2014 Update to the Austin Energy DSM Market Potential Assessment





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Cover photos: House photos by Andrew Pogue. South Congress Street and windmill photos by Jody Horton.

Table of Contents

Table of Contents

List of Exhibits

Glossary

achievable potential: The amount of savings that would occur in response to specific program funding and measure incentive levels. Savings associated with program potential are savings that are projected beyond those that would occur naturally in the absence of any market intervention.

applicability factor: The percentage of the building stock that has a particular type of equipment or for which an efficiency measure applies. For example, the applicability factor for a tankless electric water heater (compared to a base standard electric water heater) is the percentage of homes with electric water heaters. The applicability factor for high-efficiency clothes washers as an electric water heating measure is the percentage of homes with electric water heating that also have a clothes washer. For base measures, this is sometimes referred to as the equipment saturation.

business-as-usual (BAU): Represents a continuation of current activities or trends. For utility programs, it denotes a scenario in which program marketing and administrative budgets are kept constant in real terms, and incentive levels are kept constant as a percentage of incremental costs.

baseline analysis: Characterizes how energy consumption breaks down by sector, building type, and end use.

base measure: The equipment against which an efficiency measure is compared.

C&I: commercial and industrial.

CFL: compact fluorescent lamp.

coincidence factor: Utility coincidence factors are the ratio of actual demand at utility peak to the average demand, as calculated from the load shape. These factors vary by market segment or building type, end use, and by time-of-use period.

cumulative annual: Savings occurring in a particular year that are due to cumulative program activities over time. For example, if a program installs one high-efficiency widget in year 1 of the program, two in year 2, and five in year 3, the cumulative annual savings in year three would be the savings accruing on all eight surviving units in place in year 3, regardless of what year they were installed. Cumulative annual savings does account for equipment retirement. In the example above, widgets are assumed to have an effective useful life of more than three years. If the equipment in the above example were doohickeys, which only have a two-year effective useful life, the year 1 doohickey would have retired at the end of year 2, so only the units sold in years 2 and 3 would contribute to year 3 cumulative annual savings.

demand-side management (DSM): An electric system must balance the supply of electricity with the demand for electricity. Demand-side management (DSM) programs focus on managing the demand side of this balance through energy-efficiency and load management.

Energy Conservation Audit and Disclosure Ordinance (ECAD): The city of Austin requires owners of single-family homes to have an energy audit performed on their home prior to selling that home per this ordinance.

economic potential: The technical potential of those energy conservation measures that are cost effective when compared to supply-side alternatives.

effective useful life (EUL): A measure of the typical lifetime of an efficiency measure. Technically, it is the age at which half of the units have failed and half survive. In DNV GL's ASSYST™ model, all measures are assumed to remain in place until the end of their effective useful lives and then retire.

end-use energy intensity (EUI): Energy use per unit of building stock having a specific end use. For example, the EUI for commercial electric heating is the amount of electricity used for heating divided by the number of square feet of floor space that are electrically heated. EUI differs from EI in that it accounts for the equipment type's saturation. If the saturation of the equipment type is low, the EUI will be much higher than the EUI.

energy intensity (EI): Energy use per unit of building stock. For example, the EI for commercial electric heating is the amount of electricity used for heating divided by the total square feet. EI differs from EUI in that it does not account for the saturation of the equipment. If the saturation for the equipment type is low, EI will be much lower than the EUI.

EUI adjustment factor: Because equipment efficiencies can change over time independent of program activities, due to either naturally occurring technological changes or external intervention, such as appliance standards, the efficiency of new equipment may differ from the typical efficiency of the equipment stock. The EUI adjustment factor is the ratio of new standard efficiency equipment's energy use to the average energy use of units in the equipment stock.

feasibility factor: The fraction of the applicable floor space, or households, that is technically feasible to convert to a DSM technology, from an engineering perspective.

free rider: A program participant who would have invested in an energy efficiency measure even without the intervention of the program. Free riders add to program costs but do not contribute to net energy savings.

free-rider energy savings: The subset of naturally occurring energy savings for which the utility pays incentives or provides other program benefits. These savings are included in gross program savings but not in net program savings.

gross program savings: The total savings for all measures installed under the program, including those that would have been installed even without program intervention (free riders). Gross program savings equals net program savings minus free ridership.

HP: horsepower. A metric for the power of a motor.

HVAC: heating, ventilation and air conditioning. These space-conditioning measures are often discussed as a group and are referred to by the abbreviation HVAC, usually pronounced H-vac.

incomplete factor: The fraction of the applicable floor space, or households, that has not yet been converted to the particular energy-efficiency technology.

incremental cost: The additional cost required to purchase an efficiency measure compared to base equipment.

kW: kilowatts, 1,000 watts. A measure of electric power or electricity demand.

kWh: kilowatt-hour. A measure of electrical energy.

