacts* are the effects of Energy Trust program activities that have been adjusted to reflect the Base Case scenario. That is, net impacts are those impacts over and above what would have occurred in the Base Case scenario. Net impacts are based on:
    - *Gross* Energy Trust program impacts (discussed above).
    - *Less foregone household spending* as a result of the public purpose charges that are collected from ratepayers and used by Energy Trust to cover program management and administrative costs, and as incentives in their energy efficiency and renewable energy programs.

## 4. GROSS ECONOMIC IMPACTS

The gross economic impacts attributed to Energy Trust programs are based on the program costs (including administration costs), and the net incremental measure spending and net energy savings of program participants. Incremental measure spending by program participants consists of expenditures on energy efficiency equipment such as appliances and furnaces/boilers, heating, ventilation and air conditioning (HVAC) systems, lighting modifications, etc., and spending on renewable energy projects. In both cases, incremental measure spending includes spending on measure installation. This is important because expenditures on measure installation benefit local, Oregon contractors while spending on the measures themselves generally benefit non-local manufacturers.[10] As a result, spending on installation (labor) and equipment will produce substantially different economic impacts for the Oregon economy. Pinnacle received detailed

[8] Both incremental measure spending and energy savings are included on a net basis, i.e., both have been adjusted to account for potential free riders. In energy efficiency programs, free riders are participants who would have adopted the energy efficiency measure or renewable energy project even in the absence of the program.

[9] Energy savings include the net energy savings associated with market transformation efforts conducted by NEEA. These effects cannot be measured on a project-by-project basis. Thus, Pinnacle Economics allocated NEEA's commercial and industrial net energy savings on a *pro rata* basis using the distribution of net energy savings, across industry sectors, for the Energy Trust's commercial and industrial programs.

[10] For some measures, the use of "margining" on equipment sales generates economic benefits (albeit modest impacts) for Oregon retailers, wholesalers, and transporters.

incremental measure spending data from Energy Trust, and mapped this spending to over 30 different IMPLAN sectors.

Energy Trust also supplied detailed energy savings estimates, broken out by fuel type (electricity, natural gas) for program participants. For residences, lower energy costs will increase Oregon households' disposable income. Therefore, the estimated energy cost savings for residential customers were input into a modified consumption function representing the spending pattern of a middle-income household in Oregon, which mapped the spending to over 400 IMPLAN sectors.[11]

Energy savings for commercial-industrial program participants were first mapped to industry sector using North American Industrial Classification System ("NAICS") codes, and then cross-referenced to 237 different business sectors in the IMPLAN model.[12] From an input-output perspective, energy savings will affect Oregon businesses by lowering their production costs. To estimate the economic impacts associated with these lower energy costs, Pinnacle used an elasticity-based approach to estimate the change in output. That is, this approach assumes that lower energy costs increase the competitiveness of Oregon businesses, allowing them to decrease price, and increase output.[13]

Lastly, the energy savings for households and businesses translate into lower revenues to electric and natural gas utilities. Pinnacle used estimated energy savings, by fuel type, to reduce revenues to utilities. The gross economic impacts of Energy Trust programs for 2013 are shown in Table 3.

**Table 3: Gross Economic Impacts, 2013**

| Impact Measure | Gross Impacts |
|---|---|
| Output | $325,550,000 |
| Wages | $106,771,000 |
| Business Income | $21,654,000 |
| Jobs (person-years) | 2,312 |

**Sources:** Pinnacle Economics using detailed Energy Trust program data and IMPLAN.

In 2013, spending and energy savings attributed to Energy Trust programs increased economic output in Oregon by $325.6 million, including increases of $106.8 million in wages and

[11] This consumption function was modified to exclude spending on electricity and natural gas.

[12] Over time, Energy Trust's commercial and industrial energy efficiency programs have expanded to more industry sectors. In 2006, energy savings were allocated to 100 industry sectors in the IMPLAN model. In this analysis, energy savings for commercial and industrial program participants are mapped to 237 industry sectors. This is modestly less than in 2010, when energy savings were mapped to 267 different business sectors, but still represents a 137 percent increase since 2006.

