Energy Efficiency – Resource Ramping Assumptions

Class 2 DSM Resource Ramping

This document presents the methods used by The Cadmus Group, Inc. (Cadmus) and the Energy Trust of Oregon (Energy Trust) to develop reasonable estimates of annual Class 2 DSM (energy-efficiency) potential available for acquisition in PacifiCorp's service territory for consideration in PacifiCorp's 2013 Integrated Resource Plan (IRP). The Energy Trust's method is applied to resources in Oregon while Cadmus' method applies to the other five states PacifiCorp serves. Though the mechanics of the two methods differ, the objectives are the same – to estimate the amount of reasonably achievable Class 2 potential in each year of the 20-year study period. The general method is presented below, with additional detail on Cadmus and Energy Trust methods following.

General Methodology

Both Cadmus and the Energy Trust begin by estimating the technical potential for Class 2 DSM resources in the given territory. That is, the amount of energy that could be saved in the absence of market barriers and cost-effectiveness considerations. This technical potential is then translated to annual achievable technical potential by applying achievability factors and "ramp rates" representing the rate at which these resources could be achieved in each market. The application of achievability factors and ramp rates is consistent with the method used by the Northwest Power and Conservation Council (Council) in its Sixth Northwest Conservation and Electric Power Plan (6th Plan). The resulting quantities are then presented as "annual achievable technical" potential. PacifiCorp's IRP model then determines the amount of annual achievable technical potential that is cost-effective in a given year, which informs PacifiCorp's acquisition targets in each state.

Both Cadmus and the Energy Trust assume that Class 2 DSM measure acquisition is ramped (i.e., acquired) over the planning horizon depending on market availability. In general, market availability is dictated by the existence of programs, customer awareness, technology availability, and other considerations. The intent of this ramp rate is to establish a path to full market maturity for each measure or technology group and ensure that resource planning selections don't overstep acquisition capabilities. Class 2 DSM resources are divided into two categories, each of which has its own timing and achievability considerations:

- *Lost Opportunity Resources* are opportunities at the time of equipment burnout or new construction. When equipment is replaced, a unique opportunity exists to upgrade efficiency at incremental (above standard equipment), rather than full cost. If standard equipment is installed, the high-efficiency equipment would not be installed until the new equipment reaches the end of its normal life cycle, without early replacement (usually requiring a significantly higher incremental cost). The same applies for opportunities at the time of new construction.

- *Discretionary Resources* are opportunities existing in current building stock (retrofit opportunities in existing construction). As such, they are not subject to as stringent timing constraints, and as such, can theoretically be acquired at any point in the planning period assuming customer willingness and resources.

The timing challenges created by lost opportunities make these resources more difficult to acquire than discretionary opportunities. As detailed in the Cadmus and Energy Trust methodology sections below, both assume that 85% of discretionary potential can be acquired over the planning period, but estimate a lower achievable rate for lost opportunity resources (between 65% and 72%). These assumptions are consistent with the assumptions used by the Northwest Power and Conservation Council (Council) in its Sixth Northwest Conservation and Electric Power Plan (6th Plan).

In addition to the timing considerations for each measure, it is important to recognize the interaction between the two resource classes. For example, if a functioning, but inefficient, refrigerator is replaced before the end of its useful life (a discretionary opportunity), then that savings should not also be counted as an equipment replacement opportunity when the original unit would have needed to be replaced (lost opportunity). Similarly, if a home is weatherized (discretionary), upgrading the heating or cooling equipment will save less than it would have in absence of weatherization.

Both methods use recent state-specific program history to inform short-term achievable potential to account for the level of infrastructure and awareness currently in place in each jurisdiction. This process is designed to avoid large increases or decreases in short-term acquisition, which are unlikely to occur in practice. The remainder of this document presents additional detail on Cadmus and Energy Trust methods for estimating annual achievable technical potential.

Results

Though the some of the specific methods used by Cadmus and Energy Trust to calculate annual achievable technical potential differ, the results are very similar. Cadmus estimates that across all Class 2 DSM resources, 80% of total technical potential is achievable over 20 years and that 67% of this achievable technical potential would come from discretionary resources. Energy Trust estimates that 77% of the technical potential can be achieved over 20 years with 60% of this achievable potential coming from discretionary resources.

The Cadmus Group's Methodology

This subsection describes Cadmus' process for converting estimates of 20-year technical potential to annual estimates of achievable technical potential. The analysis distinguishes between measure ramping, which reflects the technical limitations of acquiring individual measures, and market ramping, which accounts for the level of delivery infrastructure in each of PacifiCorp's jurisdictions.