LED: light-emitting diode. LEDs are semiconductor light sources. They have been in use for decades as indicator lights; they are increasingly being used for general-purpose lighting. They are highly efficient compared to incandescent lamps.

line losses: When electricity is transmitted over the transmission and distribution system, some of the electricity is dissipated as heat due to resistance in the transmission lines or inefficiencies in transformers in the distribution system. As a result, the amount of electricity delivered to consumers is less than the amount produced at the generator. These are referred to as line losses or transmission and distribution losses.

load management: Load management refers to methods that control the power demand within an electric system. Load management programs are designed to reduce the electrical demands during time of system peak energy use (in contrast to energy efficiency programs that focus on reducing overall energy use, and may or may not reduce energy use during peak hours). Examples of load management programs include air conditioner cycling and thermal energy storage.

MW: megawatt, one million watts. A measure of electric power or electricity demand.

MWh: megawatt-hour, equal to 1,000 kWh. A measure of electrical energy.

naturally occurring energy savings: The amount of savings estimated to occur as a result of normal market forces, that is, in the absence of any utility or governmental intervention.

net program savings: Program savings above and beyond naturally occurring levels. Net savings exclude free-rider energy savings.

net-to-gross: The ratio of net program savings to gross program savings.

program potential: This term is used interchangeably with achievable potential.

replace on burnout (ROB): A measure that is installed when the previous equipment reaches the end of its useful life. ROB measures penetrate the market gradually as the existing stock of equipment turns over due to equipment age and eventual failure.

retrofit: A measure that is installed to achieve energy savings independent of the condition of the existing equipment. This includes measures that affect the energy use of other equipment, such as insulation to reduce heating costs. It also includes replacing equipment with higher efficiency equipment before the end of existing equipment's useful life, for example replacing T12 fluorescent lighting in an office with higher efficiency T8s. Retrofits can be done at any time and therefore have the potential to penetrate the market more quickly than ROB measures.

spinning reserves: Operating reserve is the generating capacity available to an electricity network operator within a short interval of time to meet demand in case of a disruption to electricity supply. Spinning reserve is the share of operating reserve that is available by increasing the power output of generators already connected to the power system. Spinning reserves help ensure stability of the electricity network in case of an unexpected event, such as a generator going down or unforeseen load swings.

technical potential: The savings that would result from complete penetration of all analyzed measures in applications where they were deemed technically feasible, from an engineering perspective.

technology saturation: A factor that relates the cost units used in the model for a measure to its savings units. For example, the cost of a chiller may be expressed in dollars per ton, though the savings are in kWh per square foot. The technology saturation then represents the number of tons of cooling per square foot.

time-of-use (TOU) period: The Assyst model can analyze energy use by up to six time-of-use periods. These periods are used to characterize the relationship between energy and peak demand, which varies over both season and time of day, and to capture differences in avoided costs and rates over different time periods. TOU periods usually capture differences between summer/winter and peak/off-peak but can also capture shoulder season, mid-peak, or super peak demand, depending on the needs of a utility.

transmission and distribution (T&D): This refers to the system of power lines that delivers electricity from the generator to the customer.

transmission and distribution (T&D) losses: See line losses.

total resource cost test (TRC): A benefit-cost test that compares the value of avoided energy production and power plant construction to the costs of energy efficiency measures and the program activities necessary to deliver them. The values of both energy savings and peak-demand reductions are incorporated in the TRC test.

1. Introduction

In 2012, DNV GL (as KEMA, Inc.) conducted a potential study for Austin Energy with the goal of assessing the feasibility of expanding its demand savings goal from 800 MW by 2020 to 1000 MW by 2020. Although the City did not adopt the 1000 MW savings goal at that time, a proposal is now under consideration to expand the goal to either 1000 MW or 1200 MW by 2024.

From 2007 through 2011, 269 MW had been achieved through Austin Energy's program efforts. Between 2012 and 2014, it achieved an additional 165 MW, for a total of 434 MW.

Its current program forecasts expect 384 MW to be captured from demand response (DR) and its Green Building program. To meet the proposed a goal of 1000 MW by 2024, Austin Energy would need to capture an additional 182 MW of savings from current and future DSM efforts, and their current forecasts show the programs on target to meet that goal. To meet a 1,200 MW goal, Austin Energy would need to capture 382 MW through energy efficiency. Austin Energy's current program projections fall short of that goal.

DNV GL has now updated the 2012 study to reflect changes to the market and to assess the feasibility of the expanded 2024 saving target. The results include:

- Estimates for the magnitude of potential savings on an annual basis under a range of program design scenarios
- Estimates of the costs associated with achieving those savings
- Calculations of measures and programs' cost-effectiveness based on the estimates above.

2. Scope and Approach

In this study, DNV GL estimated three basic types of energy efficiency potential using its proprietary DSM ASSYST™ model:

- **Technical potential,** defined as the complete penetration of all analyzed measures in applications where they were deemed technically feasible, from an engineering perspective
- **Economic potential,** defined as the technical potential of those energy efficiency measures that are cost-effective when compared to supply-side alternatives

- **Achievable program potential,** the amount of savings that would occur in response to specific program funding, marketing, and measure incentive levels.

