Energy Trust of Oregon

PGE Energy Efficiency

2023 Resource Assessment Model

Energy Trust of Oregon Background

Energy Trust of Oregon, Inc. (Energy Trust) is an independent nonprofit organization dedicated to helping utility customers in Oregon and Southwest Washington benefit from energy efficiency and renewable power. Energy Trust operates under a grant agreement with the Oregon Public Utility Commission (OPUC).

As a result of state legislation, tariffs and other requirements, Energy Trust is funded by customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista. Customers pay a small percentage of their utility bills, referred to as a system benefit charge or public purpose charge depending on the utility. Every dollar invested in energy efficiency by Energy Trust will save residential, commercial and industrial customers about $3 in deferred utility investment in generation, transmission, fuel purchase and other costs.

Energy Trust's model of delivering energy efficiency programs unilaterally across the service territories of the five gas and electric utilities they serve has experienced a great deal of success. Since the inception of the organization in 2002, Energy Trust has achieved total annual savings of 865 aMW of electricity. Additionally, Energy Trust has saved 84 million therms since gas efficiency programs began in 2003. Combined, this equates to more than 22.3 million tons of CO2 emissions avoided, and Energy Trust has played a significant factor with relatively flat energy loads observed by both gas and electric utilities from 2012 to 2021, as shown in OPUC utility statistic books.[1]

Energy Trust, with support from PGE, serves residential, commercial and industrial customers in Oregon. In 2021, Energy Trust's service to PGE customers through energy efficiency programs achieved 24.2 aMW of electric savings achieving 92% of goal. Energy Trust achieved electric savings at a levelized cost of 0.034$/kWh, meeting OPUC performance measures to achieve electric savings at a levelized cost below 0.046 $/kWh.

PGE actively promotes Energy Trust offerings to its customers and supports their participation in Energy Trust efficiency programs. Also, when shared technologies and programs are mutually beneficial, PGE coordinates its demand response program activities with Energy Trust's energy efficiency programs. For example, smart thermostats are used by PGE for demand response, but also provide energy efficiency savings, which the Energy Trust counts towards its energy saving goals.

In addition to administering energy efficiency programs with support from PGE, Energy Trust also provides a 20-year demand-side management (DSM) resource forecast to identify cost-effective energy efficiency savings potential. This forecast examines how much of that potential is estimated to be achieved by Energy Trust over the 20-year period. The results are used by PGE and other utilities in Integrated Resource Plans (IRP) to inform the energy efficiency resource potential Energy Trust expects to acquire in their territory, helping to offset the need for new generating resources to meet projected load growth.

Energy Trust Forecast Overview and High-Level Results

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[1] OPUC 2021 Stat book – 10 Year Summary Tables: https://www.oregon.gov/puc/forms/Forms%20and%20Reports/2021-Oregon-Utility-Statistics-Book.pdf

Energy Trust developed a 20-year DSM energy efficiency resource forecast for PGE using Energy Trust's resource assessment modeling tool (hereinafter 'RA Model') to identify the total 20-year cost effective modeled energy efficiency savings potential. Energy Trust then deploys this cost-effective potential exogenously to the RA model into an annual energy efficiency savings projection based on past program experience, knowledge of current and developing markets, and future codes and standards. This final 20-year savings projection is provided to PGE for inclusion in their Integrate Resource Planning (IRP) forecasts. The 2023 IRP results show that PGE can save 147 average megawatts (aMW) in the next five years from 2023 to 2028 and over 527 by 2042.[2] These results represent an 18% and 4% decrease respectively in cost-effective DSM potential over the prior IRP in 2018. The two main drivers of this decreased potential are:

1. Lighting market transformation savings have gone down in 2023 compared to the 2018 IRP due to increased efficiency standards for lighting products.
2. Forecasted savings projections for unforeseen large projects have gone down in 2023 compared to the 2018 IRP due to a decline in the overall average being used to forecast savings for these projects.

Figure 1 depicts the full suite of savings potential identified in the model by potential type (Technical, Achievable, Cost-effective achievable).

Figure 1 – 20 year Savings Potential by Sector and Potential Type

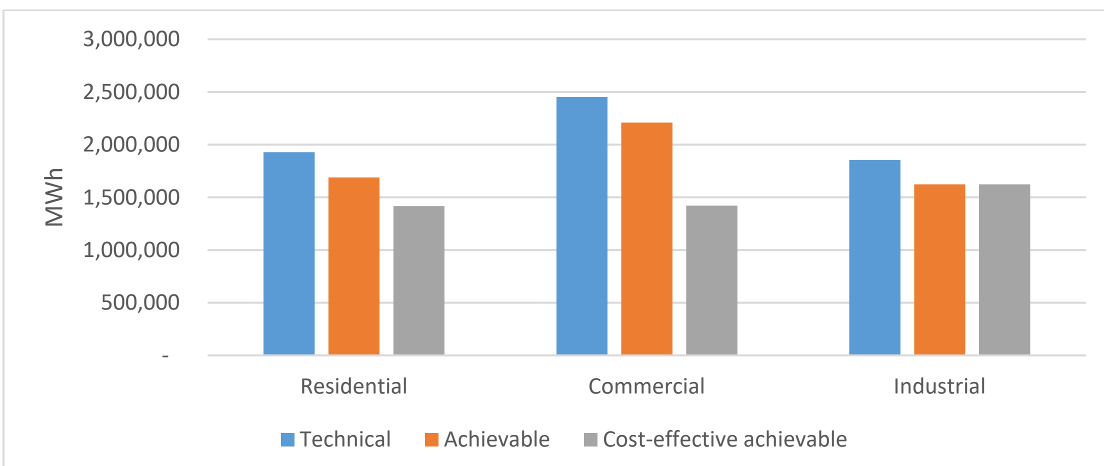
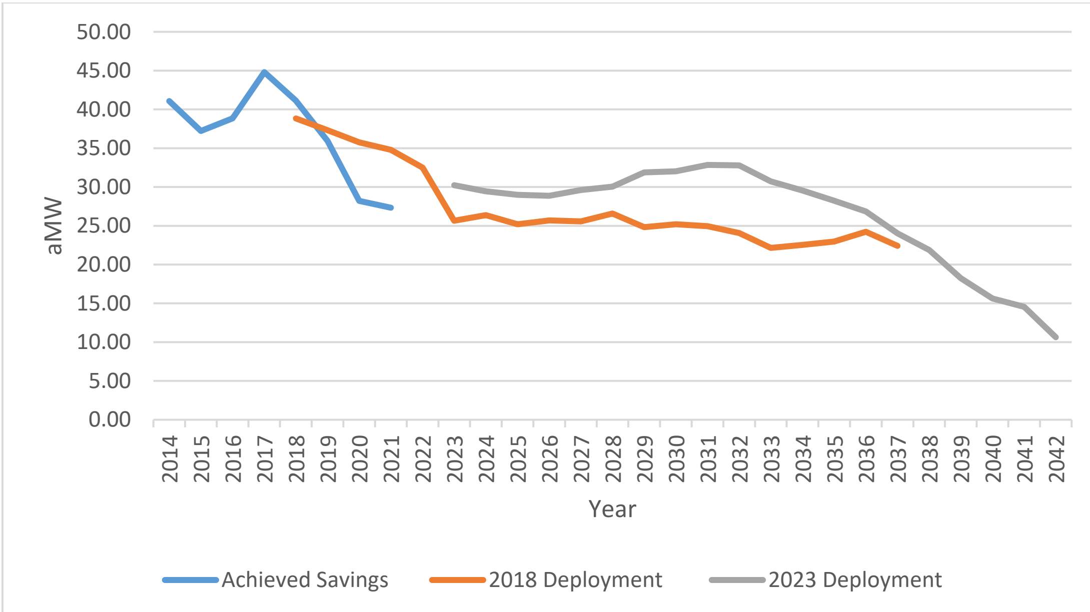


Figure 2 links actual historic savings going back to 2014 to the new savings projection for the 2023 IRP. It also compares the 2023 IRP forecast to the 2018 IRP forecast.