Measure Ramp Rates

Cadmus applies measure ramp rates to both lost opportunity and discretionary resources though the interpretation and application of these rates is different for each class, as described below. The measure ramp rates are generally the same as those used in the Council's 6th Plan, though

Cadmus made a number of additional considerations in Class 2 DSM measure acquisition, Cadmus:

- Aligned the first year of the 6th Plan ramp rates (2010) with the first year of this study (2013),
- Assigned measures that are not specified in the 6th Plan a ramp rate appropriate for that technology (i.e. same ramp rate as similar measure in 6th Plan), and
- Created a custom ramp rate for general service compact fluorescent light (CFL) bulbs such that this study's estimate of CFL penetration in 2013 aligns with PacifiCorp's 2012 activity, market trends, and forecasted 2013 activity.

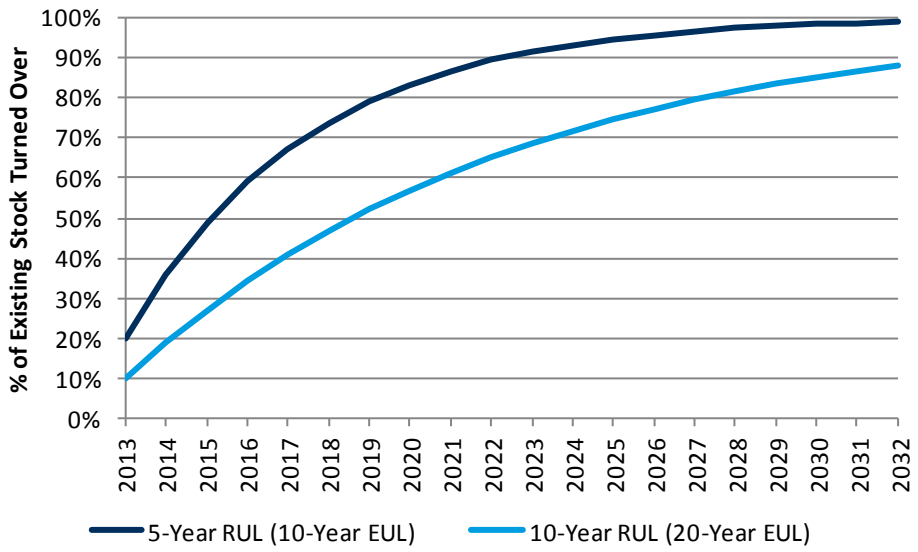
Lost Opportunity Resources

The first step in quantifying the achievable lost opportunity potential in each year is to determine the amount that will be technically available through new construction and natural equipment turnover due to failure. New construction rates are taken directly from PacifiCorp's customer forecast. Equipment turnover rates are develop by dividing the units in each year by the measure life. That is, if there are 100 units initially with a 10-year life, one tenth, or 10, units would be replaced. In the following year, 90 units would remain and one tenth, or 9, of these units would be replaced, and so on over the course of the study.

Because the existing equipment stock is composed of a mix of equipment ages, it is assumed that, on average, the remaining useful life (RUL) is half of the effective useful life (EUL)[1]. The fraction of equipment that turns over each year is a function of this RUL, thus, the technical potential for a lost opportunity measures has an annual shape before any ramp rates are applied, as illustrated in Figure 1. The same concept applies to new construction, where resource acquisition opportunities become available only when a home or building is constructed. In addition to showing an annual shape, Figure 1 demonstrates that the amount of equipment that turns over during the study period is a function of the RUL; the shorter the RUL, the higher the percentage of equipment assumed to turn over.

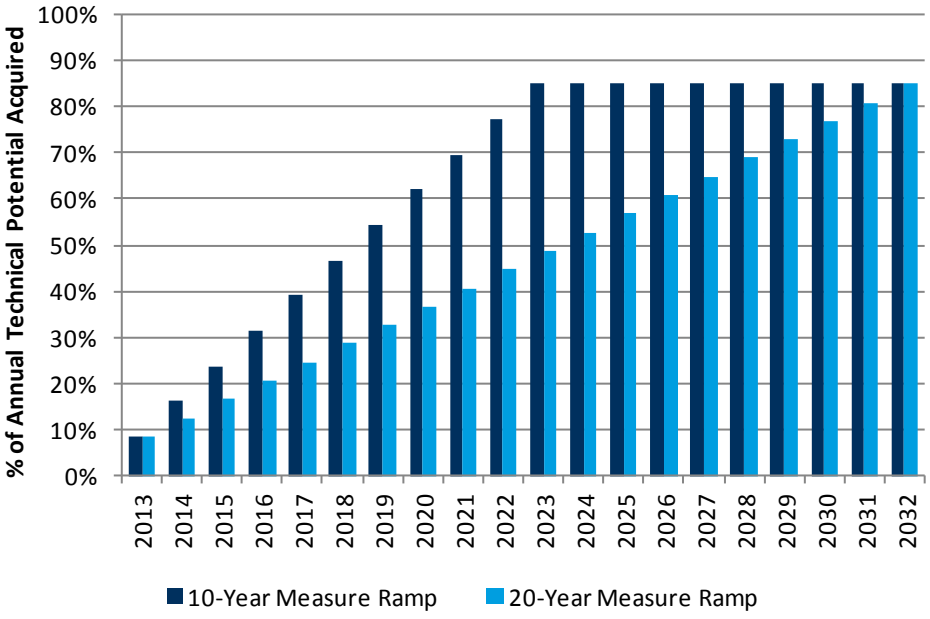
[1] The EUL represents the median lifetime, defined as the year during which half the measures installed are still in place and operable and half are not, as defined by the Regional Technical Forum: http://www.nwcouncil.org/energy/rtf/subcommittees/measurelife/RTF%20Measure%20Useful%20Life%20Guidelines%20Final%202012%200515.pdf