DSM ASSYST™ also develops an estimate of naturally occurring savings, those savings that are projected to result from normal market forces in the absence of any utility-sponsored intervention. We can therefore calculate net savings in addition to gross savings. However, because Austin Energy tracks gross energy and demand savings, and gross savings are the basis for its savings goal, we focus primarily on those savings. Where we report net savings, we will clearly identify the results as such.

The model uses a bottom-up approach in which energy efficiency costs and savings are assessed at the customer segment and energy efficiency measure level. Technical and economic potential are estimated as a function of measure savings, equipment saturation, and existing penetration of efficiency measures. Economic potential takes into account measure costs and includes only those measures that are cost effective based on the total resource cost, or TRC, test. Program savings potential is estimated for cost-effective measures based on measure economics, rebate levels, and program marketing and education efforts.

For this study, DNV GL constructed three different program funding scenarios to estimate Austin Energy's achievable energy efficiency potential. The first scenario, the business-as-usual (BAU) scenario, projects the current program design and implementation features across the forecast horizon. Once calibrated, the model produces outputs closely aligned with the known program savings results for 2013 and 2014. This approach ensures that the model, to the extent possible, can appropriately represent reality using a set of known conditions.

DNV GL estimated program results under three additional scenarios using the calibrated model. The second and third scenarios increased incentives to 75 percent and 100 percent of incremental measure costs, respectively, ramping up to that level between 2015 and 2019. In the final scenario, we tried to determine what level of program effort would be required to achieve goals of 800 MW by 2020 and 900 MW by 2024. Program administration costs were adjusted across scenarios proportionate to achievable program energy savings. These scenarios are referenced respectively as the 75-percent Scenario, 100-percent Scenario, and 800/900 Scenario. Program energy and peak-demand savings and program cost-effectiveness were assessed under all funding scenarios.

Study results are estimates of energy and demand savings potential based on certain program assumptions. The study can be used to help target measures and customer segments for DSM programs and, by resource planners, to determine to appropriate mix of demand-side and supply-side resources. The study does not attempt to provide estimates of optimal levels of DSM activity but rather provides estimates of the savings possible at various levels of effort.

The scenarios shown in this study are also fairly broad-brush, showing potentials for incentive rates that vary by scenario but are constant for all measures within a scenario. We expect that Austin Energy will adjust incentives and related program expenditures on a measure-by-measure basis to reflect differences within markets and to enhance the amount of savings that are achievable within limited program budgets. We also expect that Austin Energy will adjust its efforts over time since some measures may eventually saturate the market.

2.1 Changes from the 2012 Study

- Updated avoided costs and rates
- Revised measure costs (especially LED lighting)
- Recalibrated the model to match program accomplishments in 2012 through 2014
- Accounted for the effect on program savings of program accomplishments from 2012 through 2014
- Extended the analysis through 2024
- Ramped up to increase levels of program effort over five years (rather than immediately as in the 2012 study)
- Dropped new construction from the analysis (to avoid double-counting with the Green Buildings Program)
- Updated impacts of equipment standards