Figure 2 - Annual Savings Projection Comparison for 2018 and 2023 IRPs, with Actual savings since 2014

[2] Includes 8.8 aMW of market transformation savings resulting residential lighting standards going into effect. Also includes 11.9 aMW from a large project adder incorporated into the savings forecast.

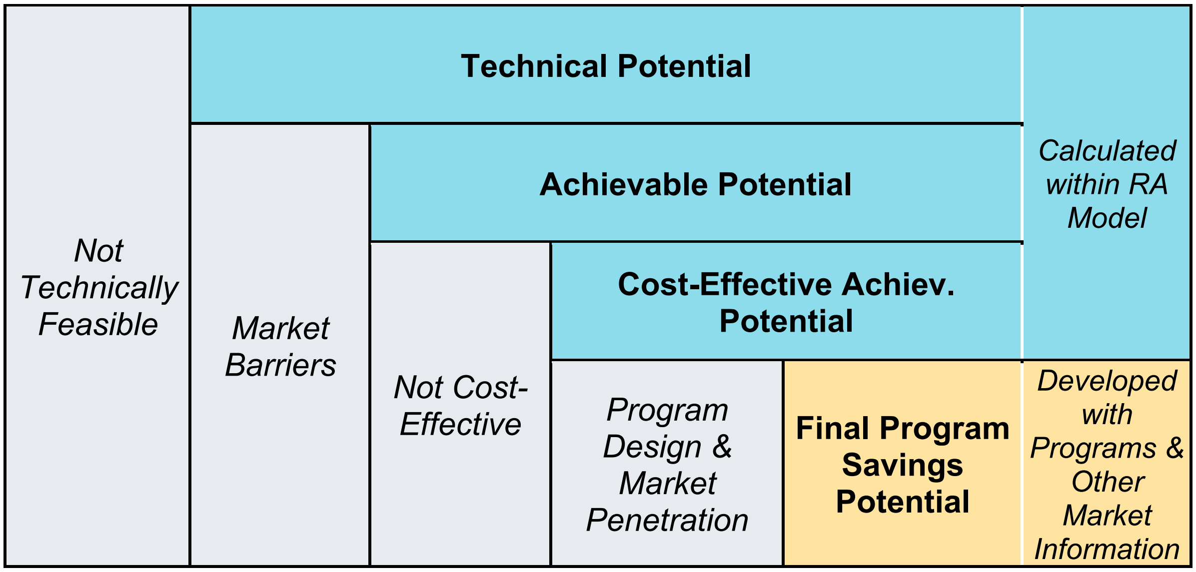


Energy Trust 20-Year Forecast Methodology

20-Year Forecast Overview

Energy Trust developed a 20-year DSM resource forecast for PGE using Energy Trust's RA Model to identify the total 20-year cost-effective modeled energy efficiency savings potential, which is 'deployed' exogenously of the model to provide an estimate of the final savings forecast. There are four types of potential that are calculated to develop the final savings potential estimate, which are shown in Figure 3 and discussed in greater detail in the sections below.

Figure 3 – Types of Potential Calculated in 20-year Forecast Determination



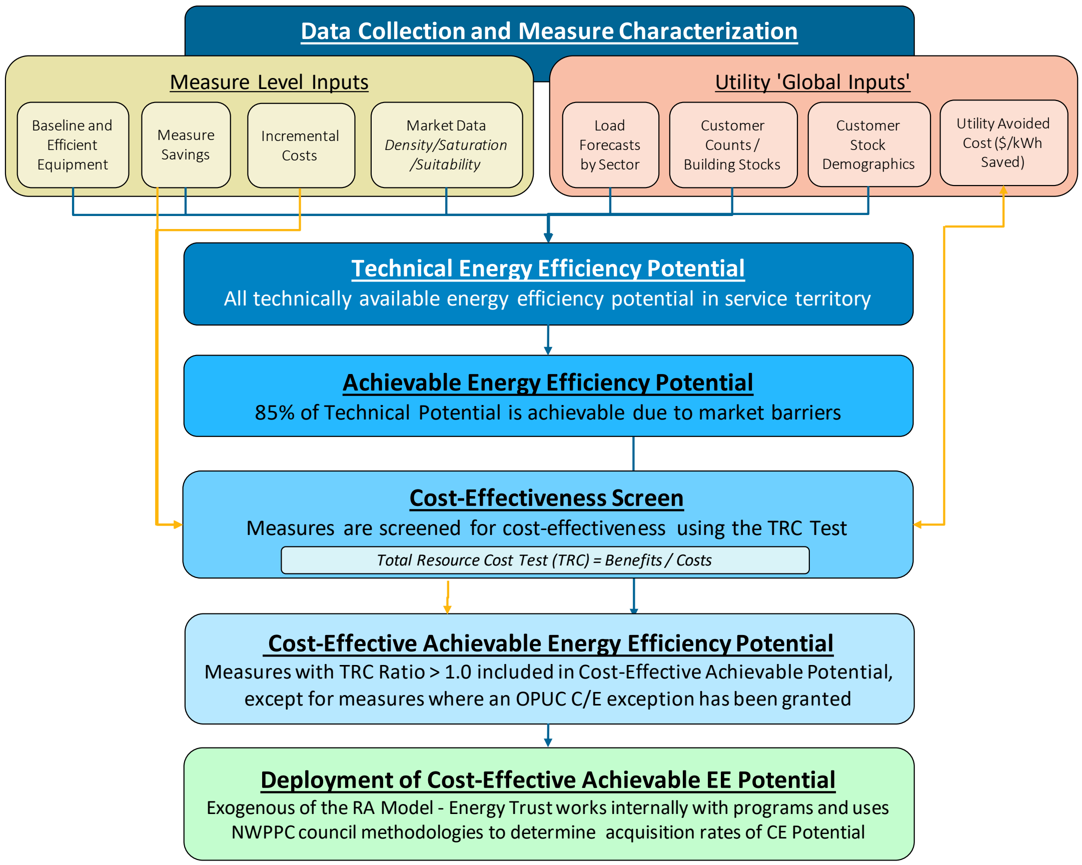
The RA Model utilizes the modeling platform Analytica®[3], an object-flow based modeling platform that is designed to visually show how different objects and parts of the model interrelate and flow throughout the modeling process. The model utilizes multidimensional tables and arrays to compute large, complex datasets in a relatively simple user interface. Energy Trust then deploys this cost-effective potential exogenously to the RA model into an annual energy savings projection based on past program experience, knowledge of current and developing markets, and future codes and standards.

20-Year Forecast Detailed Methodology

Energy Trust's 20-year forecast for DSM savings follows six overarching steps from initial calculations to deployed energy savings, as shown in Figure 4. The first five steps in the varying shades of blue nodes - Data Collection and Measure Characterization to Cost-Effective Achievable Energy Efficiency Potential - are calculated within Energy Trust's RA Model. This results in the total cost-effective potential that is achievable over the 20-year forecast. The actual deployment of these savings (the acquisition percentage of the total potential each year, represented in the green node of the flow chart) is done exogenously of the RA model. The remainder of this section provides further detail on each of the steps shown below.