Figure 1. Existing Equipment Turnover for Varying RULs



In addition to the natural timing constraints imposed by equipment turnover and new construction rates Cadmus applies measure ramp rates to reflect other limitations to resource acquisition over the study horizon such as market availability. The maximum value of these measure ramp rates is 85%, reflecting the Council's assumption that up to 85% of annual technical potential is achievable. As illustrated by Figure 2 a measure ramping up over 10 years is expected to reach full market maturity (85% of annual technical potential) after 10 years, whereas another measure may take 20 years to reach full maturity.

Figure 2. Examples of Lost Opportunity Measure Ramp Rates



To calculate annual achievable technical potential for each lost opportunity measure, the effects of technical resource availability and measure ramping are multiplied together, consistent with the Council. Note that, particularly in the early years of the study, there is a gap between assumed acquisition and the 85% maximum achievability. It is assumed that these "lost" resources are not available again until the measure's EUL has elapsed. Therefore, depending on EUL and measure ramp rate assumptions, some of the potential may be pushed out beyond the 20th year of the study and the total lost opportunity achievable technical potential may be less than 85% of the technical potential. Figure 3 shows an example of this for a measure with a 5-year RUL/10 year EUL. Figure 3Note the spike in achievable technical potential starting in year 2023 (after the measure's EUL) is caused by the acquisition of opportunities that were missed at the beginning of the study period.

Figure 3. Example of Combined Effects of Technical Resource Availability and Measure Ramping Based on 10-Year EUL

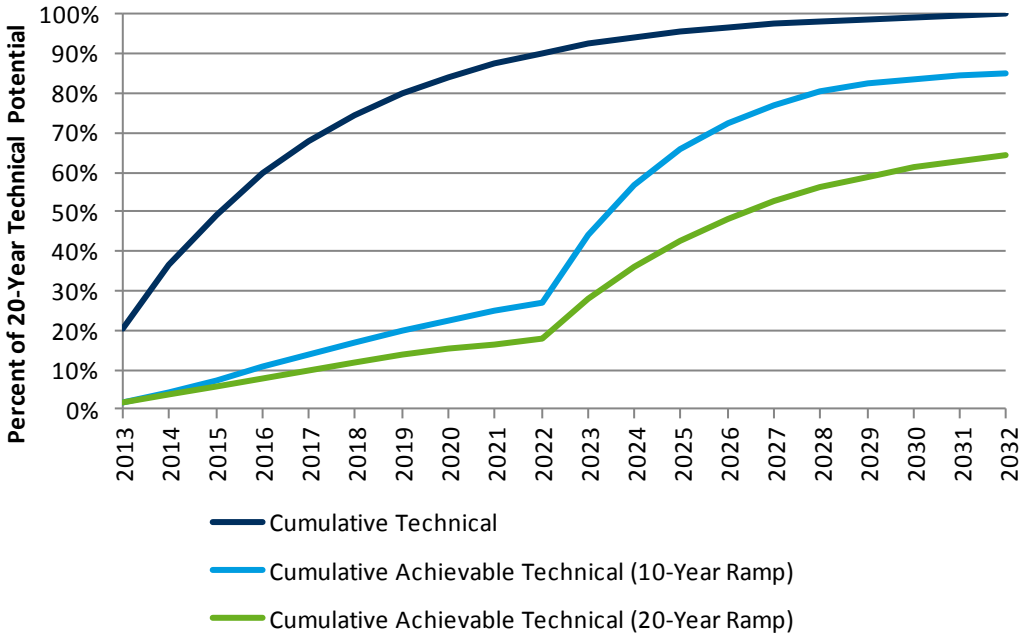


Table 1 illustrates this method based on the same 5-year RUL/10 year EUL measure on a 10-year ramp rate (light blue line in Figure 3) assuming 1,000 inefficient units in place in 2012. In the first ten years (2013 through 2022), lost opportunities accumulate because the measure ramp rate caps the availability of high efficiency equipment. Starting in year 2023, the 11th year, the opportunities lost 10 years prior become available again. As shown in Table 1, for this combination of EUL and measure ramp rate, 85% of the technical potential is achieved by the end of the study period.

