Economic Impacts of Energy Trust of Oregon's 2023 Program Activities

Final Report

pinnacle economics

3030 NW 12th Avenue
Camas, WA 98607
(503) 816-0295
www.pinnacleecon.com

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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 2023 on the Oregon economy.[1] These impacts include changes in output, wages, business income, and employment in Oregon that resulted from 2023 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 each program year that accumulate in subsequent years.

For this analysis, *gross economic 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, NW Natural, Cascade Natural Gas, and Avista. 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*.[2,3]

In 2023, Energy Trust spending in Oregon totaled $222.3 million.[4] This is $43.2 million more (24.1 percent) than in 2022. Spending was primarily focused on program implementation, with $192.5 million for energy-efficiency programs and $17.1 million for renewable energy programs. In addition, Energy Trust incurred $12.7 million in administrative and program support costs in 2023. On an annual basis, Energy Trust achieved energy-efficiency savings and renewable energy generation in Oregon totaling 59.8 average megawatts (aMW) of electricity (524,100 MWh) and saved 6.6 million therms of natural gas[5] during the 2023 program year.

The gross and net economic impacts for Energy Trust 2023 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 2023:

- An increase of $477.6 million in output;
- An increase of $164.2 million in wages and $23.9 million in income to small business owners; and
- 2,603 full- and part-time jobs, or 2,442 Full-Time Equivalents ("FTE").

[1] Some projects in these programs also received financial and/or technical assistance through state and federal tax credit programs. Based on evaluations, Energy Trust believes funding from these other programs is critical to complete 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 consumer 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.
[3] Concepts of gross and net economic impacts discussed in this report are different than conventions that Energy Trust has previously used to report energy savings. However, in some areas of the report specific energy savings conventions used to report economic impacts are called out when they are applied.
[4] This spending includes Contracts and Grants, but does not include approximately $2.8 million in spending on energy efficiency for NW Natural customers in Southwest Washington.
[5] Therm savings include Oregon Gas Transport customers.

Table ES1: Gross and Net Economic Impacts, 2023

Impact Measure	Gross Impacts	Net Impacts
Output	$757,952,300	$477,634,800
Wages	$244,680,600	$164,168,900
Business Income	$37,884,200	$23,881,700
Jobs (person-years)	3,701	2,603
FTEs	3,415	2,442

Table ES2 reports the net economic impacts for every million dollars in Energy Trust spending.[6] For the 2023 program year, every million dollars in Energy Trust spending is associated with approximately $2.2 million in net new economic activity in Oregon, including $743,000 in wages, $108,100 in business income, and 11.8 jobs or 11.0 FTE.

Table ES2: Net Economic Impacts Per $1 Million in Energy Trust Spending, 2023

Impact Measure	Net Impacts Per $1 Million in Spending
Output	$2,161,700
Wages	$743,000
Business Income	$108,100
Jobs (person-years)	11.8
FTEs	11.0

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

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

2. ENERGY TRUST 2023 PROGRAM ACTIVITIES

2.A. 2023 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 2023.[7] As shown at the bottom of the table, total spending by Energy Trust in 2023 was $222.3 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 2023, Energy Trust spending totaled $222.3 million and included:

- Total spending[8] on energy-efficiency of $192.5 million (an increase of $42.9 million or 28.6 percent from the previous year), and
- Total spending on renewable energy of $17.1 million (a decrease of $1.4 million or -7.5 percent from 2022).

Table 1: Energy Trust Program Spending ($ millions), 2023

Spending Category	Total Program Expenses	Total Support Costs	Total Spending
Energy-Efficiency Programs	$191.1	$1.4	$192.5
Renewable Energy Programs	$16.6	$0.6	$17.1
Other Admin & Program Support		$12.7	$12.7
Total	**$207.6**	**$14.7**	**$222.3**

Source: Energy Trust of Oregon, Statement of Functional Expenses, 2023. **Notes:** Renewable Energy Program spending and support costs include Solar Low-Medium Income ("LMI") and Community Solar. Numbers may not add exactly due to rounding.

2.B. 2023 ENERGY SAVINGS AND GENERATION

As shown in Table 2, on an annualized basis, a total of 59.8 average megawatts were saved or generated and 6.6 million therms were saved as a direct result of Energy Trust program activities in 2023. This includes energy savings for residential, commercial, and industrial energy-efficiency programs, as well as energy generated through Energy Trust's renewable energy program. It also includes the energy savings attributed to market transformation efforts by the Northwest Energy Efficiency Alliance (NEEA) through Energy Trust investments.

[7] This study represents an update of the economic impact study conducted by Pinnacle for Energy Trust's 2021 program year. Energy Trust did not commission a full economic impact study for the 2022 program year. As a result, direct measures of program activity (spending and energy savings) for that year were provided by Energy Trust and the economic impacts for 2022 were estimated using economic impact results from the 2021 study and the level of program spending in 2022.
[8] Program expenditures are based on incentives and allocated support costs.

Table 2: **Annualized Energy Savings and Generation, 2023**

Program Sector	Annual kWh	Average MW (aMW)	Annual Therms
Residential Energy Efficiency	79,711,152	9.1	2,231,888
Commercial and Industrial Energy Efficiency	385,527,538	44.0	4,361,662
Energy Efficiency Subtotal	**465,238,690**	**53.1**	**6,593,550**
Renewable Energy	58,861,257	6.7	0
Total Energy Saved or Generated	**524,099,948**	**59.8**	**6,593,550**

Source: Energy Trust of Oregon
Notes: Energy savings are reported using savings realization rates determined by impact evaluations. Electric savings also include transmission and distribution line loss adjustments to account for additional savings achieved at the electric generator. Energy savings include energy savings attributed to market transformation effects by NEEA. Therm savings including Oregon Gas Transport customers.