Figure 4 - Energy Trust's 20-Year DSM Forecast Determination Flow Chart

[3] http://www.lumina.com/why-analytica/what-is-analytica1/



1. Data Collection and Measure Characterization

The first step of the modeling process is to identify and characterize a list of measures to include in the model, as well as receive and format utility 'global' inputs for use in the model. Energy Trust compiles a list of commercially available and emerging technology measures for residential, commercial, industrial and agricultural applications installed in new or existing structures. The list of measures is meant to reflect the full suite of measures offered by Energy Trust, plus a spectrum of emerging technologies.[4] Simultaneous to this effort, Energy Trust collects necessary data from the utility to run the model and scale the measure level savings to a given service territory (known as 'global inputs').

[4] An emerging technology is defined as technology that is not yet commercially available but is in some stage of development with a reasonable chance of becoming commercially available within a 20-year timeframe. The model is capable of quantifying costs, potential, and risks associated with uncertain, but high-saving emerging technology measures. The savings from emerging technology measures are reduced by a risk-adjustment factor based on what stage of development the technology is in. The working concept is that the incremental risk-adjusted savings from emerging technology measures will result in a reasonable amount of savings over standard measures for those few technologies that eventually come to market without having to try and pick winners and losers.

- ***Measure Level Inputs:***
  Once the measures to include in the model have been identified, they must be characterized to determine their savings potential and cost-effectiveness. The characterization inputs are determined through a combination of Energy Trust primary data analysis, regional secondary sources[5], and engineering analysis. There are over 30 measure level inputs that feed into the model, but on a high level, the inputs are put into the following categories:
    1. ***Measure Definition and Equipment Identification***: This is the definition of the efficient equipment and the baseline equipment it is replacing (e.g. a ductless mini-split heat pump replacing residential electric resistance space heat). A measure's replacement type is also determined in this step – Retrofit (RET), Replace on Burnout (ROB), or New Construction (NEW).
    2. ***Measure Savings****:* the kWh or therms savings associated with an efficient measure calculated by comparing the baseline and efficient measure consumptions.
    3. ***Incremental Costs****:* The incremental cost of an efficient measure over the baseline. The definition of incremental cost depends upon the replacement type of the measure. If a measure is a RET measure, the incremental cost of a measure is the full cost of the equipment and installation. If the measure is a ROB or NEW measure, the incremental cost of the measure is the difference between the cost of the efficient measure and the cost of the baseline measure.
    4. ***Market Data:*** Market data of a measure includes the density, saturation, and suitability of a measure. A density is the number of measure units that can be installed per scaling basis (e.g. the average number of showers per home for showerhead measures). The saturation is the average saturation of the density that is already efficient (e.g. 50% of the showers already have a low flow showerhead). Suitability of a measure is a percentage input to represent the percent of the density that the efficient measure is actually suitable to be installed in. These data inputs are all generally derived from regional market data sources such as NEEA's Residential and Commercial Building Stock Assessments (RBSA and CBSA).
- ***Utility Global Inputs:***
  The RA Model requires several utility level inputs to create the DSM forecast. These inputs include:
    1. ***Customer and Load Forecasts****:* These inputs are essential to scale the measure level savings to a utility service territory. For example, residential measures are characterized on a scaling basis 'per home', so the measure densities are calculated as the number of measures per home. The model then takes the number of homes that PGE serves currently and the forecasted number of homes to scale the measure level potential to their entire service territory.
    2. ***Customer Stock Demographics****:* These data points are utility specific and identify the percentage of stock that utilize different heating fuels for both space heating and water heating. The RA Model uses these inputs to segment the total stocks to the stocks that are applicable to a measure (e.g. gas storage water heaters are only applicable to customers that have gas water heat).
    3. ***Utility Avoided Costs****:* Avoided costs are the net present value of avoided energy purchases and avoided system costs that result from energy efficiency savings

[5] Secondary Regional Data sources include: The Northwest Power Planning Council (NWPPC), the Regional Technical Forum (the technical arm of the NWPPC), and market reports such as NEEA's Residential and Commercial Building Stock Assessments (RBSA and CBSA)

represented as $s per kWh saved. These values are provided by PGE based generally upon the avoided costs generated by PGE as an outcome of their IRP modeling. Avoided costs are the primary 'benefit' of energy efficiency in the cost-effectiveness screen.

2. Calculate Technical Energy Efficiency Potential

Once measures have been characterized and utility data loaded into the model, the next step is to determine the technical potential of energy that could be saved. Technical potential is defined as the total potential of a measure in the service territory that could be achieved regardless of market barriers, representing the maximum potential energy savings available. The model calculates technical potential by multiplying the number of applicable units for a measure in the service territory by the measure's savings. The model determines the total number of applicable units for a measure utilizing several of the measure level and utility inputs referenced above:

Total applicable units =	*Measure Density * Baseline Saturation * Suitability Factor * Heat Fuel Multipliers (if applicable) * Total Utility Stock (e.g. # of homes)*
Technical Potential =	*Total Applicable Units * Measure Savings*

The measure level technical potential is then summed up to show the total technical potential across all sectors. This savings potential does <u>not</u> account for the various market barriers that will limit a 100 percent adoption rate.

3. Calculate Achievable Energy Efficiency Potential

Achievable potential is simply a reduction to the technical potential based on each measure's achievability assumption rate, to account for market barriers that prevent total adoption of all cost-effective measures. Historically the achievable potential was defined as 85 percent of the technical potential. The Northwest Power and Conservation Council (NWPCC) updated the achievability assumption for certain measures in the most recent power plan, and Energy Trust has aligned the RA model with these assumptions. Many measures still have 85 percent achievability while market transformation and codes and standards are assumed to be closer to 100% achievable while shell measures are closer to 60% achievable.

Achievable Potential =	*Technical Potential * achievability %*

4. Determine Cost-effectiveness of Measures using TRC Screen

The RA Model screens all DSM measures in every year of the forecast horizon using the Total Resource Cost (TRC) test, a benefit-cost ratio (BCR) that measures the cost-effectiveness of the investment being made in an efficiency measure. This test evaluates the total present value of benefits attributable to the measure divided by the total present value of all costs. A TRC test value equal to or greater than 1.0 means the value of benefits is equal to or exceeds the costs of the measure and is therefore cost-effective and contributes to the total amount of cost-effective potential. The TRC is expressed formulaically as follows:

TRC = Present Value of Benefits / Present Value of Costs

Where *the Present Value of Benefits* includes the sum of the following two components:

a) Avoided Costs: The present value of electricity saved over the life of the measure, as determined by the total kWh saved multiplied by PGE's avoided cost per kWh. The net present-value of these benefits is calculated based on the measure's expected lifespan using PGE's discount rate.
b) Non-energy benefits are also included when present and quantifiable by a reasonable and practical method (e.g. water savings from low-flow showerheads, operations and maintenance (O&M) cost reductions from advanced controls).

Where *the Present Value of Costs* includes:

a) Total participant incremental cost

The cost-effectiveness screen is a critical component for Energy Trust modeling and program planning because Energy Trust is only allowed to incentivize cost-effective measures, unless an exception has been granted by the OPUC. Energy Trust is governed by policy directives to obtain all reasonably attainable cost-effective potential[6].