3. Results

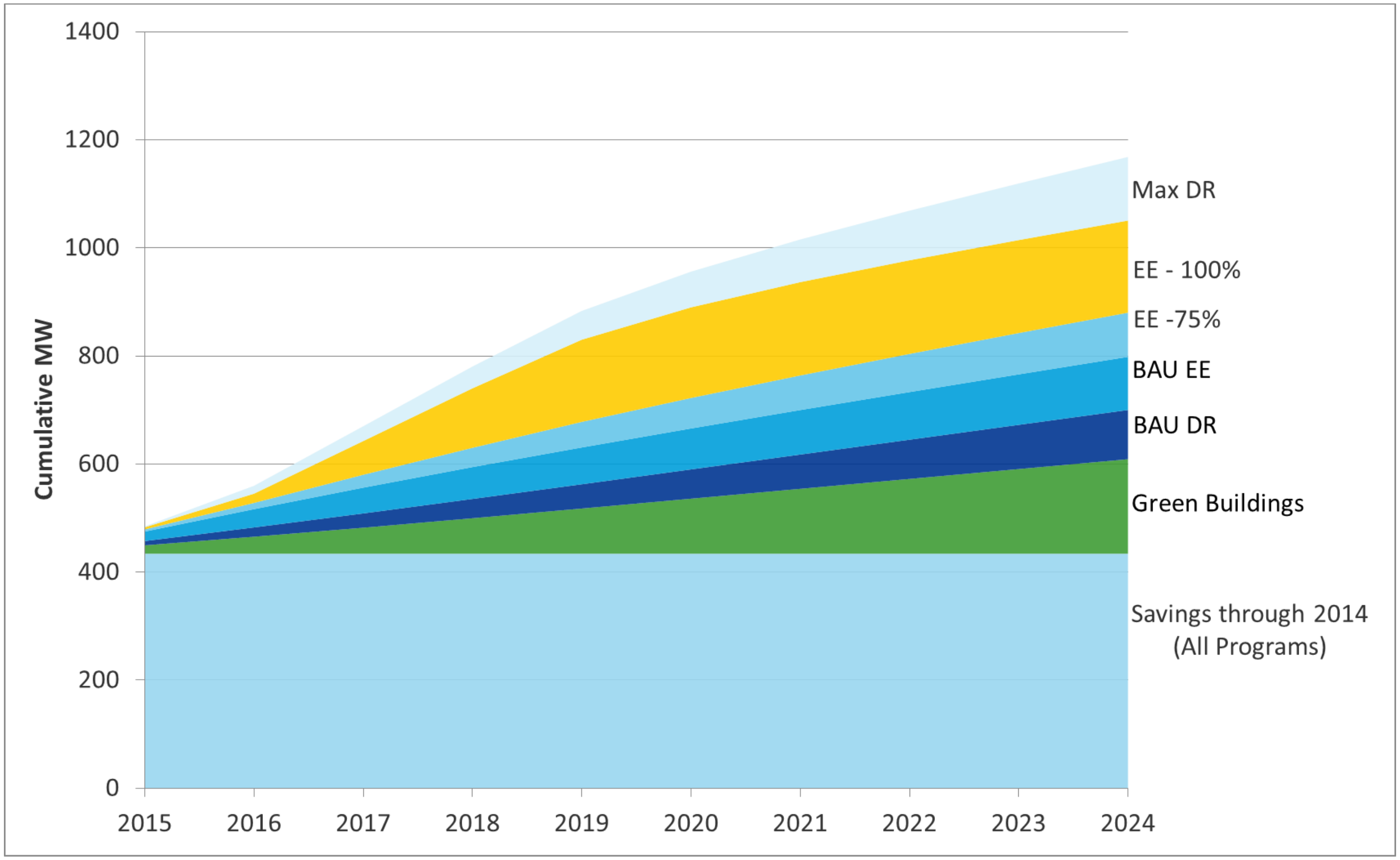
3.1 Demand Savings

We assessed and present the energy-efficiency savings estimates for this study in the context of Austin Energy's historical program savings, its Green Building programs, and its demand response programs. The savings estimates for all but the energy-efficiency savings were provided by Austin Energy. Austin Energy provided both a business-as-usual DR forecast, representing their current programs, and a Max DR forecast, a scenario created by Austin Energy in evaluating the feasibility of increased savings targets.

Figure 3-1 shows overall results of the DSM potential study for the 75 percent and 100 percent scenarios (savings for the 800/900 scenario are charted separately) in context. The results for each energy-efficiency scenario are shown incrementally to the previous scenario. That is, the 100 percent scenario area represents only the incremental savings for that program over and above the 75 percent scenario; total savings for the 100% energy-efficiency scenario are equal to the BAU savings area plus the 75 percent scenario savings area plus the 100% scenario area. Similarly, the Max DR scenario area is incremental to the base DR savings area.