[13] Because we do not have elasticity coefficients for each of the 237 business sectors (and their commodities) that benefited from reduced energy costs, Pinnacle uses unitary elasticity, i.e., a 1 percent decrease in costs translates into a 1 percent increase in output.

$21.7 million in business income. This activity also supported 2,312 jobs in Oregon. Table 3, however, reports gross impacts that do not take into consideration alternative uses of Energy Trust and participant spending related to these programs. These net impacts are addressed in the next section.

## 5. NET ECONOMIC IMPACTS

All of the economic impacts reported in this section of the report are *net impacts* and reflect economic benefits over and above what would have occurred had Energy Trust programs not existed. To calculate net impacts, the economic impacts of the Base Case scenario are estimated first, which assumes that the money that is currently spent on Energy Trust programs is instead reallocated to, and spent by, utility ratepayers. The economic impacts resulting from the Base Case scenario are then subtracted from the gross impacts discussed in the previous section to determine net impacts.

Table 4 shows the net economic impacts attributed to Energy Trust programs in 2013. The net economic impacts are positive and (by design) significantly less than the gross economic impacts reported previously. The gross economic impacts include the assumption that revenues to utilities and other providers of energy services decline as a result of the energy savings by households and businesses. To this, we have now included the Base Case spending scenario that assumes that all Energy Trust funds are instead spent by ratepayers of the utilities according to the spending patterns of a typical Oregon household.

For 2013, Energy Trust programs had a net effect of increasing Oregon's economic output by $175.1 million relative to the Base Case scenario. This includes an increase of $60.4 million in wages and $14.7 million in business income within Oregon. Energy Trust programs also had a positive net impact on employment in Oregon, with 1,091 jobs sustained by Energy Trust program activities in 2013. This reflects jobs over and above what would have been created in the Base Case scenario, i.e., in the absence of Energy Trust's energy efficiency and renewable energy programs.

**Table 4: Net Economic Impacts, 2013**

| Impact Measure | Net Impacts |
|---|---|
| Output | $175,089,000 |
| Wages | $60,448,000 |
| Business Income | $14,705,000 |
| Jobs (person-years) | 1,091 |

**Sources:** Pinnacle Economics using detailed Energy Trust program data and IMPLAN.

## 6. ECONOMIC IMPACTS ACROSS ALL PROGRAM YEARS, 2002 THROUGH 2013

An important dimension of energy efficiency programs is that energy savings and the associated economic impacts continue to benefit the economy after the first program year, when spending

and installations occur, as most measures have estimated useful lives of eight to 20 years, or more.

The cost savings from these measures for homes and businesses also extend into future years (with some degradation as equipment ages and some increase in savings as rates increase) after the initial purchase. These cost savings continue to benefit the economy, as households spend less on electricity and natural gas and more on other consumer products, and businesses are able to produce goods and services more efficiently. As a consequence, the net effects from the first year when the equipment and program spending occur only capture a fraction of the overall benefit of these programs.

Table 5 shows the annualized economic impacts due to energy cost savings from energy efficiency measures installed in 2013. These estimates were calculated using the input-output model to estimate the economic impacts of reduced energy costs while setting all other costs (i.e., equipment purchases and program implementation costs) equal to zero. To truly isolate the impact of the energy cost savings, we also assumed that there are no lost utility revenues resulting from the measures installed and that utilities would be able to sell the unused power to other customers. This provides an estimate of energy efficiency benefits based solely on the reduced energy costs to the economy and excludes any additional benefits due to the spending on these programs and measures.

**Table 5: Annualized Economic Impacts Due to Energy Savings Alone, 2013**

| Impact Measure | Impact Due to 2013 Energy Savings |
|---|---|
| Output | $66,694,000 |
| Wages | $20,570,000 |
| Business Income | $2,410,000 |
| Jobs | 538 |

**Sources:** Pinnacle Economics using detailed Energy Trust Program data and IMPLAN.
**Notes:** 1) Energy savings impacts are based on both electric and natural gas savings, and include the net energy savings attributed to NEEA's market transformation efforts. 2) Energy savings impacts do not include energy generation attributed to Energy Trust's renewable energy program.