5. Quantify the Cost-Effective Achievable Energy Efficiency Potential

The RA Model's final output of potential is the quantified cost-effective achievable potential. If a measure passes the TRC test described above, then the *achievable savings* (designated percentage of technical potential) from this measure is included in the cost-effective achievable potential. If the measure does not pass the TRC test above, the measure is not included in the cost-effective achievable potential. However, the cost-effectiveness screen can be overridden for some measures under three specific conditions:

1) The OPUC has granted an exception to offer non-cost-effective measures under strict conditions or,
2) When the measure isn't cost-effective using utility specific avoided costs but the measure is cost-effective when using blended electric avoided costs for all of the electric utilities Energy Trust serves and is therefore offered by Energy Trust programs.
3) The measure is not cost-effective in our model, but may appear cost-effective in program settings, where costs are combined with other measures or are highly variable from project to project. For example, some commercial new construction measures may be screened on a project by project basis relying on a system based performance approach to cost-effectiveness.

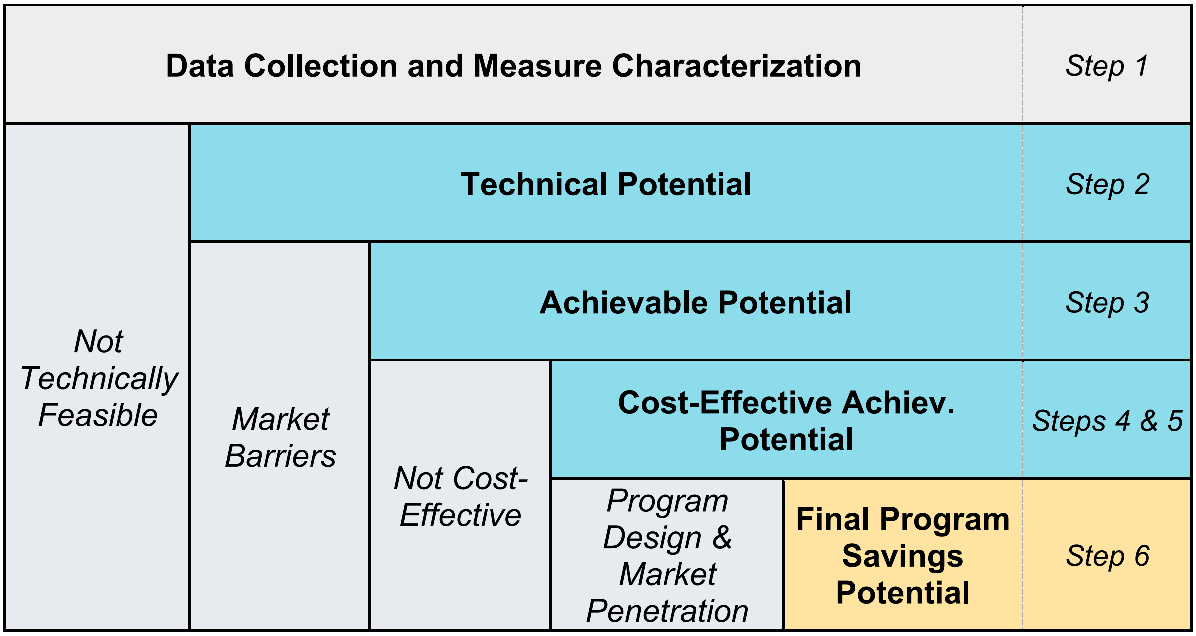
6. Deployment of Cost-Effective Achievable Energy Efficiency Potential

After the model determines the 20-year cost-effective achievable potential, Energy Trust develops a savings projection based on past program experience, knowledge of current and developing markets, and future codes and standards. The savings projection is a 20-year forecast of energy savings that is projected to result in a reduction of load on PGE's system. This savings forecast includes savings from program activity for existing measures and emerging technologies, expected savings from market transformation efforts that drive improvements in codes and standards, and a forecast of what Energy Trust is describing as a 'large project adder'. The 'large project adder' is characterized as savings that account for large unidentified projects that consistently appear in Energy Trust's historic savings record and have been a source of overachievement against IRP targets in prior years for other utilities that Energy Trust serves.

[6] As directed in OPUC docket UM-551 and 2017 ORS 757.054

Figure 5 below reiterates the types of potential shown in Figure 3, and how the steps described above and in the flow chart fit together.

Figure 5 - The Progression to Program Savings Projections



Forecast Results

Forecast results will be shown in several different sections, as the RA model has different output capabilities that are applied to project energy savings potential in a variety of different views, including by segment, end use, and in supply curves. The final savings projection is provided by segment and program delivery type. The RA Model produces results by type of potential, as well as several other useful outputs, including a supply curve based on the levelized cost of energy efficiency measures. This section discusses the overall model results by potential type and provides an overview of the supply curve.

Forecasted Savings by Sector

Table 1 summarizes the technical, achievable, and cost-effective achievable potential for PGE's system in Oregon. The savings in the table represent the total 20-year cumulative energy savings potential identified in the RA Model for each of the three respective types of potential identified in Figure 3 and Figure 5, prior to deployment of the savings into the final savings projection.

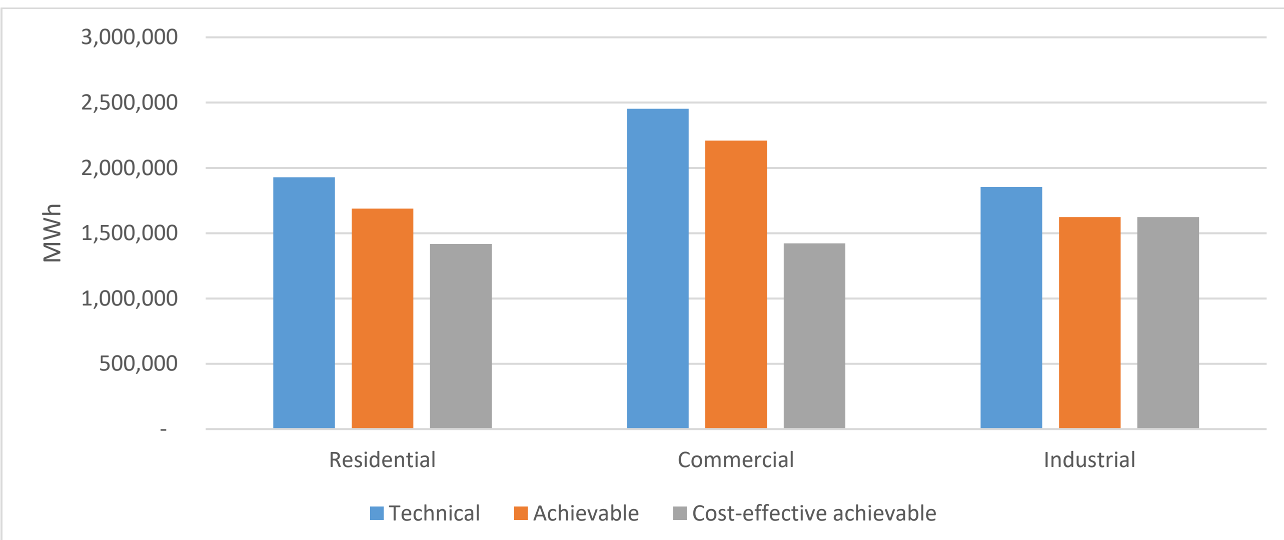
Table 1 - Summary of Cumulative Modeled Savings Potential - 2023–2042

Sector	Technical Potential (aMW)	Achievable Potential (aMW)	Cost-Effective Achievable Potential (aMW)
Residential	220	193	162
Commercial	280	252	162
Industrial	212	185	185
Total	**712**	**630**	**509**

Figure 6 shows cumulative forecasted savings potential across the three sectors Energy Trust serves, as well as the type of potential identified in PGE's service territory.