Energy savings and generation attributed to Energy Trust program activities in 2023 include:

- Energy-efficiency programs that saved, on an annualized basis, 465,239 MWh of electricity. This represents an increase of 20.7 percent from the previous report for 2021 when Energy Trust energy-efficiency programs saved 385,337 MWh of electricity.
- Energy-efficiency programs that saved 6,593,550 therms of natural gas in the 2023 program year. This represents a decrease of 502,437 therms or a -7.1 percent change from the previous study for 2021.
- Renewable energy projects that generated approximately 58,861 MWh of electricity, representing a 23.7 percent increase since 2021. The amount of energy generated by the renewable energy program in 2023 is relatively small compared to the energy savings attributed to energy efficiency programs, which is consistent with recent previous program years.

The energy savings and generation reported 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.[9] However, utility operations are capital intensive, thus they require less labor and intermediate goods and services than other sectors of the Oregon economy. As a result, the economic impacts on the Oregon economy from utility operations are much less, per million dollars of output, than operations of other industry sectors or spending by households. Consequently, the foregone economic activity attributed to lost power sales has a small, negative effect on the gross economic impacts from Energy Trust program spending.

There is an additional long-term benefit from the efficiency gains, as they delay the need for investments in utility system expansion, including electricity generation resources and the wires

[9] 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.

and pipes needed to deliver electricity and gas to customers. Utility system expansion will almost certainly be more expensive than using existing system 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 system expansion. 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

The analysis methods employed in this study are identical to the methods used across all previous studies, dating back to the 2002 program year. Importantly, after a comprehensive survey and review of economic impact methodologies in the United States and Canada, the American Council for an Energy-Efficient Economy ("ACEEE") recommended the hybrid modeling approach previously developed by Pinnacle Economics and Energy Trust of Oregon for the *ex-post* verification of economic impacts and job creation of energy-efficiency and renewable energy programs.[10] The findings and recommended modeling approaches from the ACEEE study will be noted throughout this section of the report.

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 2023 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. These data techniques are packaged into the IMPLAN (for "IMpact Analysis for

[10] Bell, Barrett, and McNerney, "Verifying Energy Efficiency Job Creation: Current Practices and Recommendations," Report F1501, American Council for an Energy-Efficient Economy, September 2015.

PLANning") modeling software. Pinnacle Economics relied on the IMPLAN economic impact model and 2022 IMPLAN data for the Oregon economy—the most current data available.[11]

Input-output analysis employs specific terminology to identify three different types of economic impacts.[12] Expenditures made through Energy Trust programs affect the Oregon economy *directly*, through the purchases of goods and services in this state. Direct impacts include Energy Trust's hiring and payroll; participant spending on energy-efficiency installations, audits, or other services; and consumption spending by households as they re-spend their energy savings.

Direct spending will, in turn, generate purchases of intermediate goods and services from other, related sectors of the economy. These *indirect* impacts are often called supply-chain impacts because they represent spending among businesses. The first round of indirect impacts include Energy Trust's spending on Program Management and Delivery Contractors ("PMCs" and "PDCs") who deliver and promote energy-efficiency programs; Oregon manufacturers of energy efficient equipment or, in their absence, Oregon retailers, wholesalers, and distributors of energy-efficient equipment; and a broad range of local manufacturers, farmers, and others who provide the commodities purchased by consumers.[13] The first round of indirect impacts lead to additional indirect impacts as, for example, PMCs rent office space and purchase office supplies and equipment, manufacturers purchase spare parts and utilities, and local farmers purchase fuels and fertilizers.

The direct and indirect increases in employment and income enhance overall economic purchasing power for Oregon households, which generates consumption-related spending and leads to additional *induced* impacts. This cycle of direct, indirect, and induced spending 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 accounts for imported goods and services through the use of Local Purchase Coefficients (or "LPCs") for the commodities produced by the 546 industry sectors in the Oregon model.

The IMPLAN model reports the following economic impact measures:

- *Total Industrial Output (Output)* is the value of production by industries for a specified period. Output can also be thought of as the value of sales including reductions or increases in business inventories.

[11] Staff at Pinnacle Economics used IMPLAN and the same modeling framework for all of our previous impact analyses for Energy Trust (dating back to 2002), 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 ACEEE. In addition, Alec Josephson, of Pinnacle Economics, was among the earliest adopters of the IMPLAN model and helped beta test early editions of IMPLAN in the early 1990s.

[12] The direct, indirect, and induced impacts measured in this analysis are wholly consistent with the category definitions recommended by ACEEE. In their 2015 report, ACEEE *"…found that key terms were used differently in various assessments…In our review of studies and methodologies, we found that some studies identified "indirect" job impacts as jobs created as a result of energy savings, regardless of the level at which the jobs were created. To the extent that studies report various categories and levels of job creation, the inconsistent use of terms can create significant confusion*." See ACEEE report page vii.

[13] Consistent with ACEEE recommendations, spending on energy-efficiency services generates direct impacts and spending on energy-efficiency equipment generates indirect impacts.

- *Employee Compensation (Wages)* includes workers' wages and salaries, as well as other benefits such as health and life insurance, 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. In addition, job estimates can be converted to full-time equivalents ("FTEs") using jobs-to-FTEs conversion ratios for the 546 industry sectors in the IMPLAN model.[14]

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:

- *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.[15] Similar to previous reports, we have assumed that installations occur evenly throughout the year and have used a 50 percent implementation adjustment factor for energy savings in the current program year—in this report, the 2023 program year.[16]

[14] U.S. Bureau of Economic Analysis ("BEA") National Income and Product Accounts ("NIPA") Tables 6.4D and 6.5D.