Table 1. Example of Lost Opportunity Treatment – 10 Year EUL Measure on 10-Year Ramp Rate

Year	Incremental Stock Equipment Turnover (Units)	Cumulative Stock Equipment Turnover (Units)	Measure Ramp Rate	Installed High Efficiency Units	Missed Opportunities for Acquisition in Later Years (Units)	Missed Opportunities Acquired (Units)	Cumulative Units Installed	Cumulative Percent of Technical Achieved
2013	200	200	9%	17	180	0	17	9%
2014	160	360	16%	26	130	0	43	12%
2015	128	488	24%	30	92	0	73	15%
2016	102	590	31%	32	65	0	106	18%
2017	82	672	39%	32	44	0	138	20%
2018	66	738	47%	31	29	0	168	23%
2019	52	790	54%	29	19	0	197	25%
2020	42	832	62%	26	11	0	223	27%
2021	34	866	70%	23	6	0	246	28%
2022	27	893	77%	21	2	0	267	30%
2023	21	914	85%	18	0	153	438	48%
2024	17	931	85%	15	0	110	563	60%
2025	14	945	85%	12	0	78	653	69%
2026	11	956	85%	9	0	55	717	75%
2027	9	965	85%	7	0	38	762	79%
2028	7	972	85%	6	0	25	793	82%
2029	6	977	85%	5	0	16	814	83%
2030	5	982	85%	4	0	10	828	84%
2031	4	986	85%	3	0	5	836	85%
2032	3	988	85%	2	0	2	840	85%

Note: Units in Table 1 represent units installed annually. Columns may not add to totals due to rounding.

As described above, the amount of technical potential that can be achieved is a function of the EUL and measure ramp rate. The same 10-year EUL measure on a slower 20-year ramp rate would achieve less of its 20-year technical potential, as shown in Figure 3. Across all lost opportunity measures included in this study, approximately 72% of the technical potential is deemed achievable over the 20-year study period. This is consistent with the Council's assumption that less than 85% of lost opportunity resources are achievable.[2].

Discretionary Resources

Discretionary resources differ from lost opportunity resources in that they are available for acquisition at any point in the study horizon. From a theoretical perspective, this suggests that all achievable technical potential for discretionary resources could be acquired in the first year of the study. But, from a practical perspective, this outcome is realistically impossible to achieve due to infrastructure and budgetary constraints and customer considerations. Further, due to interactive effects between discretionary and lost opportunity resources, assuming immediate acquisition would distort the potential for lost opportunity resources. For example, if one

[2] A Retrospective Look at the Northwest Power and Conservation Council's Conservation Planning Assumptions, April 2007. http://www.nwcouncil.org/library/2007/2007-13.htm

assumes all homes are weatherized in the first year of a program the amount of potential available to high efficiency HVAC equipment would decrease significantly (i.e., a high-efficiency heat pump would save less energy in a fully weatherized home).