The Commercial sector, which includes multifamily, represents the largest source of efficiency potential within PGE's territory. 88% of the industrial technical potential is cost-effective, while the residential and commercial sectors cost-effective achievable potential are 73% and 58% of technical potential respectively.

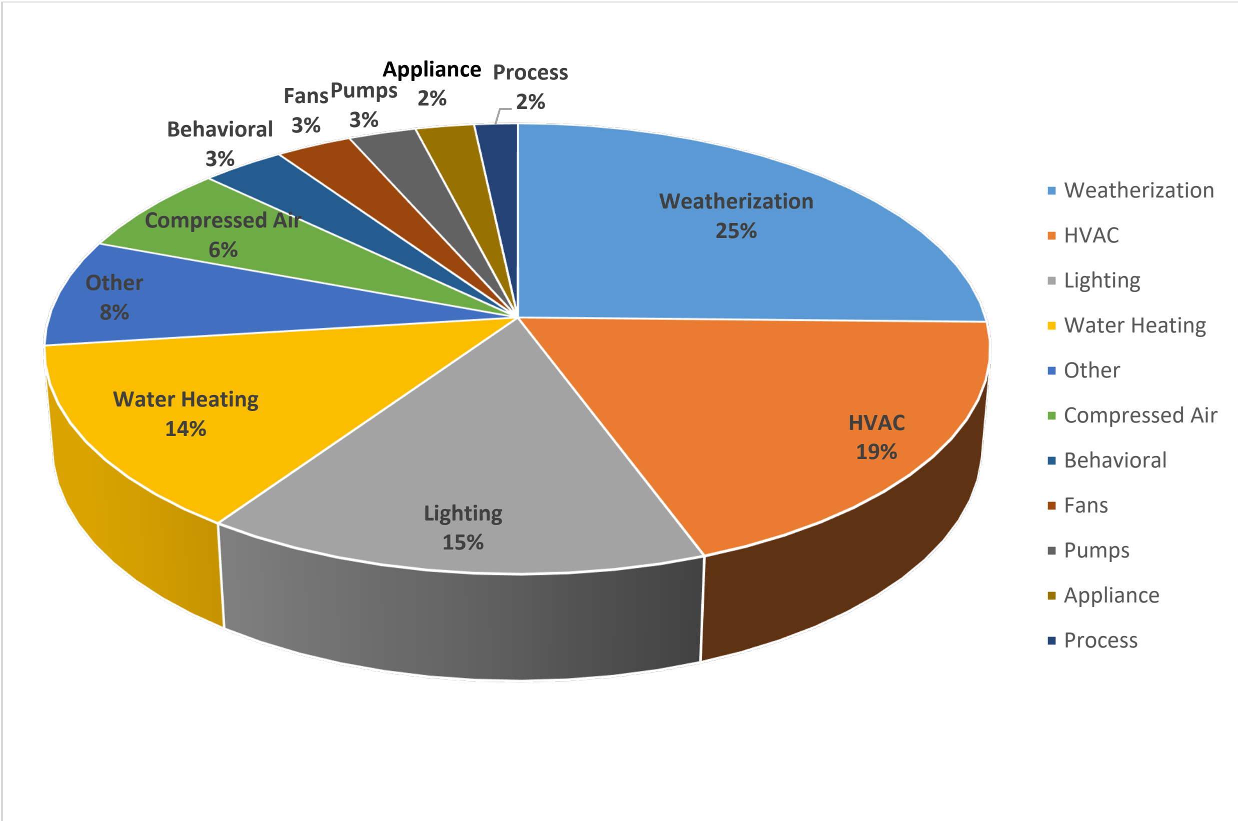
Figure 6 - Savings Potential by Sector – Cumulative 2023–2042 (MWh)



Cost-Effective Achievable Savings by End-Use

Figure 7 below provides a breakdown of PGE's 20-year cost-effective DSM savings potential by end use.

Figure 7 – 20-year Cost-Effective Achievable Cumulative Potential by End Use



Contribution of Emerging Technologies

As mentioned earlier in this report, Energy Trust includes a suite of emerging technologies (ETs) in its model. The emerging technologies included in the model are listed in Table 2.

Table 2 - Emerging Technologies Included in the Model that are pertinent for PGE

Residential	Commercial	Industrial
• Window Attachments • Advanced Insulation • Behavior Competitions • Heat Pump Dryers • Heat Pump Water Heaters • Smart Thermostats • High Efficiency Heat Pumps	• Advanced Ventilation Controls • DOAS/HRV • Heat Pump Water Heaters • Advanced Package RTUs • Zero Net Energy Path • Hybrid Indirect-Direct Evaporative Cooler • Advanced Refrigeration Controls • Advanced Window Technologies	• Compressed Air Nozzles • Adaptive Refrigeration Controls • Advanced Insulation Heat Pump Water Heaters

Energy Trust recognizes that emerging technologies are inherently uncertain and utilizes a risk factor to hedge against that risk. The risk factor for each emerging technology is used to characterize the inherent uncertainty in the ability for ETs to produce reliable future savings. This risk factor was determined based on qualitative metrics of:

- Market risk
- Technical risk
- Data source risk

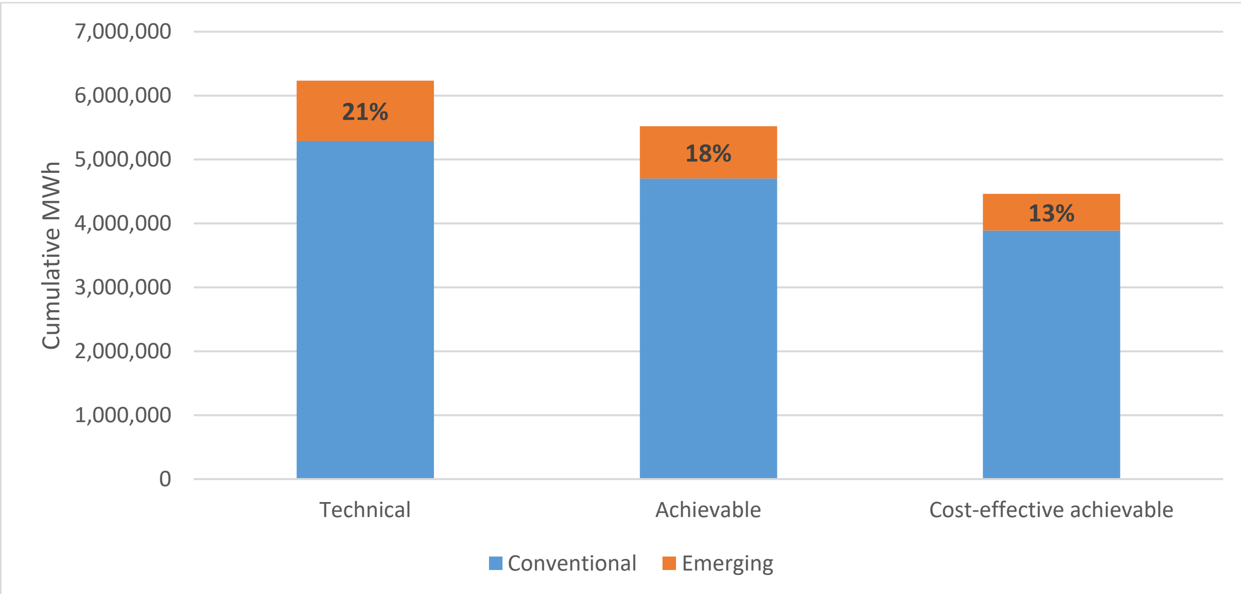
The framework for assigning the risk factor is shown in Table 3. Each ET was assessed within each risk category; a total weighted score was then calculated. Well-established and researched technologies have lower risk factors while nascent, unevaluated technologies (e.g., CO2 heat pump water heaters) have higher risk factors. This risk factor was then used as a multiplier of the incremental savings potential of the measure.