To be consistent with previous impact reports, the energy savings impacts shown in Table 5 are reported on an annualized basis, i.e., they describe the economic impacts from energy savings for energy efficiency measures that were installed in 2013 and operated for an entire year. In the first program year, energy savings develop as energy efficiency measures are installed, and installation occurs over the course of the year. Pinnacle does not have data on when each individual installation was completed. Thus, we have assumed that installations occur evenly throughout the year and have used a 50 percent implementation adjustment factor for energy savings in the first program year. (The economic impacts shown earlier in this report are based on energy savings that have been adjusted using this implementation adjustment factor.)

Energy Trust first introduced its energy efficiency and renewable energy programs in Oregon in 2002. Thus, the 2013 program year represents the 12th year of program activity in this state. This section of the report looks at the net energy savings and net economic impacts over this 12-year period.

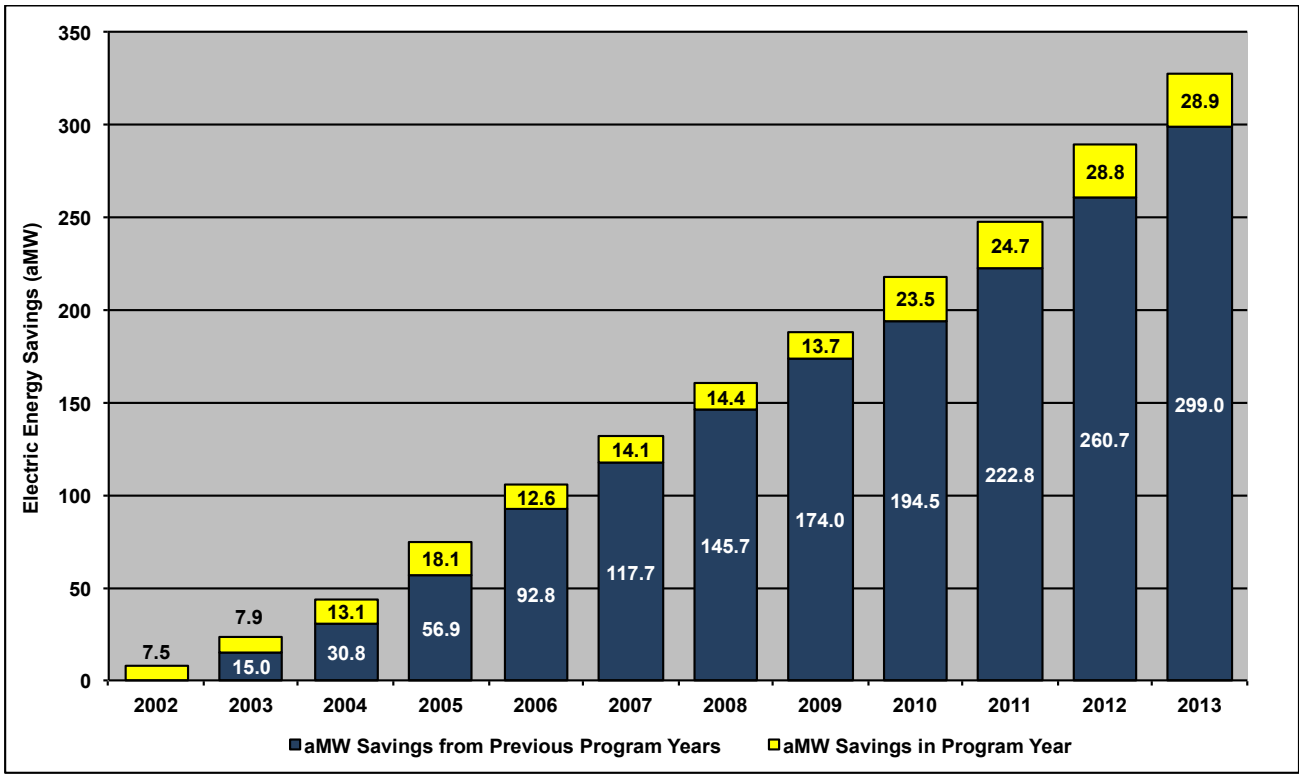
**Program year impacts** include the net economic impacts associated with net energy savings adjusted for measure implementation (i.e., 50 percent of the annualized net energy savings), and program and participant spending. **Future out-year impacts** are based on the annualized net energy savings installed in each program year with adjustments for the following:

- **Measure Estimated Useful Life (EUL).** To account for the Estimated Useful Life of installed measures, Energy Trust supplied a matrix of electric and natural gas "die-off" rates for each program year. These die-off rates allow net energy savings in future out-years to be adjusted for the percent of measures still in place. For example, Energy Trust estimates that 44 percent of the electric measures installed in the 2002 program year will be in operation in 2013. As a result, the electric energy savings associated with the 2002 program year are adjusted downward from 15.0 aMW in 2002 (annualized) to 6.7 aMW in 2013.
- **Program True Up.** Each year, the Energy Trust adjusts previously reported energy savings and renewable generation through a True Up process that includes corrections for transaction errors, new data, anticipated evaluation results, and actual evaluation results. Once completed, this True Up process results in the most accurate reporting of energy savings (both electric and natural gas savings) and renewable generation.[14]

To illustrate, Figure 1 reports the net electric energy savings (aMW) for energy efficiency measures installed as part of Energy Trust's energy efficiency programs between 2002 and 2013.

[14] The True Up process results in increases or decreases in reported energy savings for each program year. Although this has changed the distribution of reported energy savings over time, the overall effect on total energy savings attributed to Energy Trust energy efficiency programs is quite small. Between 2002 and 2012, Trued Up electric energy savings represent 98.2 percent of reported electric energy savings. Similarly, Trued Up natural gas savings represent 98.3 percent of reported natural gas savings between 2002 and 2012. True Up reports that provide detailed information about the adjustments made to energy savings in each annual True Up process are available on Energy Trust's website, energytrust.org.