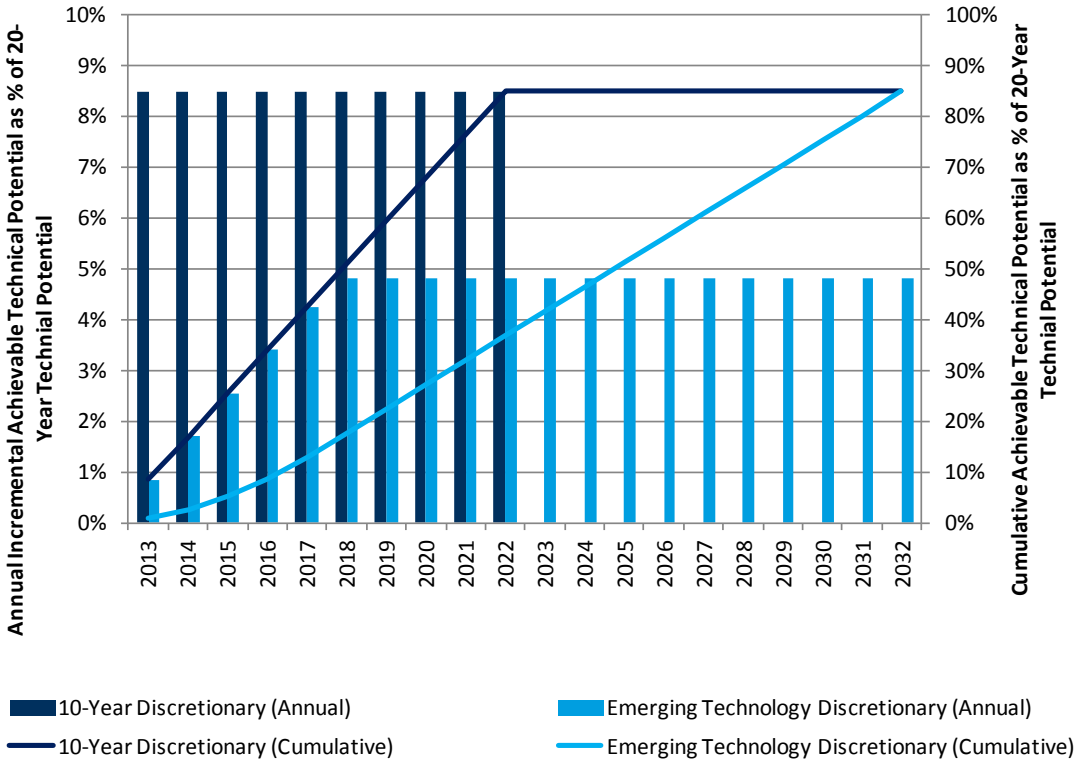
Consequently, Cadmus' approach addresses discretionary resources in two steps:

1. Develop a 20-year estimate of discretionary resource technical potential assuming that technically feasible measure installations occur equally (1/20th of the total available) in each year of the study to avoid distorting the interaction between discretionary and lost opportunity resources described above.
2. Overlay a measure ramp rate to specify the timing of achievable discretionary resource potential, transforming a 20-year cumulative technical value into annual, incremental achievable values

The discretionary measure ramp rates specify only the timing of resource acquisition and do not affect the portion of the 20-Year technical potential that is achieved over the study period.

Figure 4 shows the incremental (bars) and cumulative (lines) acquisitions for two different discretionary ramp rates. A measure on the 10-Year Discretionary ramp rate is expected to reach full maturity (85% of total technical potential) in 10 years, with market penetration increasing in equal increments each year. A measure on the Emerging Technology Discretionary ramp rate is expected to take a longer amount of time to reach full maturity (also, 85% of total technical potential), but ultimately arrives at the same cumulative savings as the measure on the 10-year ramp rate.

Figure 4. Examples of Discretionary Measure Ramp Rates



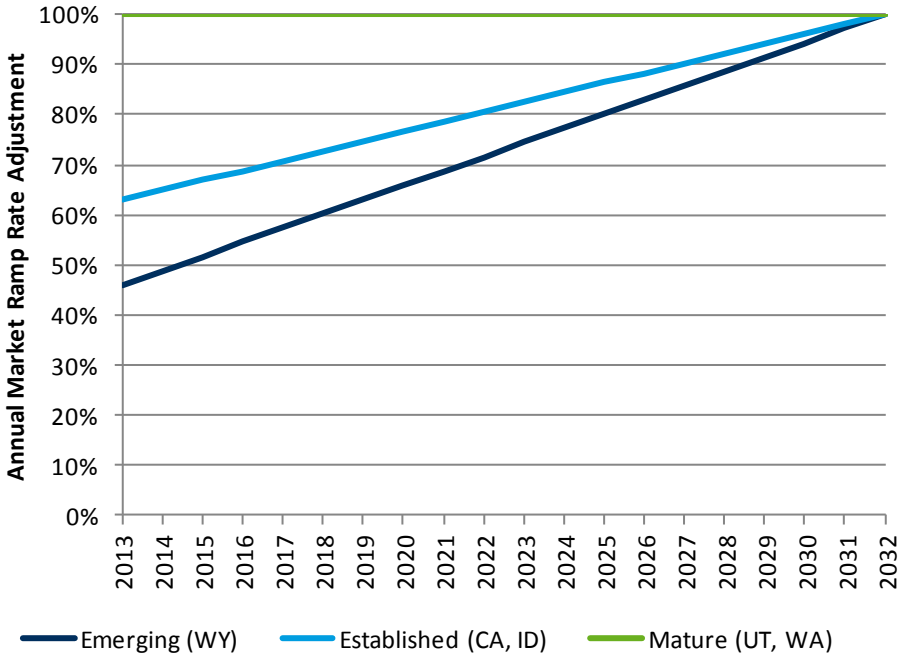
In the Cadmus study, discretionary measures account for 63% of total technical potential, and achieve 85% of that technical potential over the 20-year horizon. Lost Opportunity measures account for the remaining 37% of the total technical potential and achieve 72% of that technical potential over 20 years, as described above. Overall, Cadmus estimates that 80% of total technical potential (discretionary and lost opportunity) is achievable over the study horizon.