Table 3 - Emerging Technology Risk Factor Score Card

	ET Risk Factor				
Risk Category	**10%**	**30%**	**50%**	**70%**	**90%**
Market Risk (25% weighting)	**High Risk:** • Requires new/changed business model • Start-up, or small manufacturer • Significant changes to infrastructure • Requires training of contractors. Consumer acceptance barriers exist.			**Low Risk:** • Trained contractors • Established business models • Already in U.S. Market • Manufacturer committed to commercialization	
Technical Risk (25% weighting)	**High Risk:** Prototype in first field tests. A single or unknown approach	Low volume manufacturer. Limited experience	New product with broad commercial appeal	Proven technology in different application or different region	**Low Risk:** Proven technology in target application. Multiple potentially viable approaches.
Data Source Risk (50% weighting)	**High Risk:** Based only on manufacturer claims	Manufacturer case studies	Engineering assessment or lab test	Third party case study (real world installation)	**Low Risk:** Evaluation results or multiple third party case studies

Figure 8 below shows the amount of emerging technology savings within each type of DSM cumulative potential. While emerging technologies make up about 21% of the technical potential, once the cost-effectiveness screen is applied, the relative share of emerging technologies drops to about 13% of total cost-effective achievable potential. This is because many of these technologies are still in early stages of development and are quite expensive. Though Energy Trust includes factors to account for forecasted decreases in cost and increased savings from these technologies over time, some are still never cost-effective over the planning horizon or do not become cost-effective until later years.

Figure 8 – Cumulative Contribution of Emerging Technologies by Potential Type



Cost-Effective Override Effect

Table 4 shows the savings potential in the RA model that was added by employing the cost-effective override option in the model. As discussed in the methodology section, the cost-effective override option forces non-cost-effective potential into the cost-effective potential results and is used when a measure meets one of the following three criteria:

1. A measure is offered under an OPUC exception.
2. When the measure isn't cost-effective using PGE-specific avoided costs but the measure is cost-effective when using blended electric avoided costs for all of the electric utilities Energy Trust serves and is therefore offered by Energy Trust programs.
3. The measure is not cost-effective in our model, but may appear cost-effective in program settings, where costs are combined with other measures or highly variable from project to project[7].

Table 4 - Cumulative Cost-Effective Potential (2023-2042) due to Cost-effectiveness override (aMW)

[7] Some measures can have high degrees of variations in savings and costs. If a measure is cost-effective in the RA model then all savings attributable to the measure are included. Conversely, if a measure is not cost-effective in the RA model then zero savings will be shown in the model. While costs are updated frequently to reflect changing markets there may be instances where some instances of installation are cost-effective and others are not. Many of these types of projects are screened individually for cost-effectiveness in Energy Trust's custom program offerings.

Sector	Total Cumulative Cost-Effective Potential With CE Override	Total Cumulative Cost-Effective Potential No CE Override	Difference
Residential	162	153	9
Commercial	162	150	12
Industrial	185	185	-
Total DSM:	**509**	**489**	**21**

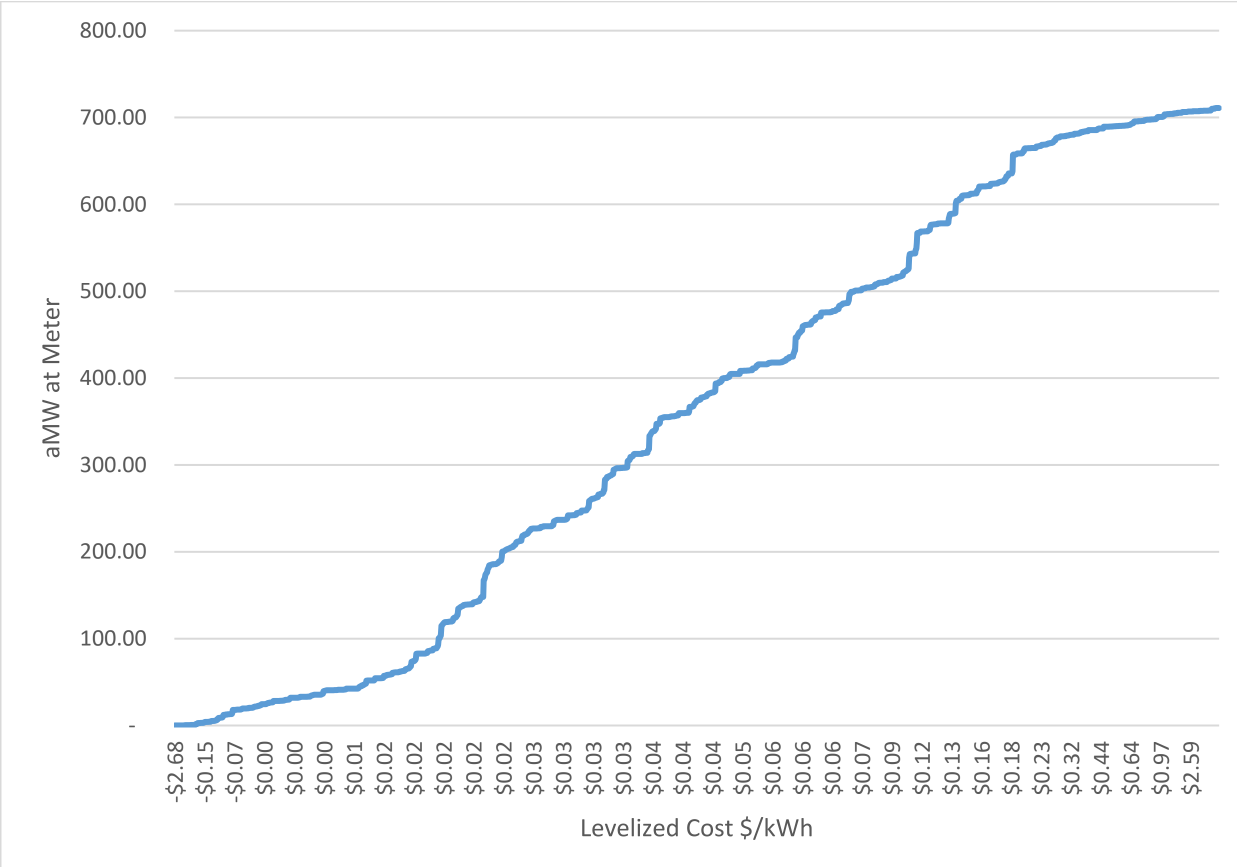
In this IRP, 4% of the cost-effective potential identified by the model is due to the use of the cost-effective override for measures.