[15] Energy savings include the 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 energy savings on a *pro rata* basis using the distribution of energy savings, across industry sectors, for the Energy Trust's commercial and industrial programs.

[16] In the current program year, energy savings occur after energy-efficiency measures are installed, and installations occur 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 current program year. Energy savings in future out-years are reported on an annualized basis, i.e., they describe the economic impacts from energy savings for energy-efficiency measures that were installed in 2023 and operated for an entire year. Both assumptions are consistent with previous economic impact reports.

- *Reductions in utility revenues* as households and businesses consume less electricity and natural gas.

- *Net Impacts* reflect the economic 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 Impacts* (discussed previously).
  - *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 its energy-efficiency and renewable energy programs.

4. GROSS ECONOMIC IMPACTS, 2023

The gross economic impacts attributed to Energy Trust programs are based on program costs (including administration costs), and incremental measure spending and energy savings of program participants. Incremental measure spending by program participants consists of expenditures on energy-efficiency equipment and services such as appliances, heating, ventilation, and air conditioning (HVAC) systems, lighting modifications, weatherization improvements, etc., and spending on renewable energy projects. Incremental measure spending—particularly spending on installations—generally represents the most important driver of economic impacts from energy-efficiency programs.

Incremental measure spending includes *direct* spending on measure installation and the first round of *indirect* spending on equipment. This is important because expenditures on measure installations generally directly benefit local, Oregon contractors. Spending on the measures themselves will generate indirect impacts if the equipment is manufactured in Oregon. Spending on imported energy-efficiency equipment generates no impacts for local manufacturers, though the use of "margining" on equipment sales will generate indirect economic benefits for Oregon retailers, wholesalers, and transporters.[17] As a result, spending on installation (labor) and equipment will produce substantially different economic impacts for the Oregon economy. Pinnacle received detailed incremental measure spending data from Energy Trust and mapped this spending to over 70 different IMPLAN sectors.[18]

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 consumption function representing the spending pattern of a middle-income household in Oregon, which mapped the spending to over 500 IMPLAN sectors.

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[17] ACEEE notes, "*Before calculating the direct* [sic, should read "the first round of indirect"] *job implications at the manufacturer level, it is important to allocate a share of the revenues to the retail or wholesale trade sector to account for the fact that the purchase price of the equipment is higher than the production cost to cover sales margins."* ACEEE p. 20.

[18] Energy-efficiency measures, and the custom production functions developed by Pinnacle Economics for solar renewable energy projects, include a wide range of equipment, parts, and supplies. As a result, Pinnacle used IMPLAN's bridge table with over 18,000 NAICS codes sectors to allocate incremental measure spending to the appropriate IMPLAN industry sector.

Energy savings for commercial-industrial program participants were first mapped to industry sectors using North American Industrial Classification System ("NAICS") codes, and then cross-referenced to 155 different industry sectors in the IMPLAN model. 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.[19]

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.[20] The gross economic impacts of Energy Trust programs for 2023 are shown in Table 3.

Table 3: Gross Economic Impacts, 2023

Impact Measure	Gross Impacts
Output	$757,952,300
Wages	$244,680,600
Business Income	$37,884,200
Jobs (person-years)	3,701
FTEs	3,415

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

In 2023, the gross economic impacts attributed to Energy Trust's energy-efficiency and renewable energy programs totaled $758.0 million in output, including $244.7 million in wages, $37.9 million in business income, and 3,701 jobs or 3,415 FTEs in Oregon. The gross impacts reported in Table 3 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, 2023

All the economic impacts reported in this section 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, assuming 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.

[19] Lacking elasticity coefficients for each of the business sectors (and their commodities) that benefited from reduced energy costs, this analysis uses unitary elasticity, i.e., a 1 percent decrease in costs translates into a 1 percent increase in output.

[20] ACEEE notes, "…*accurate accounting of the estimated employment impacts requires that losses to energy supply industries also be accounted for. To do this, apply the total net energy savings (not including participant costs) as revenue losses for the energy supply sector and use the appropriate job multipliers to determine the negative employment impact in the energy supply industry, the supply chain, and the broader economy."* ACEEE p. 20.

Table 4 shows the net economic impacts attributed to Energy Trust programs in 2023. 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 2023, Energy Trust programs had a net effect of increasing Oregon's economic output by $477.6 million relative to the Base Case scenario. This includes an increase of $164.2 million in wages and $23.9 million in business income within Oregon. Energy Trust programs also had a positive net impact on employment in Oregon, with 2,603 jobs or 2,442 FTEs sustained by Energy Trust program activities in 2023. 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, 2023

Impact Measure	Net Impacts
Output	$477,634,800
Wages	$164,168,900
Business Income	$23,881,700
Jobs (person-years)	2,603
FTEs	2,442

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

Originally provided in the 2015 study and included in this study are the net economic impacts that accrue to women and Black, Indigenous, and people of color (BIPOC) employees and small business owners in Oregon.[21] On a net basis, Pinnacle estimates that Energy Trust energy-efficiency and renewable energy programs generated the following economic impacts for women and BIPOC individuals in 2023:

- $69.6 million in income (wages and benefits plus small business income) and 1,000 jobs for women, and

[21] Pinnacle's Gender and Race Impact Calculator was developed using detailed employment data, by gender and race, gathered by the U.S. Equal Employment Opportunity Commission ("EEOC"). The EEOC requires employers to file reports on the composition of their work forces by sex and by race/ethnic category. Key among these reports is the EEO-1, which is collected annually from private employers with 100 or more employees or federal contractors with 50 more employees, and EEO-4, which is collected biannually from state and local governments with more than 100 employees. Through these reports, EEOC provides employment patterns and participation rates by industry sector at a three-digit NAICS code level, for every state. Industry participation rates for Oregon in 2021 were mapped to the 546 industry sectors in the IMPLAN model of the Oregon economy in 2022.