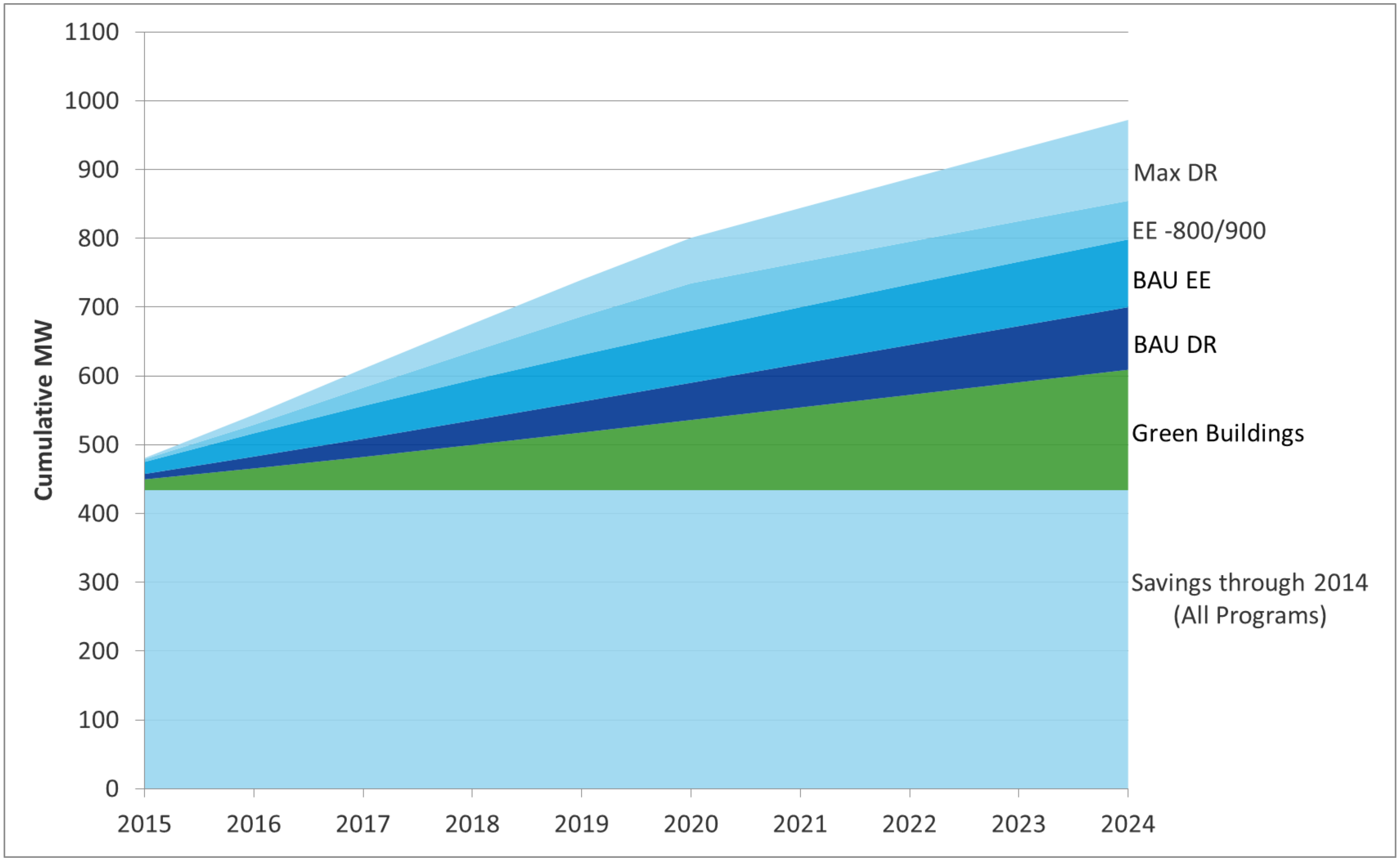
Figure 3-2 similarly shows the results for the 800/900 MW scenario. This scenario hold incentives at 75 percent, but aggressively ramps up budgets in the early years of the program in order to reach the 800 MW goal by 2020. After 2024, we were able to dramatically scale back the programs and still comfortably hit the 900 MW target by 2024. Because the savings are higher than the 75 percent scenario only in some years, we were unable to show this scenario on the same stacked chart as the 75 percent scenario.

Figure 3-1
Summary of Cumulative DSM Potentials, 75% and 100% Scenarios—2015–2024



Notes: Out-of-analysis savings include Austin Energy's forecasted savings from DR programs and Austin's Green Buildings Program (codes and ratings). All estimates include 7% for transmission and distribution losses. Historical savings include an additional 13% factor for spinning reserves. Each bar represents savings incremental to the ones below it.

Figure 3-2
Summary of Cumulative DSM Potentials, 800/900 Scenario—2015–2024



Notes: Out-of-analysis savings include Austin Energy's forecasted savings from DR programs and Austin's Green Buildings Program (codes and ratings). All estimates include 7% for transmission and distribution losses. Historical savings include an additional 13% factor for spinning reserves. Each bar represents savings incremental to the ones below it.

Table 3-1 shows the numbers behind Figure 3-1 and Figure 3-2. For each program and scenario, the table shows annual and cumulative savings.

Table 3-2 shows cumulative savings for combinations of the programs and scenarios (including savings-to-date) in the goal years of 2020 and 2024. Business-as-usual programs fall short of targets. Not only does it fail to reach the 800 MW target by 2020 (it reaches only 666 MW), but even with four additional years it is still short of 800 MW (at 798 MW). Expanding demand response program while leaving energy-efficiency programs at BAU levels increases saving in 2020 to 732 MW; expanding energy-efficiency programs to the 75 percent scenario while keeping DR at BAU levels reaches 722. Both are well short of the 800 MW goal. The DR program shows more gains from 2020 to 2024, compared to the 75 percent energy-efficiency scenario, reaching 916 MW by 2024 (compared to 880 MW for the 75 percent scenario).

Combining the 75 percent and Max DR scenarios resulted in 788 MW of savings by 2020 and 998 by 2024. While still short of the 800 MW target for 2020, it comes very close to hitting 1,000 MW by 2024.

The 800/900 scenario was designed to hit 800 MW by 2020 and 900 MW by 2024 in conjunction with the Max DR scenario, and does so (the more interesting question is how much it will cost, which we address in the next section). Once we accelerated the program budgets to meet the 2020 target, it ended up overshooting the 900 MW target (by 72 MW), even with drastically scaled back budgets (recall that the DR program hit 916 MW paired with the BAU energy-efficiency scenario).