**Figure 1: Net Electric Energy Savings for Energy Trust Energy Efficiency Programs, 2002—2013**

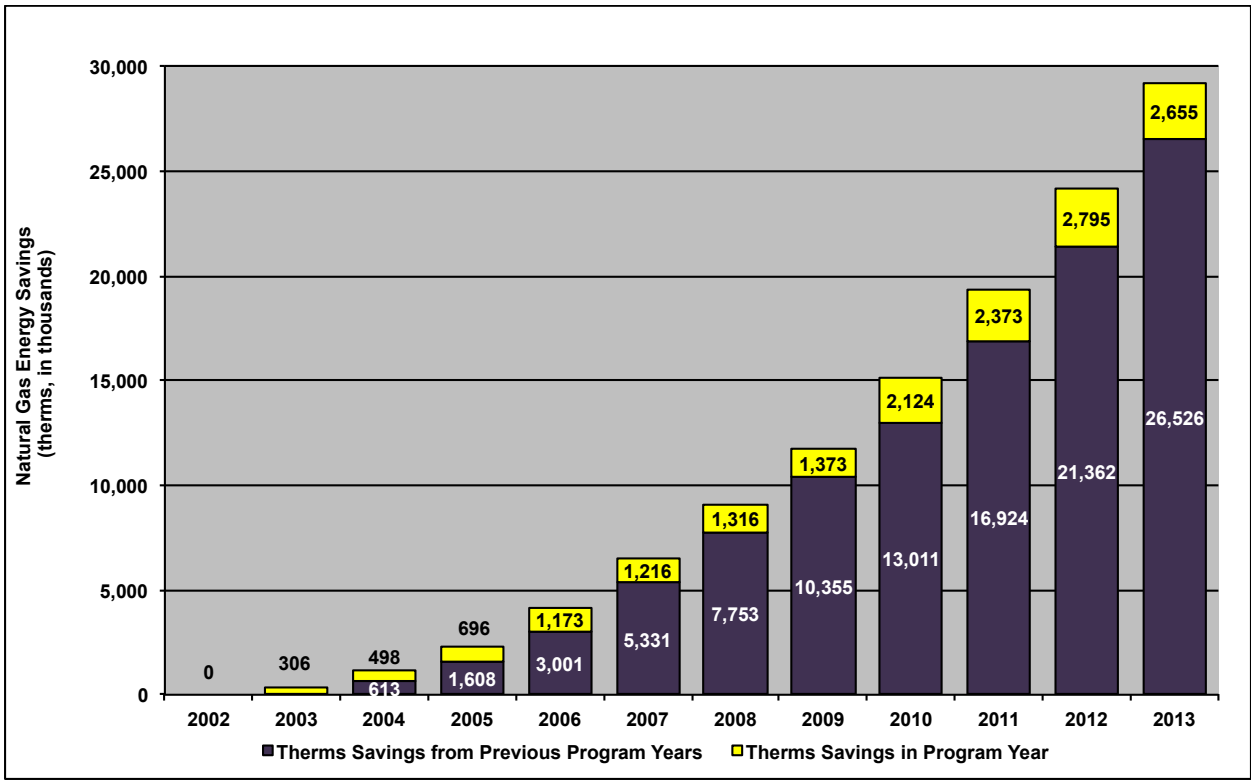



**Sources:** Calculations by Pinnacle Economics using detailed Energy Trust Program data
**Notes:** 1) Net electric energy savings have been adjusted for Energy Trust True Up. 2) Net electric energy savings include NEEA electric energy savings.

In 2013, Energy Trust's program activities included installation of energy efficiency measures that would yield an estimated 57.8 aMW of electric energy savings annually. As shown in Figure 1, these energy savings have been adjusted in the first program year to account for actual implementation throughout the year using the 50 percent implementation adjustment factor assumption referenced previously.

Figure 2 reports the net natural gas savings (in thousands of therms) for energy efficiency measures installed as part of the Energy Trust's energy efficiency programs between 2002 and 2013.

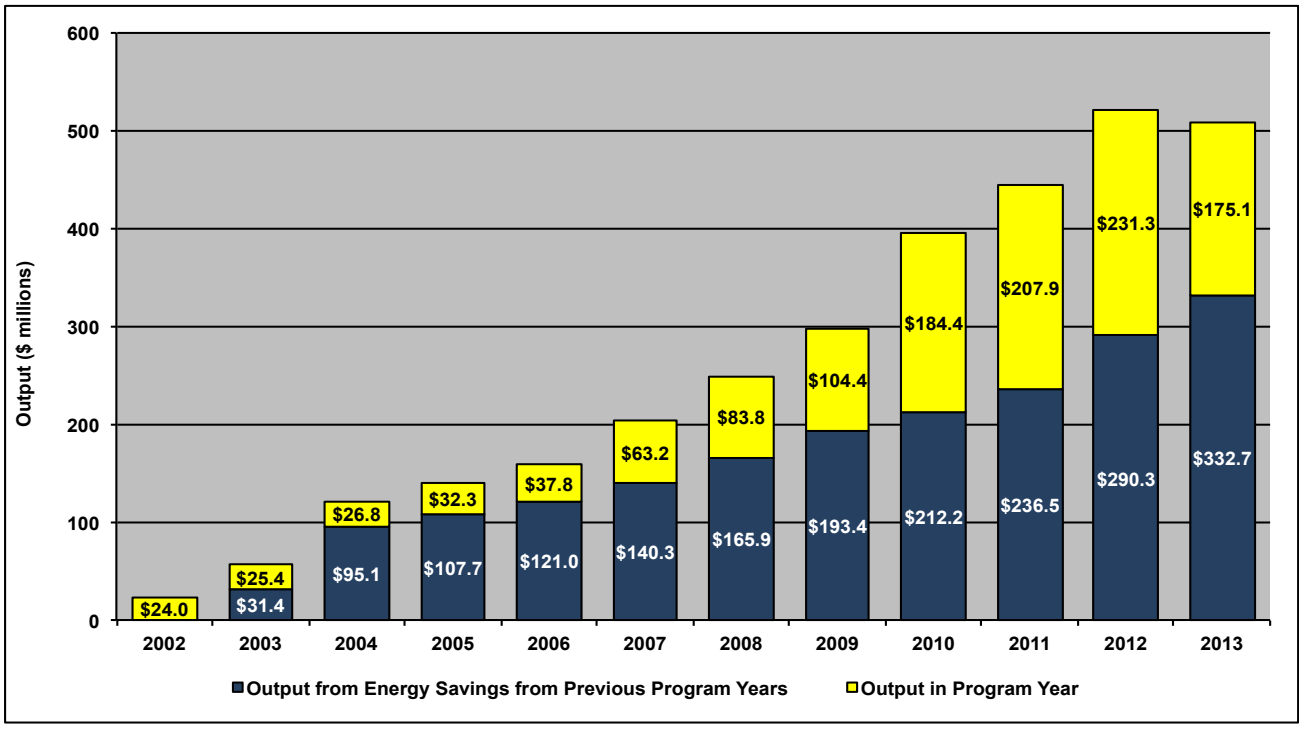
**Figure 1: Net Natural Gas Energy Savings for Energy Trust Energy Efficiency Programs, 2002—2013**