- $44.9 million in income and 641 jobs for all BIPOC individuals, including:
    - $4.4 million in income and 64 jobs for Black people
    - $16.1 million in income and 254 jobs for Hispanic people
    - $15.1 million in income and 180 jobs for Asian people
    - $9.3 million and 142 jobs for all other races.[22]

Table 5 reports the total net economic impacts, by type of impact, and provides additional details to fully understand how the counterfactual spending assumption included in the Base Case spending scenario affects the net economic impacts.

Table 5: Net Economic Impacts, by Type of Impact, 2023

Impact Measure	Direct	Indirect	Induced	Total
Output	$70,224,400	$288,411,100	$118,999,300	$477,634,800
Wages	$33,166,200	$96,247,300	$34,755,400	$164,168,900
Business Income	$3,073,600	$15,501,300	$5,306,800	$23,881,700
Jobs (person-years)	198	1,572	832	2,603
FTEs	238	1,454	749	2,442

Sources: Pinnacle Economics using detailed Energy Trust program data and IMPLAN.
Note: On a net basis, direct FTE is greater than direct jobs due to employment gains in industry sectors with fewer part-time employees and employment losses in industry sectors with more part-time employees.

Net economic impacts consist of: 1) positive economic impacts from program spending, and participant incremental measure spending and energy savings, and 2) negative economic impacts from the reduction in utility revenues attributed to participant energy savings and the foregone household spending attributed to public purpose charges collected from ratepayers. The implications from these opposing changes in spending include:

- **Direct net economic impacts that are positive and modest.** This represents the combination of the following two factors. First, the direct gains attributed to Energy Trust's own internal operations, participant incremental measure spending on energy-efficiency installations, and the increases in household spending and industry output attributed to energy savings largely offset the direct losses due to reductions in utility revenues and foregone household spending. Second, direct gains in industry sectors with higher output and higher incomes compared to the direct losses that occur in industry sectors with lower output and lower incomes. (Note: Energy savings impacts during the program year are

[22] The terminology used by Pinnacle to describe races is identical to that employed by the Equal Employment Opportunity Commission (EEOC). According to EEOC documentation, "Race/ethnic designations as used by the EEOC do not denote scientific definitions of anthropological origins. For the purposes of this report (EEO-1), an employee may be included in the group to which he or she appears to belong, identifies with, or is regarded in the community as belonging. However, no person should be counted in more than one race/ethnic group. The race/ethnic categories for the EEO-1 survey are as defined in U.S. Department of Commerce, Office of Federal Statistical Policy and Standards' Directive No. 15. Accordingly, the race/ethnic categories reported in this analysis include (EEOC definitions): 1) White (all persons having origins in any of the original peoples of Europe, North Africa, or the Middle East (not of Hispanic origin)); 2) Black (all persons having origins in any of the Black racial groups of Africa (not of Hispanic origin)); 3) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race); 4) Asian (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and 5) All other races (includes American Indian or Alaskan Native, Hawaiian, or persons of two or more races.)

strongly affected by the 50 percent implementation adjustment factor used in this analysis to accommodate the timing of energy-efficiency installations during the year.)

- **Indirect net economic impacts that are significant and positive.** This shows that much of the net economic activity attributed to the Energy Trust's program activities enters the economy through indirect channels. For example, in economic impact terms, Energy Trust expenditures ($67.4 million for Oregon energy efficiency and renewable energy programs in 2023) on Program Management and Delivery Contractors, as well as additional participant spending on energy efficient and renewable equipment, represent the first round of indirect impacts. Each of these expenditures will have subsequent indirect impacts on the Oregon economy, as will Energy Trust's own operations, energy savings impacts attributed to households and businesses, and incremental measure spending on energy-efficiency installations. These positive indirect impacts significantly exceed the reduction in indirect impacts attributed to the loss in utility revenues and foregone household spending.
- **Induced net impacts that are positive.** Induced impacts are attributed to the wages and income that accrue to households and business owners, respectively. The most important factor of the large, positive induced impacts is the significant increase in indirect net wages and business income. To this, we can add the increase in direct net wages and business income. Combined, these positive changes in net wages and business income will generate positive induced net impacts.

Both the gross and net economic impacts in 2023 increased since the last study. For example, total gross jobs increased from 3,227 jobs to 3,701 jobs (14.7 percent), and total net jobs increased from 1,771 jobs to 2,603 jobs (47.0 percent) between 2021 and 2023. Factors contributing to the increase in gross and net economic impacts between 2021 and 2023 include:[23]

1. An increase of 79,901 MWh (+20.7 percent) in electric energy savings for commercial, industrial, and residential energy-efficiency program participants combined with an increase of 11,294 MWh (+23.7 percent) in electric energy generation for renewable energy program participants. All else the same, increases in electric energy cost savings will increase the positive economic impacts associated with additional business activities and consumer spending.
2. Collectively, incremental measure spending across all programs increased by $113.7 million or 39.5 percent between 2021 and 2023. In addition, all programs experienced a shift in the mix of spending, with decreases in equipment spending and increases in installation and other labor. All else the same, the economic impacts associated with labor services provided by Oregon contractors will generally be larger than economic impacts associated with equipment that may or may not be manufactured in this state. As such, this

[23] Energy Trust no longer uses net-to-gross ratios to adjust energy savings and generation numbers because the long-term adjustments from this step proved to be trivial, and the measurement methods decreasingly persuasive. This adjustment occurred prior to the previous study, thus, has no effect on the relative economic impacts in 2023 compared to 2021.

shift in spending from equipment to labor between 2021 and 2023 will increase the economic impacts in Oregon.