Market Ramp Rates

After addressing technical and general market constraints, Cadmus applies state-specific market ramp rates to reflect the unique market characteristics of each state within PacifiCorp's service territory that are not captured by the more generic measure-specific ramp rates described above. For example, robust DSM programs have been offered in Oregon, Utah, and Washington for many years, and thus there are well-developed delivery infrastructures and high customer awareness in these states. In Wyoming, where DSM programs are newer, we assume that the ramp-up time for full acquisition will be slower. California and Idaho markets fall between those extremes.

To accurately reflect the acquisition trends in each state, Cadmus designed market ramp rates to set identified 2013 achievable technical potential to reflect a reasonable increase over PacifiCorp's 2012 Class 2 DSM targets in each state (excluding Oregon). Figure 5 illustrates these market ramp rates, where Utah and Washington are unadjusted for market constraints (i.e., assumed to be at full program maturity), Idaho and California are "established" markets, and Wyoming is an "emerging" market.

Figure 5. Market Ramp Rates by State

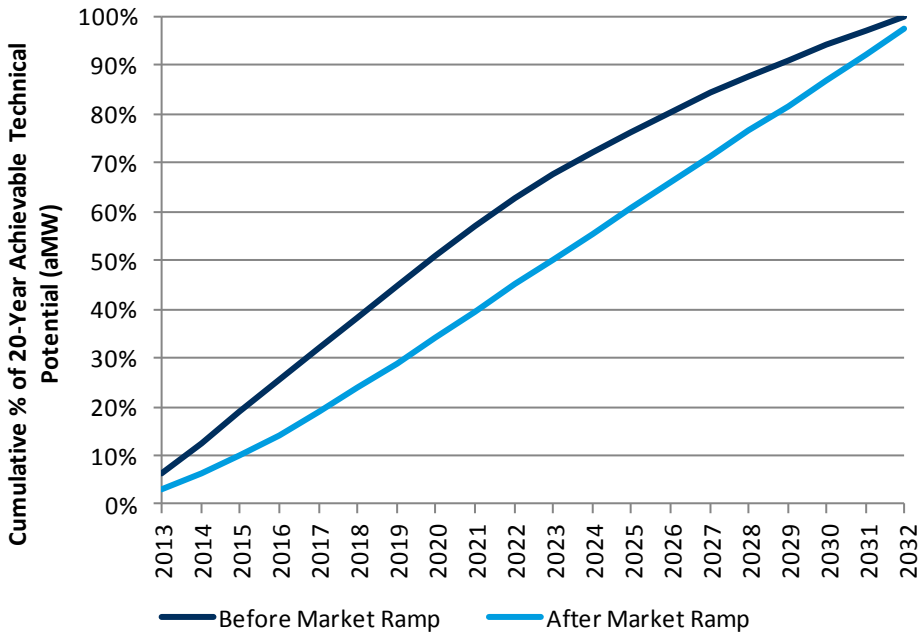


These market ramp rates are overlaid on the measure ramp rates in arrive at the final estimate of annual achievable potential in each state. For discretionary opportunities, slower acquisition

pushes some resources out to later years, but the 20-year achievable technical potential remains the same. However, because of the timing constraints of lost opportunities, failure to acquire these resources in the early years of the study may push the opportunity out beyond the 20-year study period, depending on the EUL. However, as shown in Figure 6, applying the "Emerging" market ramp rate in Wyoming leads to a reduction in 20-year achievable technical potential of only two percent.

Measure and market ramp rate percentages by year are provided in Table 2 at the end of this document.

Figure 6. Example of Market Ramp Rate Impact for Wyoming



Energy Trust of Oregon Methodology

The Energy Trust begins by assessing the 20-year technical potential for each measure in its assessment based on a 'frozen efficiency' baseline of commercially available technical resources. This 20-year total of first year technical savings is then translated into annual achievable acquisitions by applying an achievable percentage and annual acquisition rates. Determining the optimum annual breakdown of individual measures is a function of several considerations, which are detailed below:

Consistent with the Cadmus method presented above, Energy Trust distinguishes between discretionary and lost opportunity resources to capture timing and interactive considerations. The Energy Trust resource assessment works with the measures in various ways to ensure that retrofit and replacement would not be double-counted in instances where they compete. As an example, often, the retrofit is much more expensive because it considers the full cost of replacement, whereas an upgrade on equipment burnout considers only the incremental cost over above standard new equipment. In cases where retrofit costs fall well above the range of costs expected

to be deemed cost-effective by the IRP model, the savings are assumed to be acquired through natural equipment replacement.