The 100 percent scenario, paired with the Max DR scenario, reaches 956 MW by 2020 and 1,168 MW by 2024. Even with that level of program expansion, the expected sayings in 2024 are still short of the 1200 MW goal that was recently under consideration.

Table 3-1
Annual and Cumulative Savings by Program Component and Scenario—2015-2024

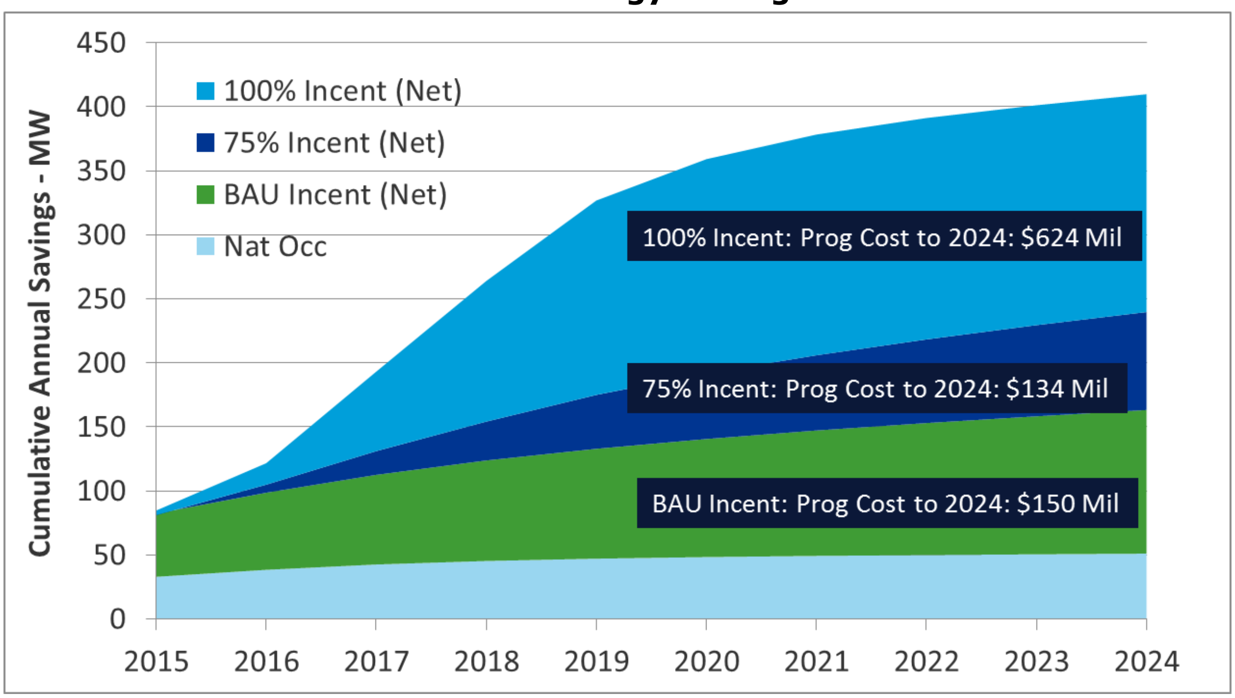
	Annual							Cumulative						
	Green Buildings	BAU DR	Max DR	BAU EE	EE - 75%	EE - 800/900	EE - 100%	Green Buildings	BAU DR	Max DR	BAU EE	EE - 75%	EE - 800/900	EE - 100%
2015	15.5	8.0	9.6	17.5	21.5	21.5	25.5	15.5	8.0	9.6	17.5	21.5	21.5	25.5
2016	16.0	9.2	22.1	16.3	23.8	24.8	37.0	31.5	17.2	31.7	33.8	45.3	46.3	62.4
2017	16.6	9.2	22.1	13.9	26.2	28.1	71.5	48.1	26.4	53.8	47.7	71.5	74.3	133.9
2018	17.6	9.2	22.1	11.3	23.1	25.6	70.8	65.7	35.7	75.9	59.0	94.6	100.0	204.7
2019	17.9	9.2	22.1	9.1	20.8	24.1	62.8	83.7	44.9	98.0	68.1	115.4	124.0	267.5
2020	18.3	9.2	22.1	7.6	16.8	20.5	32.3	101.9	54.1	120.2	75.7	132.2	144.6	299.9
2021	18.3	9.2	22.1	6.7	14.2	2.9	19.2	120.2	63.4	142.3	82.4	146.4	147.5	319.1
2022	18.3	9.2	22.1	5.8	12.3	2.6	12.9	138.4	72.6	164.4	88.2	158.7	150.1	332.0
2023	18.3	9.2	22.1	5.3	11.1	2.3	10.0	156.7	81.8	186.5	93.5	169.8	152.4	342.0
2024	18.3	9.2	22.1	4.9	10.3	2.1	8.6	174.9	91.0	208.6	98.4	180.1	154.6	350.6