3. By most measures, Energy Trust operations increased between 2021 and 2023. Direct employment at Energy Trust increased from 116 employees in 2021 to 159 employees in 2023, or by 37.1 percent. Direct payroll (wages and benefits) increased by $5.0 million or 31.5 percent. Spending on PMCs increased by $15.3 million or by 29.3 percent.
4. In 2023, program incentives increased by $19.9 million or by 19.6 percent. For energy-efficiency and renewable energy programs, incentives form the basis of the counterfactual spending argument. As such, given that the increase in incentives are less than the increase in electric energy savings, electric energy generation, and incremental measure spending, this will tend to increase the measure of net impacts in 2023.

6. Economic Impacts from Across All Years, 2002 Through 2023

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 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 6 shows the annualized economic impacts due to energy cost savings from energy-efficiency measures installed in 2023. 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 6: Annualized Economic Impacts Due to Energy Savings Alone, 2023

Impact Measure	Impact Due to 2023 Energy Savings
Output	$85,402,305
Wages	$26,559,730
Business Income	$3,909,882
Jobs (person-years)	482
FTE	433

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 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 6 are reported on an annualized basis, i.e., they describe the economic impacts from energy savings for energy-efficiency measures that were installed in 2023 and operated for an entire year.

The monetary impacts attributed solely to energy savings in 2023 are slightly greater than those measured for the 2021 program year due, in part, to a substantial increase in electric energy savings that is partially offset by a decrease in natural gas energy savings between 2021 and 2023. Electric energy savings for residential and commercial-industrial energy efficiency programs increased from 385,337 MWh in 2021 to 465,239 MWh in 2023, or by 20.7 percent. Natural gas savings decreased from 7,095,987 therms in 2021 to 6,593,550 therms in 2023, or by -7.1 percent. The job impacts attributed to energy savings for energy efficiency measures that were installed in 2023 are approximately the same as the those in 2021 suggesting that energy efficiency program participants have slightly lower direct jobs and/or multiplier spending effects compared to 2021 program participants. This result is strongly influenced by the mix of commercial and industrial energy-efficiency program participants.

Energy Trust first introduced its energy-efficiency and renewable energy programs in Oregon in 2002. Thus, the 2023 program year represents the 22nd year of program activity in this state. This section of the report looks at the cumulative net energy savings and net economic impacts over this 22-year period, and includes the following types of impacts:

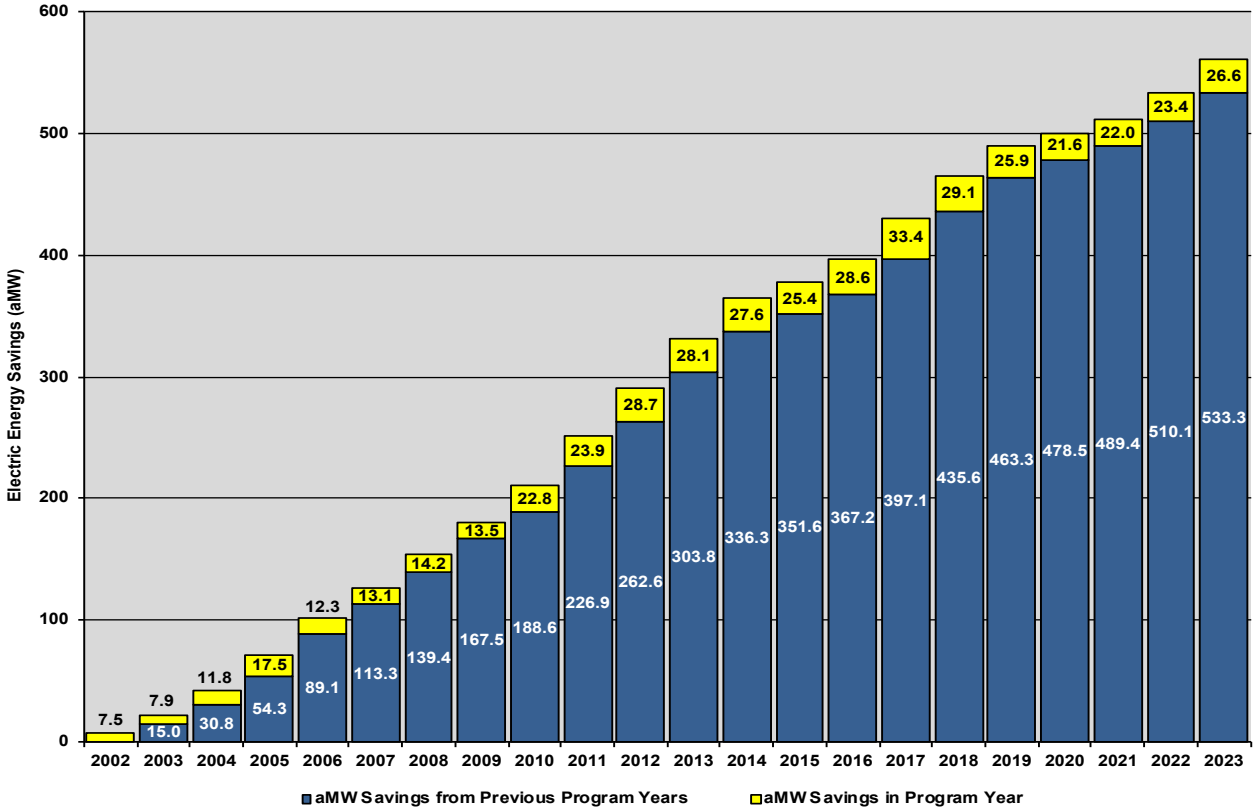
- **2023 program year impacts** are based on the net economic impacts associated with energy savings and renewable energy generation adjusted for measure implementation (i.e., 50 percent of the annualized net energy savings), and program and participant spending in 2023. These net economic impacts represent those reported in the previous section of this report.
- **Program year impacts through 2020** have been adjusted for Program True Up. Energy Trust previously adjusted 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 associated with these years. For example, the initial estimate of net electric energy savings in the 2002 program year was 13.5 aMW. The current Trued Up electric energy savings associated with the 2002 program year is 15.0

aMW. Energy Trust stopped applying the True Up process after the 2020 program year for reasons briefly discussed on page 15.