Supply Curves and Levelized Cost Outputs

An additional output of the RA Model is a resource supply curve developed from the levelized cost of energy of each measure. The supply curve graphically depicts the total potential in average megawatts that could be saved at various costs for all measures. The levelized cost for each measure is determined by calculating the present value of the total cost of the measure over its economic life, per kWh of energy savings ($/kWh saved). The levelized cost calculation starts with the customer's incremental TRC of a given measure. The total cost is amortized over an estimated measure lifetime using the PGE's discount rate provided to Energy Trust. The annualized measure cost is then divided by the annual kWh savings. Some measures have negative levelized costs because non-energy benefits amortized over the life of the measure are greater than the total cost of the measure over the same period.

Figure 9 below shows the supply curve developed for this IRP that can be used for comparing demand-side and supply-side resources.

Figure 9 – Electric Supply Curve ($ per kWh saved)



Deployed Results – Final Savings Projection

The results of the final savings projection show that Energy Trust can save 147 aMW across PGE's system in the next five years from 2023 to 2028 and over 527 aMW by 2042. This represents a 17 percent cumulative load reduction by 2042[8] and is an average of nearly 1.0 percent incremental annual load reduction. The cumulative final savings projection is shown in Table 5 compared to the technical, achievable and cost –effective achievable potential.

Table 5 - 20-Year Cumulative savings potential by type, including final savings projection (aMW at the meter)

Sector	Technical Potential	Achievable Potential	Cost-Effective Achievable Potential	Final Savings Projection
Residential	220	193	162	117
Commercial	280	252	162	213
Industrial	212	185	185	185

[8] Cumulative savings assumes customers will continue to purchase equipment equal or higher efficiency equipment after the measure reaches the end of its useful life and therefore savings in this instance are assumed to persist in future years.

Large Projects[9]	-	-	-	12
Total	**712**	**630**	**509**	**527**

The final deployed savings projection for the residential sector is just over 70% of the modeled cost-effective achievable potential. There are several reasons for this additional step down in savings:

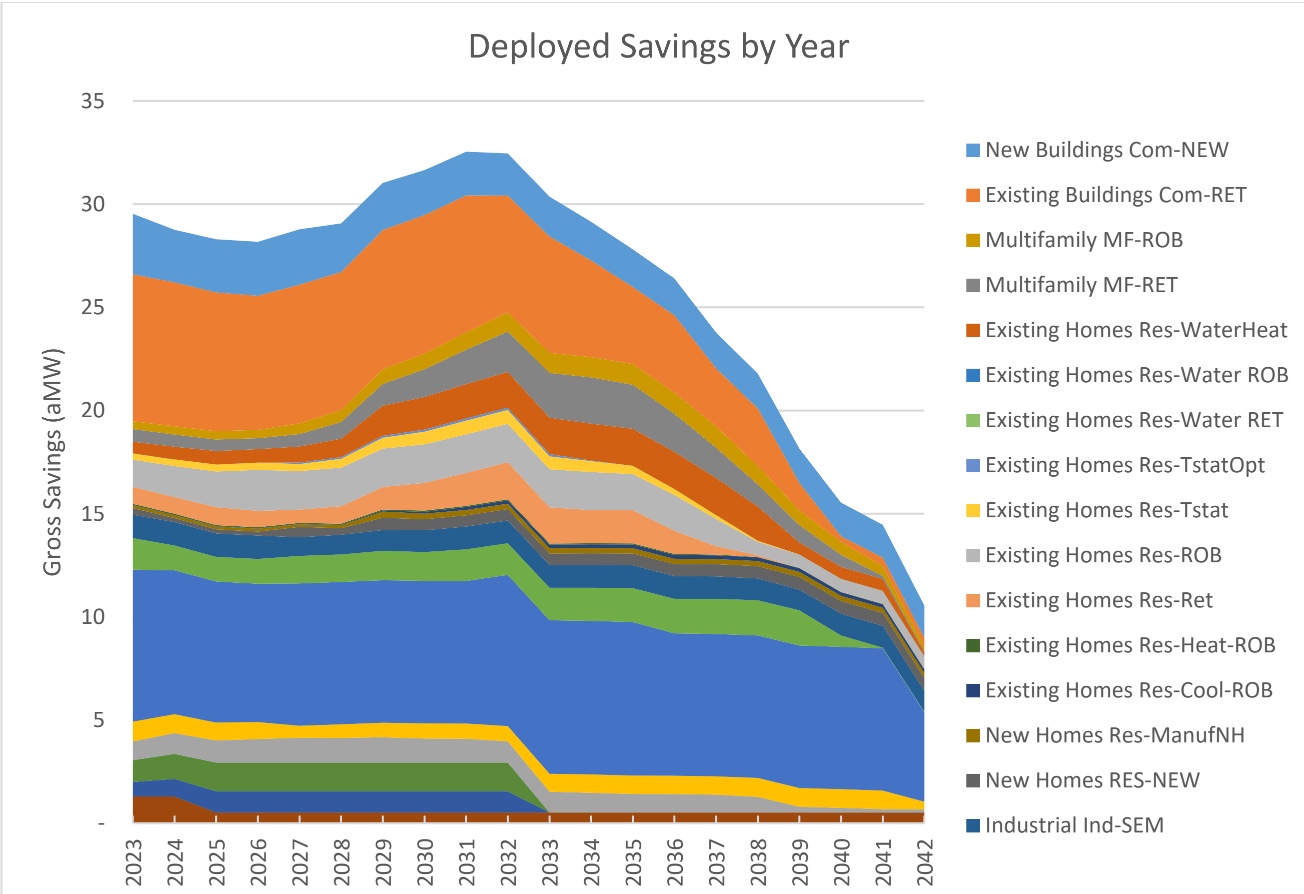
1) "Lost Opportunity Measures" – Measures that are meant to replace failed equipment (ROB) or new construction measures (NEW) are considered lost opportunity measures because programs have one opportunity to influence the installation of efficient equipment over code baseline when the existing equipment fails or when the new building is built. This is because these measures must be installed at that specific point in time, and if a program administrator misses the opportunity to influence the installation of more efficient equipment, the opportunity is lost until the equipment fails again. Energy Trust expects that most of these opportunities will be met in later years as efficient equipment becomes more readily adopted. However, in early years, the level of acquisition for these opportunities is smaller and ramps higher as time progresses.
2) "Hard to Reach Measures" – some measures that show high savings potential are notoriously hard to reach and are capped at about 40 percent of total retrofit potential. These measures include residential insulation and windows.

The final deployed savings projection for the commercial sector is higher than the cost-effective savings identified in the model due to program goals including savings from market transformation. Market transformation savings represent energy efficiency savings resulting from commercial code adoption in Oregon in prior years. As presently constructed, the model does not have a way to represent these savings in an easily defined manner and is represented by setting ramp rates at higher than 100 percent in early years to show that the savings from new construction measures are more than just incremental beyond current code. As a result, the final deployed savings is higher than the cost-effective achievable savings identified in the model by about 31 percent.

Figure 9 below shows the annual savings projection by sector and measure type.