**Sources:** Calculations by Pinnacle Economics using detailed Energy Trust Program data
**Notes:** 1) Net natural gas energy savings have been adjusted for Energy Trust True Up. 2) Net natural gas energy savings include NEEA natural gas energy savings.

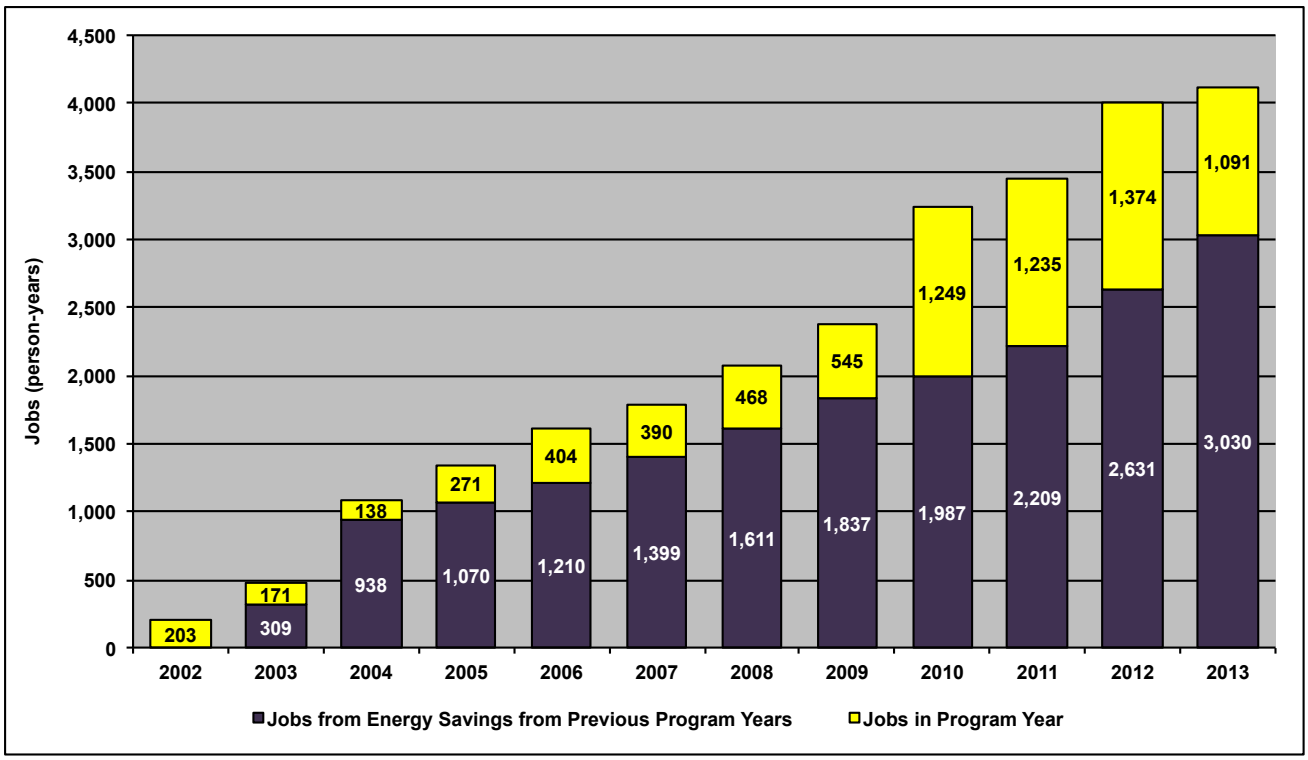
A similar effect occurs for the net economic impacts attributed to each program year. For businesses, energy savings lower production costs and enable businesses to increase output. Similarly, less residential spending on energy allows households to spend more on everything else. This contributes to increased employment as spending shifts to other goods and services in sectors that have a greater impact on the Oregon economy. Figures 3 and 4 show the annual output and job impacts, respectively, associated with Energy Trust program activities between 2002 and 2013.