Table 3-2
Cumulative Savings for Program Combination in 2020 and 2024 Goal Years

	Green Buildings + BAU EE + BAU DR	Green Buildings + BAU EE + Max DR	Green Buildings + 75% EE + BAU DR	Green Buildings + 75% EE + Max DR	Green Buildings + 800/900 EE + Max DR	Green Buildings + 100% EE + Max DR
2020	666	732	722	788	801	956
2024	798	916	880	998	972	1,168

Figure 3-3 separates out the 75 and 100 percent energy-efficiency cumulative potentials. In this chart, we split out naturally occurring energy savings, topped by the incremental effects of the BAU scenario, 75 percent scenario, and 100 percent scenario. In this chart you can clearly see that savings increase at a diminishing rate over time, reflecting decreasing annual (new program) savings. The decline in annual savings occurs because retrofit measures (measures that are not dependent on equipment turnover cycles and can be added at any time) reach high saturations over time, reducing the available pool for these opportunities and making it more difficult to capture additional savings. While the decline in additional savings is fairly modest under the BAU scenarios, it is more pronounced in the higher incentive cases. For the 100-percent incentive scenario, savings accumulate rapidly during the first few years of the forecast horizon but then flatten out thereafter. This can be perceived as the program becoming a victim of its own success—it ramps up dramatically over a few years and then must be scaled back significantly afterward as the program's participation declines due to high saturation levels. While the high-incentive scenario may lead to front-loaded energy savings, it could lead to dramatically reduced program effort and funding in later years, which may affect the program's ability to evolve and continue to capture emerging opportunities.

Figure 3-3
Achievable Electric Energy-Savings: All Sectors



3.2 Budgets and Cost Effectiveness

Figure 3-4 shows the budgets associated with each program and scenario. As with Figure 3-1, each bar is incremental to the previous bar, so while the incremental cost of the 100 percent scenario in 2015 is $7 million, the total cost is $37 million ($2 million for the BAU scenario plus $21 million incremental for the 75 percent scenario plus $7 million incremental for the 100 percent scenario).

The fall-off in energy efficiency budgets after 2019 reflects the declining opportunities for retrofits (due to those opportunities having been captured through aggressive retrofit programs in the early years). This corresponds to the decline in annual savings observed in Table 3-1.

Table 3-3 shows the underlying annual budgets for each program and scenario, and for the scenario combinations corresponding to Table 3-2. The 800/900 scenario, which met the 800 MW target in 2020 and 900 MW in2024, costs 70 percent more (net present value of 10-year budgets) compared to business-as-usual). The 100 percent scenario, while its savings potential may be enticing, would cost 234 percent more (more than triple) over 10 years (net present value).