- **Future out-year impacts**—i.e., those beyond the initial program year—are based on the annualized energy savings installed in each program year with adjustments for program True Up and the Estimated Useful Life ("EUL") of installed energy-efficiency measures in respective years where these adjustments are applicable. To account for the EUL of installed measures, Energy Trust provided a matrix of electric and natural gas *die-off* rates for each program year. These die-off rates allow energy savings in future out-years to be adjusted for the percent of measures still in place. For example, the Energy Trust estimates that none (0 percent) of the electric measures installed in the 2002 program year will be in operation in 2023 (these measures completely died off in the 2016 program year). As a result, this analysis assumes that the energy savings benefits for the Oregon economy attributed to the Trued Up 15.0 aMW in electric energy savings installed during the 2002 program year ended in 2016.

To illustrate, Figure 1 reports the electric energy savings (aMW) for energy-efficiency measures installed as part of Energy Trust's energy-efficiency programs from 2002 to 2023.

Figure 1: Annual Electric Energy Savings for Energy Trust Energy-efficiency Programs, 2002—2023

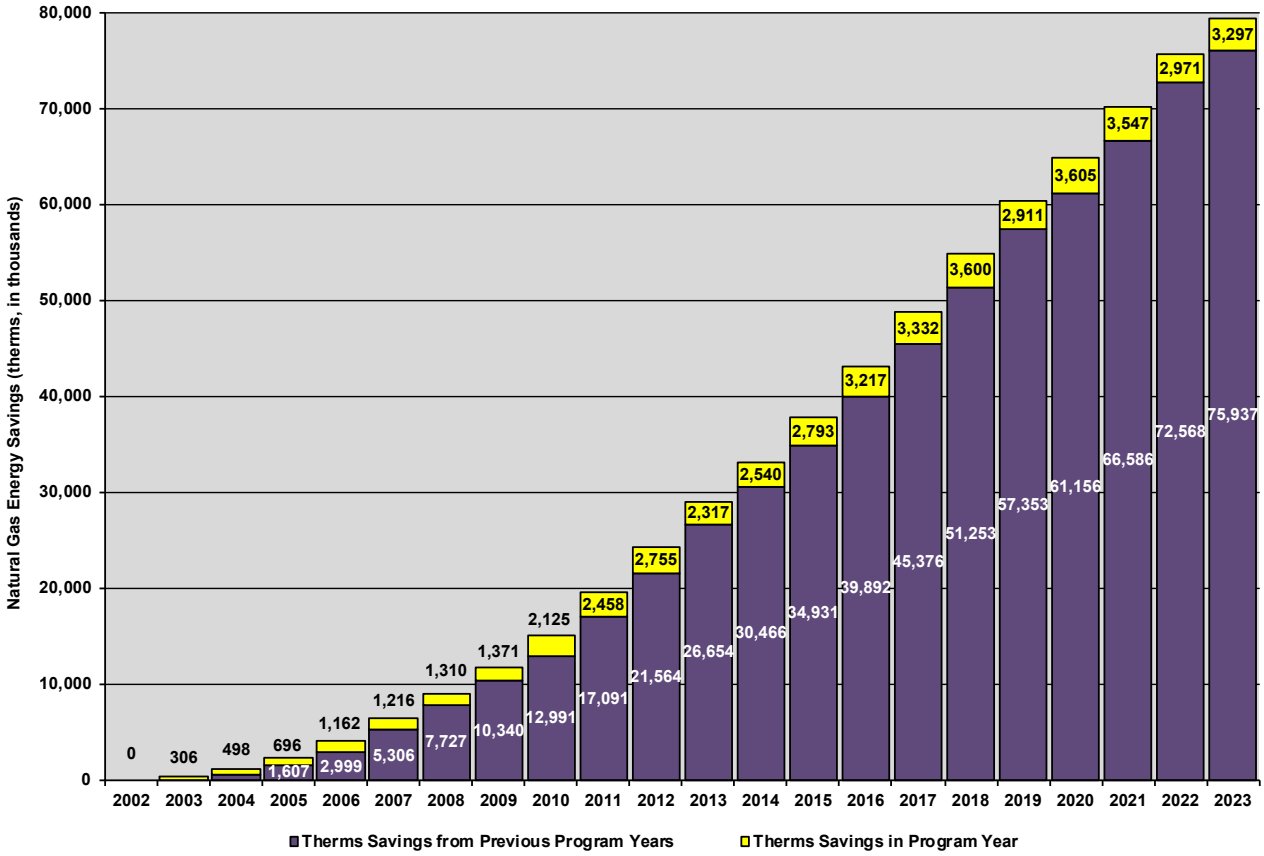


Sources: Calculations by Pinnacle Economics using detailed Energy Trust Program data.
Notes: 1) Electric energy savings in the 2023 program year have been adjusted using a 50 percent implementation adjustment. Previous program year electric energy savings are annual savings that have been adjusted for True Up. 2) Electric energy savings in future out-years include adjustments for True Up in the program year and measure EUL or measure die off in out-years. 3) Electric energy savings include NEEA electric energy savings.