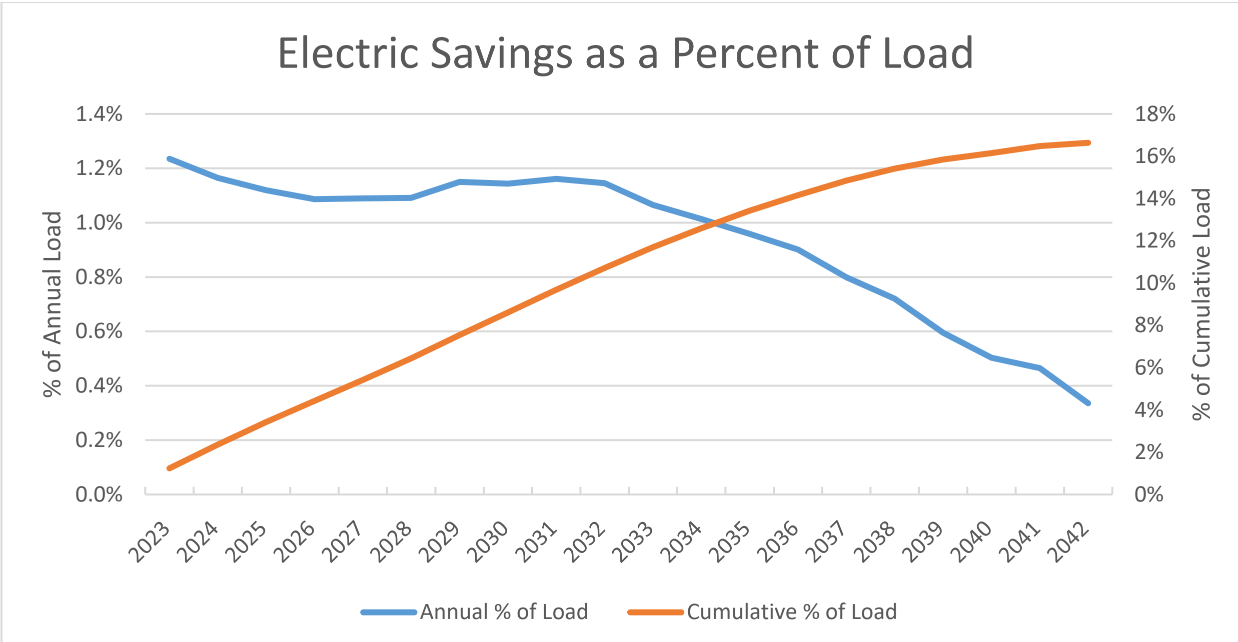
[9] The large project adder is not a line item in the model but based on analysis of previous Energy Trust program data and added during the deployment.

Figure 10 – Annual Deployed Final Savings Potential by Sector and Measure Type (aMW w/ line losses)



Finally, Figure 11 shows the annual and cumulative savings as a percentage of PGE's load forecast. Annually, the savings as a percentage of load varies from about 0.3% at its lowest to 1.2% at its highest, as represented on the *left* Y-axis of the graph and the blue line. Cumulatively, the savings as a percentage of load builds to 17% by 2042, shown on the right Y-axis and the gold line.

Figure 11 – Annual Forecasted Savings as a Percentage of Annual Load Forecast



Deployed Results – Peak Day Results

Ongoing regional emphasis on peak and capacity management and an OPUC docket focused on electric utility Distribution System Planning (OPUC docket UM 2005) has resulted in continued interest in the contribution energy efficiency can make to managing electric utility loads. Additionally, the OPUC has directed Energy Trust to report peak impacts in the appendices of our annual report beginning in 2017[10].

Peak hour factors are the percentage of annual energy savings that occur during peak hours over the course of a year. Energy Trust calculates peak demand factors using Equation 1, where load factors and coincidence factors being derived from the NWPCC library of load profiles.

Equation 1 – Calculation of Peak Factors from Load and Coincidence Factors

*Peak factor = (1 yr/8760) * Load Factor * Coincidence Factor*

Figure 11 below shows the annual, deployed peak day savings potential based upon the results of the 20-year forecast. Each measure analyzed is assigned a load shape and the appropriate peak factor is applied to the annual savings to calculate the overall DSM contribution to peak day capacity. The commercial sector achieves 39%, the industrial sector achieves 35% and the residential sector achieves 26% of the overall peak savings over the 20 year period. Cumulatively, this is equal to 1,392 MW[11], as shown in Table 6 below.

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[10] For the 2021 version of this report see Appendix 9 of Energy Trust's "*2021 Annual Report to the Oregon Public Utility Commission & Energy Trust Board of Directors*" available at https://www.energytrust.org/wp-content/uploads/2022/04/2021-Annual-Report.pdf

[11] Peak results do not include energy savings from residential lighting market transformation categories

Figure 12 - Annual Deployed Peak Savings Contribution by Season (MW)

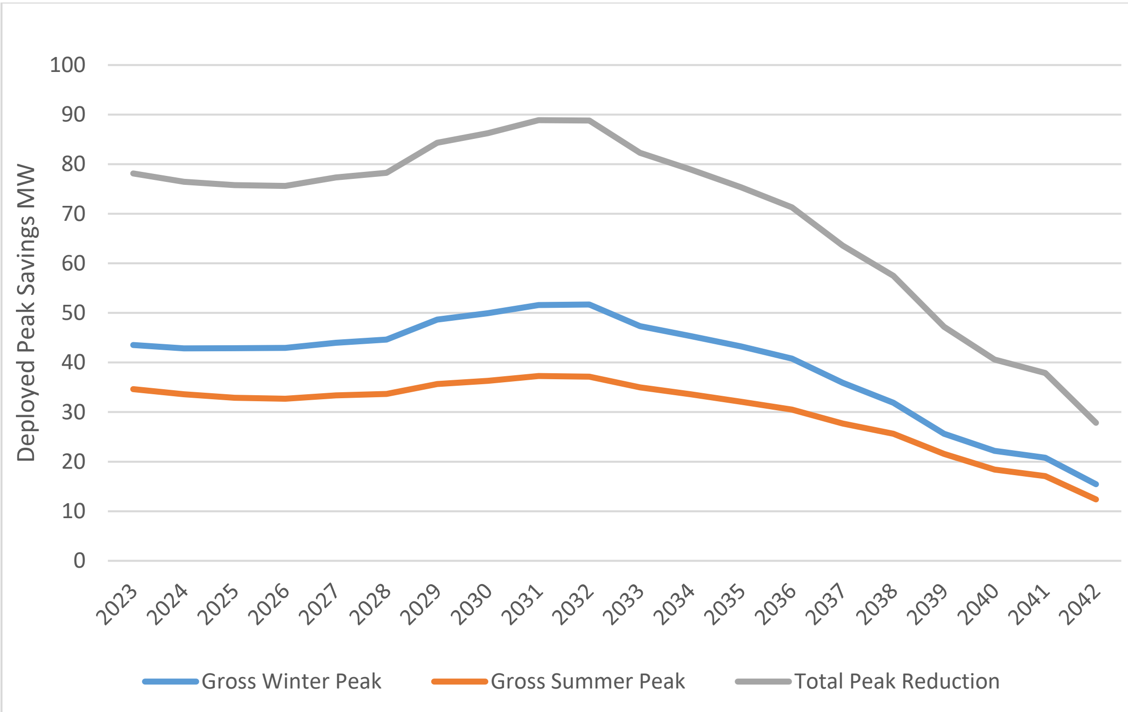

Table 6 - Cumulative Deployed Peak Savings Contribution by Sector (MW)

Sector	Cumulative Gross Peak Savings (MW)	% of Overall Peak Savings
Commercial	550	39%
Residential	360	26%
Industrial	481	35%
Total	1,392	**100%**