Lost Opportunity Resources

Like the Cadmus method, the Energy Trust uses equipment turnover and new construction rates to calculate the total technical potential over the planning period. Equipment turnover is assumed to be inversely proportionate to the EUL and new construction rates are tied to PacifiCorp's customer forecast. Next, this 20-year technical potential is adjusted for expected achievability, which is assumed to be, on average, 66% and 73% for new construction and equipment replacement, respectively. This achievable technical potential is then spread to each year of the study using deployment rates informed by equipment turnover and new construction rates, market conditions, and program experience.

Discretionary Resources

Again like the Cadmus method, the Energy Trust calculates the achievable technical potential for retrofit opportunities by applying the regionally accepted 85% achievability factor to its identified 20-year technical potential. This total achievable potential is then distributed across the years of the study by applying ramp rates reflecting what Energy Trust believes to be reasonable deployment rates accounting for current program pipeline activity among other market factors.

Deployment Rates

The deployment rates for lost opportunity and discretionary resources are informed by:

- **Delivery market expansion/contraction** – Changes in year-to-year acquisition create volatility in the delivery market and years of boom and bust which is not ideal for businesses installing measures or customers receiving ever-changing messages about program offerings and funding availability. Therefore, creating reasonable transitions from year to year is important and is captured in the deployment rates.
- **Portfolio management** - The mix of measure types deployed each year needs to balance other long standing goals of providing equity for all customer types so there is something available for everyone. For example, deploying all industrial resource in one year but all residential and commercial in the following year may result in consistent savings from year to year, but a lack of balance in each individual year.
- **Cost effectiveness** - In the first two years of the planning period, Energy Trust assumes that only resources that are currently cost-effective (levelized total resource cost is less than avoided costs) will meet cost-effectiveness requirements and be used in programs. In later years, resources with higher costs are considered available to be acquired if selected by the IRP model.

The resulting annual achievable potential, also called the Energy Trust deployment scenario, is informed in the first two years by the program delivery team. That is, achievable quantities are based on what program managers believe can be acquired in the short term. Ramp rates for the subsequent 18 years are informed primarily by the planning department by allocating the remaining resource according to the considerations listed above. The application of these ramp rates is comparable to those used in the Cadmus study, described above. That is, they are an estimate of the total available resource that can be acquired in that year considering limitations to

the Energy Trust's implementation. The Energy Trust assumes that just over 77% of the technical potential can be achieved over the 20-year study period. Approximately 60% of the achievable potential is discretionary, with the remaining 40% from lost opportunity resources.

Energy Trust's deployment rates are separated into two groups: those for measures expected to be cost-effective (levelized cost under $0.09/kWh) in the short therm and those that are not. These rates are provided in Table 3 and Table 4 at the end of this document.

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Table 2. Measure and Market Ramp Rates Used in Cadmus' Analysis