In 2023, Energy Trust's program activities included installation of energy-efficiency measures that would yield an estimated 53.1 aMW of electric energy savings annually. As shown in Figure 1, these energy savings have been adjusted in the 2023 program year to account for actual implementation throughout the year using the 50 percent implementation adjustment factor assumption referenced previously. From 2002 to 2023, the total net electric energy savings attributed to Energy Trust's energy-efficiency programs totaled 6,418.6 aMW.

Figure 2 reports the natural gas savings (in thousands of therms) for energy-efficiency measures installed as part of the Energy Trust's energy-efficiency programs from 2002 to 2023. In 2023, Energy Trust's program activities included installation of energy-efficiency measures that would save an estimated 6.6 million therms annually. Similar to electric energy savings, net natural gas savings shown in Figure 2 have been adjusted in the 2023 program year to account for actual implementation throughout the year using the 50 percent implementation adjustment factor. From 2002 to 2023, the total net natural gas savings attributed to Energy Trust's energy-efficiency programs totaled 690.4 million therms.

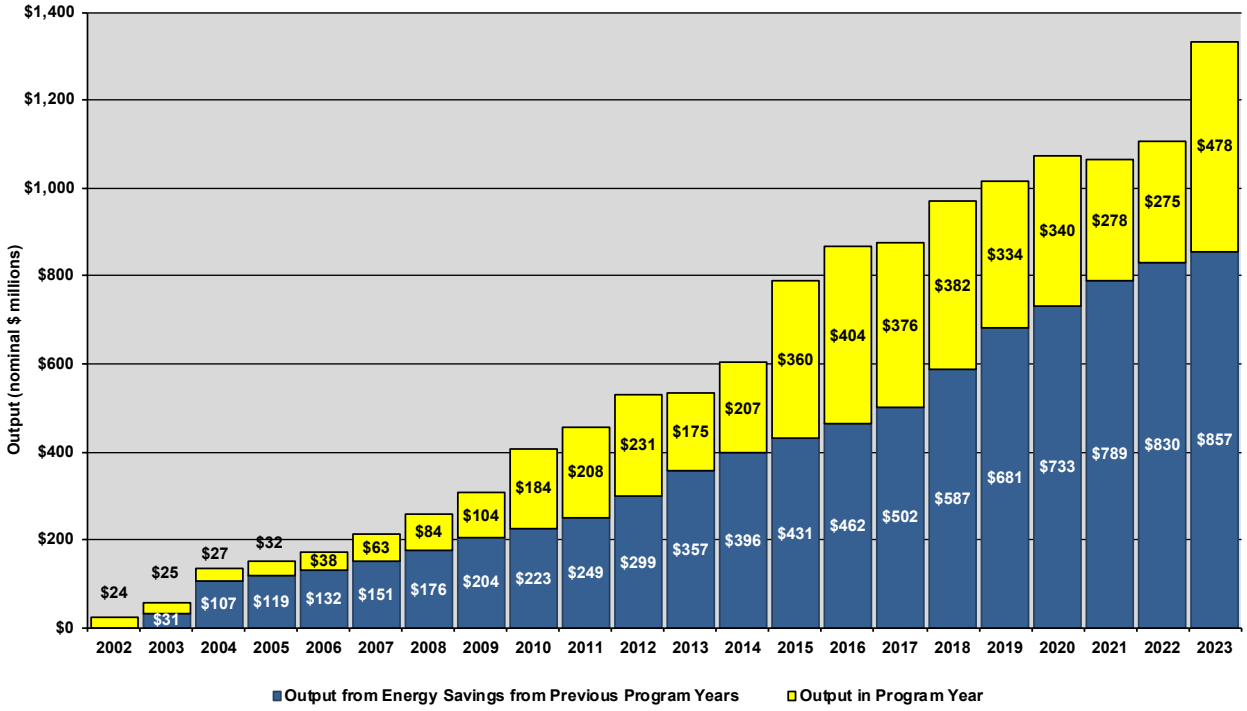
Figure 2: Net Annual Natural Gas Energy Savings for Energy Trust Energy-efficiency Programs, 2002—2023



Sources: Calculations by Pinnacle Economics using detailed Energy Trust Program data.
Notes: 1) Natural gas energy savings in the 2023 program year have been adjusted using a 50 percent implementation adjustment. Previous program year natural gas energy savings are annual savings that have been adjusted for True Up. 2) Natural gas energy savings in future out-years include adjustments for True Up in the program year and measure EUL or measure die off in out-years. 3) Natural gas energy savings include NEEA electric energy savings.

A similar accumulation 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. These cost savings contribute 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 from 2002 through 2023.[24]