## Figure 3: Net Output Impacts Of Energy Trust Programs, 2002—2013




**Sources:** Pinnacle Economics using detailed Energy Trust Program data and IMPLAN.
**Note:** Energy savings impacts based on both electric and natural gas energy savings.

## Figure 4: Net Employment Impacts Of Energy Trust Programs, 2002—2013




**Sources:** Pinnacle Economics using detailed Energy Trust Program data and IMPLAN.
**Note:** Energy savings impacts based on both electric and natural gas energy savings.

Table 7 reports the net economic impacts associated with Energy Trust' energy efficiency programs in Oregon between 2002 and 2013. The net economic impacts are based on spending and actual energy savings in each program year, as well as the annualized energy savings for energy efficiency measures in future out-years.

**Table 7: Summary of Cumulative Net Impacts From Energy Trust Program Activities Between 2002 and 2013 (in millions of nominal dollars)**

| Economic Impact Measure | Cumulative Net Impacts During Program Years 2002-2013 | Annualized Impacts in Future Years |
|---|---|---|
| Output | $3,123.0 | $399.4 |
| Wages | $928.7 | $120.7 |
| Business Income | $180.8 | $17.1 |
| Jobs (person-years) | 25,770 | 3,567 |

**Sources:** Pinnacle Economics using detailed Energy Trust Program data and IMPLAN.

As is shown in Table 7, the spending and energy savings associated with Energy Trust program activities in Oregon between 2002 and 2013:

- Sustained, on a net basis, $3,123.0 million in output, including $928.7 million in wages, $180.8 million in business income and 25,770 person-years of employment over the twelve-year period.
- Will continue to generate additional energy savings that is linked to $399.4 million in output, including $120.7 million in wages, $17.1 million in business income, and 3,567 person-years of employment annually, albeit at diminishing levels, in the short run.

The cumulative net impacts reported in Table 7 are derived from previous analyses conducted by Pinnacle Economics that rely on a consistent methodology across program years. This methodology measures 1) **gross impacts** based on program spending, net incremental measure spending and energy savings, and foregone utility revenues, and 2) **net impacts** based on gross impacts less foregone household spending as a result of ratepayer charges used to fund Energy Trust program activities and incentives. Energy savings beyond each program year do not include energy savings from the renewable energy projects, and have been adjusted (reduced) to reflect the EUL of measures installed in each program year.

There are, however, other economic factors that could cause the economic impacts to decline over time in which case the economic impacts reported above would be overstated. Given the static nature of input-output modeling, in general, and the IMPLAN model used in this analysis, cumulative impacts do not take into account changes in production and business processes that Oregon businesses make in anticipation of future higher energy prices and/or increased market pressure from international competition to increase production efficiency. To the extent that Oregon businesses are already adjusting in anticipation of higher costs and/or tougher competition, then cumulative impacts presented here are overstated, as the overall market would become more efficient due to factors outside Energy Trust influence. However, Energy Trust

savings estimates do not include the energy savings that program evaluations indicate would have happened, either immediately or in the very near future, without Energy Trust programs. This possible overstatement, therefore, only pertains to additional, future market-driven increases in efficiency. Furthermore, in a period of moderating forecasts of energy costs, this is less of a concern.

The cumulative numbers also rely on the critical assumption that each dollar saved will translate into a dollar of increased economic output for those businesses adopting conservation measures. This assumption is a simplifying assumption made in absence of better information specific to Oregon's economy. This assumption is reasonable in the short run, but in the long run it is likely that a dollar of energy savings will translate to less than a dollar of increased economic output (as reflected in the current economic variables for Oregon used in IMPLAN) if the overall market adopts more efficient production practices in anticipation of increased competition and higher energy costs. Consequently, the cumulative impacts shown here represent an upper bound. Despite these caveats, the ongoing and cumulative effect of conservation due to Energy Trust activities is nevertheless a significant net benefit to Oregon’s economy.