Type	Ramp Rate	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Measure	EmergTech[D]	2.6%	3.2%	3.2%	3.9%	3.9%	3.9%	3.9%	75.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Measure	EmergTech Slow[D]	0.6%	1.3%	1.9%	2.6%	3.2%	3.9%	4.5%	5.2%	5.8%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
Measure	EmergTech Medium[D]	1.0%	2.0%	3.0%	4.0%	5.0%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%
Measure	EmergTech Fast[D]	2.0%	4.0%	6.0%	8.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Measure	NonLostOp_20yr[D]	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Measure	NonLostOp_15yr[D]	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Measure	NonLostOp_10yr[D]	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Measure	NonLostOp_5yr[D]	20.0%	20.0%	20.0%	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Measure	CFL	31.0%	42.0%	45.0%	53.0%	59.0%	86.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LO_EmergTech	2.6%	5.8%	9.1%	13.0%	16.9%	20.8%	24.7%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LO_EmergTech Slow	0.6%	1.9%	3.9%	6.5%	9.7%	13.5%	18.1%	23.2%	29.0%	35.5%	41.9%	48.4%	54.8%	61.3%	67.7%	74.2%	80.6%	87.1%	93.5%	100%
Measure	LO_EmergTech Medium	1.0%	3.0%	6.0%	10.0%	15.0%	20.7%	26.3%	32.0%	37.7%	43.3%	49.0%	54.7%	60.3%	66.0%	71.7%	77.3%	83.0%	88.7%	94.3%	100%
Measure	LO_EmergTech Fast	2.0%	6.0%	12.0%	20.0%	30.0%	40.0%	50.0%	60.0%	70.0%	80.0%	90.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_10yr	10.0%	19.0%	28.0%	37.0%	46.0%	55.0%	64.0%	73.0%	82.0%	91.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_12yr	10.0%	17.5%	25.0%	32.5%	40.0%	47.5%	55.0%	62.5%	70.0%	77.5%	85.0%	92.5%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_15yr	10.0%	16.0%	22.0%	28.0%	34.0%	40.0%	46.0%	52.0%	58.0%	64.0%	70.0%	76.0%	82.0%	88.0%	94.0%	100%	100%	100%	100%	100%
Measure	LostOp_20yr	10.5%	15.2%	19.9%	24.6%	29.3%	34.0%	38.7%	43.5%	48.2%	52.9%	57.6%	62.3%	67.0%	71.7%	76.4%	81.2%	85.9%	90.6%	95.3%	100%
Measure	LostOp_8yr	10.0%	21.3%	32.5%	43.8%	55.0%	66.3%	77.5%	88.8%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LO_EmergTech_v2	1.3%	2.6%	5.8%	9.1%	12.9%	16.8%	20.7%	24.6%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_10yr_v2	50.0%	60.0%	70.0%	80.0%	90.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_12yr_v2	30.0%	40.0%	50.0%	60.0%	70.0%	80.0%	90.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_15yr_v2	20.0%	30.0%	40.0%	50.0%	60.0%	70.0%	80.0%	90.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_20yr_v2	10.0%	20.0%	30.0%	40.0%	50.0%	60.0%	70.0%	80.0%	90.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LostOp_5yr	50.0%	66.7%	83.3%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LO Slow	5.9%	11.8%	17.6%	23.5%	29.4%	35.3%	41.2%	47.1%	52.9%	58.8%	64.7%	70.6%	76.5%	82.4%	88.2%	94.1%	100%	100%	100%	100%
Measure	LO Medium	11.8%	23.5%	35.3%	47.1%	58.8%	70.6%	82.4%	94.1%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LO Fast	23.5%	47.1%	70.6%	94.1%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Measure	LO 20Fast	22.1%	39.3%	52.8%	63.2%	71.3%	77.7%	82.6%	86.5%	89.5%	91.8%	93.6%	95.0%	96.1%	97.0%	97.6%	98.2%	98.6%	98.9%	99.1%	99.3%
Market	Emerging	46.0%	48.8%	51.7%	54.5%	57.4%	60.2%	63.1%	65.9%	68.7%	71.6%	74.4%	77.3%	80.1%	82.9%	85.8%	88.6%	91.5%	94.3%	97.2%	100%
Market	Established	63.0%	64.9%	66.9%	68.8%	70.8%	72.7%	74.7%	76.6%	78.6%	80.5%	82.5%	84.4%	86.4%	88.3%	90.3%	92.2%	94.2%	96.1%	98.1%	100%
Market	Mature	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

[D] – Indicates discretionary measure ramp rate

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Table 3. Energy Trust Deployment Rates for Resources Under $0.09/kWh Levelized

Deployment Rate	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Residential New Homes	22.2%	24.2%	10.0%	7.5%	5.0%	3.5%	3.5%	3.3%	2.0%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Residential Replacement	10.3%	10.3%	4.3%	3.8%	3.8%	3.8%	3.8%	3.8%	3.5%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Residential Retrofit	8.6%	8.8%	9.0%	9.0%	7.0%	6.5%	6.0%	5.0%	5.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Commercial Retrofit	12.4%	13.4%	12.5%	12.0%	11.0%	8.0%	5.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Commercial Replacement	4.0%	3.9%	3.8%	3.8%	3.8%	3.8%	4.0%	4.0%	4.3%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Commercial New	5.4%	5.0%	4.3%	4.3%	3.5%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Industrial Retrofit	6.7%	7.5%	8.0%	8.0%	7.8%	7.0%	5.5%	5.0%	4.0%	4.0%	4.0%	4.0%	4.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Industrial Replacement	3.5%	3.0%	3.0%	3.3%	3.3%	3.8%	4.5%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%

Table 4. Energy Trust Deployment Rates for Resources Over $0.09/kWh Levelized

Deployment Rate	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Residential New Homes	0.0%	0.0%	2.5%	3.0%	3.5%	4.0%	4.0%	4.5%	4.5%	4.8%	4.8%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Residential Replacement	0.0%	0.0%	3.5%	3.8%	3.0%	3.3%	3.5%	3.5%	3.5%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Residential Retrofit	0.0%	0.0%	1.0%	4.0%	4.0%	5.0%	5.0%	5.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
Commercial Retrofit	0.0%	0.0%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%
Commercial Replacement	0.0%	0.0%	3.0%	3.0%	3.5%	3.8%	4.0%	4.3%	4.5%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Commercial New	0.0%	0.0%	2.9%	3.3%	3.5%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Industrial Retrofit	0.0%	0.0%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%
Industrial Replacement	0.0%	0.0%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%