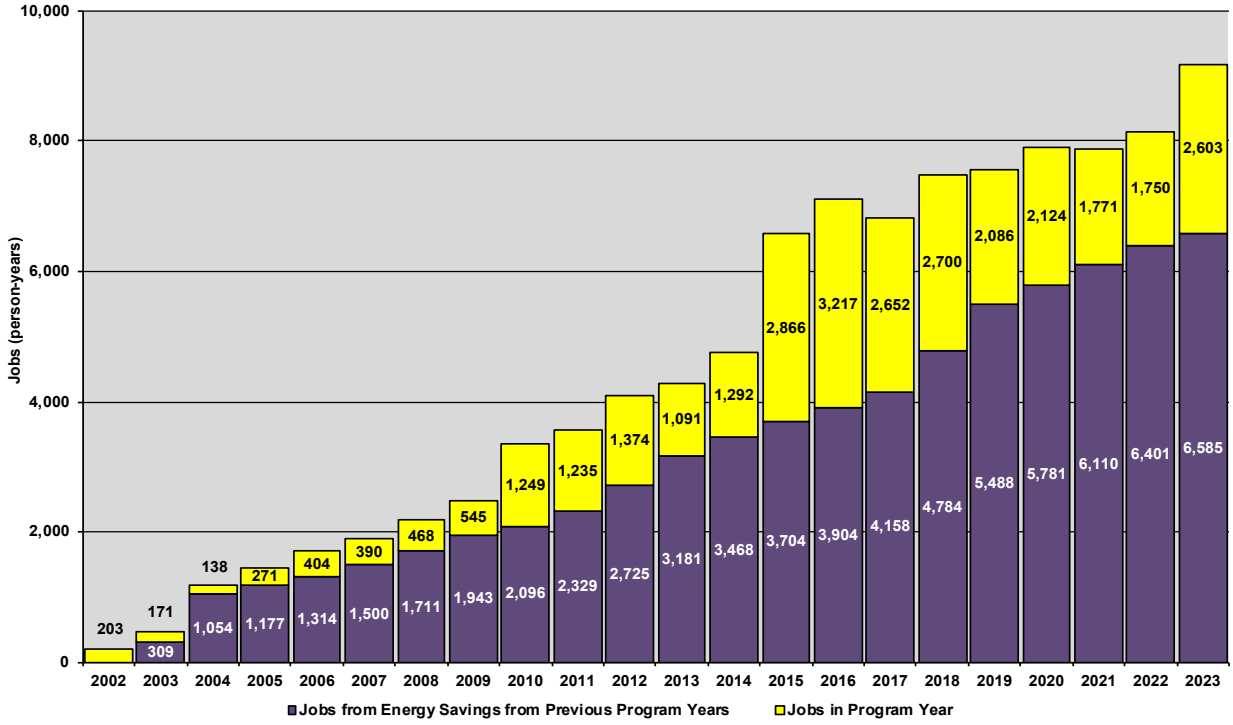
Figure 3: Net Annual Economic Output Impacts of Energy Trust Programs, 2002—2023



Sources: Pinnacle Economics using detailed Energy Trust Program data and IMPLAN.
Notes: 1) Economic impacts in the 2023 program year are net economic impacts based on 50 percent of reported energy savings and energy generation, and program and participant spending. (These net economic impacts represent those reported in the previous section of this report.) Net economic impacts from previous program years have been adjusted for True Up. 2) Net economic impacts attributed to energy savings in future out-years include adjustments for True Up in the program year and measure EUL or measure die off in out-years. 3) Economic impacts include both electric and natural gas energy savings, and NEEA electric energy savings. This version of the report fixes an error in the calculations to estimate the net annual output impacts in program years 2016 and 2018. The reader may notice a difference if they compare these years in this report with the last report that was published in 2019.

[24] Between 2014 and 2015, there was a large increase in economic impacts while energy savings increased more gradually. The increase in economic impacts is attributed to changes in the level and mix of participant spending on measure installations and equipment. Total incremental measures costs were $206.4 million in 2013 and increased to $289.0 million (+40.0 percent) in 2015. In addition, solar measures in the renewable energy program also experienced significant growth, and solar installations typically include local contractors and labor resulting in large multiplier effects.

Figure 4: Net Annual Employment Impacts of Energy Trust Programs, 2002—2023



Sources: Pinnacle Economics using detailed Energy Trust Program data and IMPLAN.
Notes: 1) Economic impacts in the 2023program year are net economic impacts based on 50 percent of reported energy savings and renewable energy generation, and program and participant spending. (These net economic impacts represent those reported in the previous section of this report.) Net economic impacts from previous program years have been adjusted for True Up. 2) Net economic impacts attributed to energy savings in future out-years include adjustments for True Up in the program year and measure EUL or measure die off in out-years. 3) Economic impacts include both electric and natural gas energy savings, and NEEA electric energy savings. This version of the report fixes an error in the calculations to estimate the net annual output impacts in program years 2016 and 2018. The reader may notice a difference if they compare these years in this report with the last report that was published in 2019

Table 7 reports the net economic impacts associated with Energy Trust's energy-efficiency and renewable energy programs in Oregon from 2002 through 2023. The net economic impacts are based on spending and actual energy savings and energy generation in each program year, as well as the annualized energy savings for energy-efficiency measures in future out-years.

Table 7: Summary of Total Net Impacts from Energy Trust Program Activities from 2002 to 2023 (in millions of nominal dollars)

Economic Impact Measure	Total Net Impacts from 2002 to 2023	Annualized Impacts in Future Years
Output	$12,132.6	$942.2
Wages	$4,072.9	$286.3
Business Income	$667.9	$39.5
Jobs (person-years)	100,320	7,070
FTE	90,433	6,373

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 from 2002 to 2023:

- Sustained, on a net basis, $12.1 billion in output, including $4.1 billion in wages, $667.9 million in small business income, and 100,320 person-years of employment or 90,433 FTE over the 22 year period.
- Will continue to generate additional energy savings that are linked to $942.2 million in output, including $286.3 million in wages, $39.5 million in small business income, and 7,070 person-years of employment or 6,373 FTE annually, albeit at diminishing levels, in the short run.

The total 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, net 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 generation from the renewable energy projects and have been adjusted (reduced) to reflect the EUL of measures installed in each program year.[25]

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,

[25] As discussed previously, the energy savings impacts associated with the 2002 program year (the first year of Energy Trust's energy efficiency programs) are assumed to have ended by 2016.

then cumulative impacts presented here are overstated, as the overall market would become more efficient due to factors outside Energy Trust influence.

The totals reported in Table 7 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 total impacts shown here represent an upper bound. Despite these caveats, the effect of Energy Trust energy efficiency and renewable activities is nevertheless a significant net benefit to Oregon’s economy.