Figure 3-4
Summary of Annual Program Budgets, 75% and 100% Scenarios—2015–2024

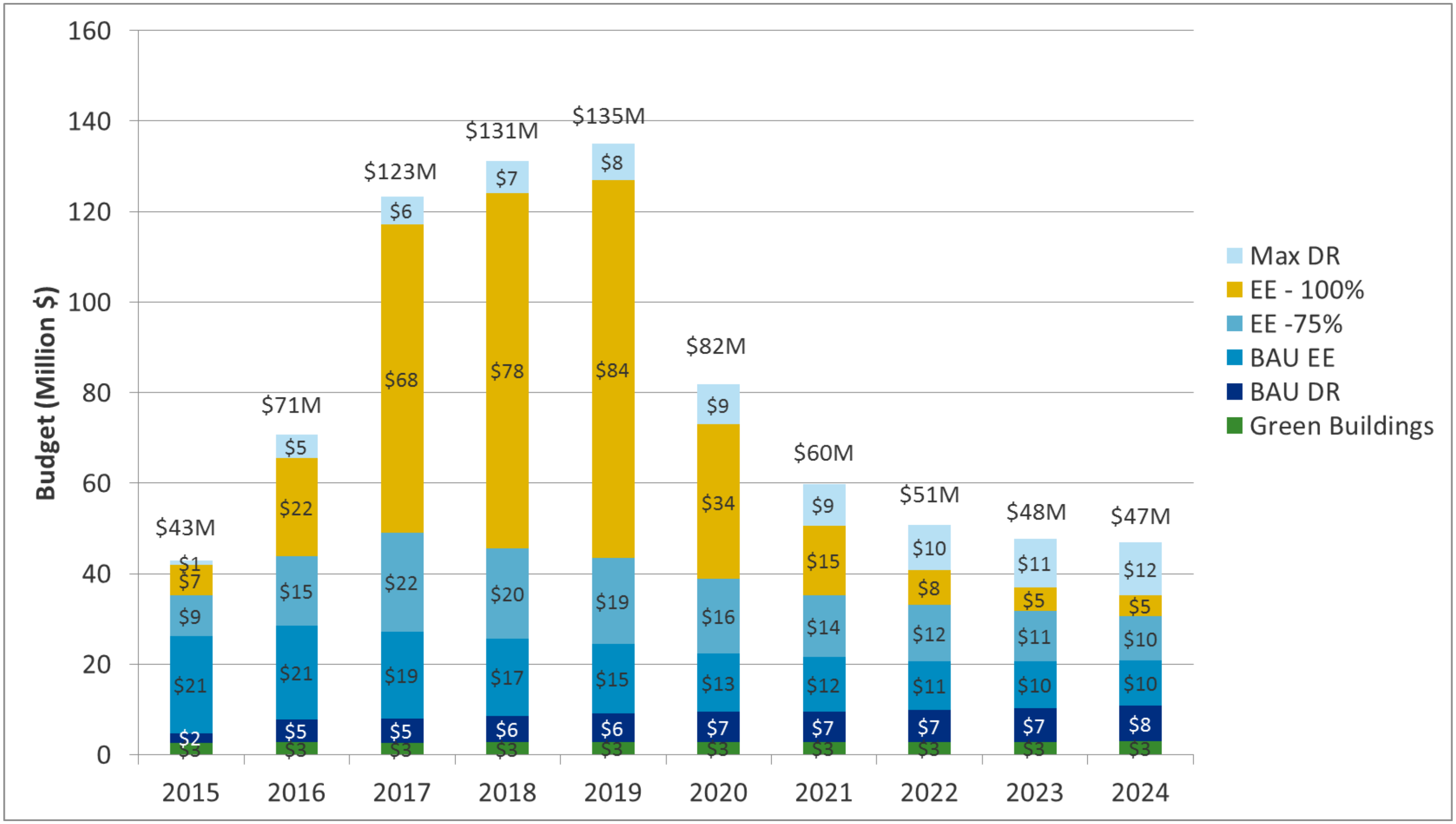


Table 3-3

Annual Budgets by Program Component and Scenario, Alone and in Combination—2015-2024 (Million $)

	Green Buildings	BAU DR	Max DR	BAU EE	EE - 75%	EE - 800/900	EE - 100%	Green Buildings + BAU EE + BAU DR	Green Buildings + BAU EE + Max DR	Green Buildings + 75% EE + BAU DR	Green Buildings + 75% EE + Max DR	Green Buildings + 800/900 EE + Max DR	Green Buildings + 100% EE + Max DR
2015	$2.7	$2.1	$3.0	$21.5	$30.5	$30.5	$37.2	$26.2	$27.2	$35.2	$36.2	$36.2	$42.9
2016	$2.7	$5.0	$10.3	$20.8	$36.2	$37.2	$57.7	$28.5	$33.8	$43.9	$49.2	$50.2	$70.7
2017	$2.6	$5.4	$11.6	$19.1	$41.0	$42.8	$109.2	$27.1	$33.3	$49.0	$55.2	$57.0	$123.4
2018	$2.7	$5.8	$12.9	$17.1	$37.1	$39.6	$115.6	$25.7	$32.7	$45.6	$52.7	$55.2	$131.2
2019	$2.8	$6.3	$14.2	$15.4	$34.4	$37.5	$118.0	$24.5	$32.4	$43.4	$51.4	$54.5	$134.9
2020	$2.8	$6.7	$15.5	$12.9	$29.3	$32.8	$63.4	$22.4	$31.2	$38.8	$47.6	$51.2	$81.8
2021	$2.8	$6.7	$15.9	$12.0	$25.7	$2.2	$41.1	$21.5	$30.7	$35.2	$44.4	$20.9	$59.8
2022	$2.8	$7.1	$17.1	$10.8	$23.1	$2.1	$31.0	$20.7	$30.6	$33.0	$43.0	$21.9	$50.8
2023	$2.8	$7.5	$18.2	$10.4	$21.4	$2.0	$26.6	$20.7	$31.5	$31.7	$42.5	$23.0	$47.7
2024	$2.9	$7.8	$19.4	$10.1	$19.8	$1.8	$24.5	$20.9	$32.5	$30.6	$42.2	$24.1	$46.9
Sum of 10-Year Budgets								$238.1	$315.8	$386.5	$464.3	$394.3	$790.1
Net Present Value (@ 4% Discount Rate)								$195.47	$255.98	$317.21	$377.72	$328.70	$651.74

Figure 3-5 shows costs and savings across the four scenarios. Costs shown here are net present value of 10-year program costs and should be read from the secondary axis. Note that most of the savings gains from the 75 percent to the 800/900 scenario are not from energy efficiency, but from stepping up demand response from business-as-usual to Max DR. Because the DR savings have a lower cost per kW, there is a large increase in savings at little additional cost. In contrast, the savings gains from the 800/900 scenario to the 100 percent scenario are all from energy efficiency (both scenarios as charted assume Max DR). The cost increase between these scenarios is steep.

Figure 3-5
Cumulative Savings vs. Net Present Value 10-Year Budget

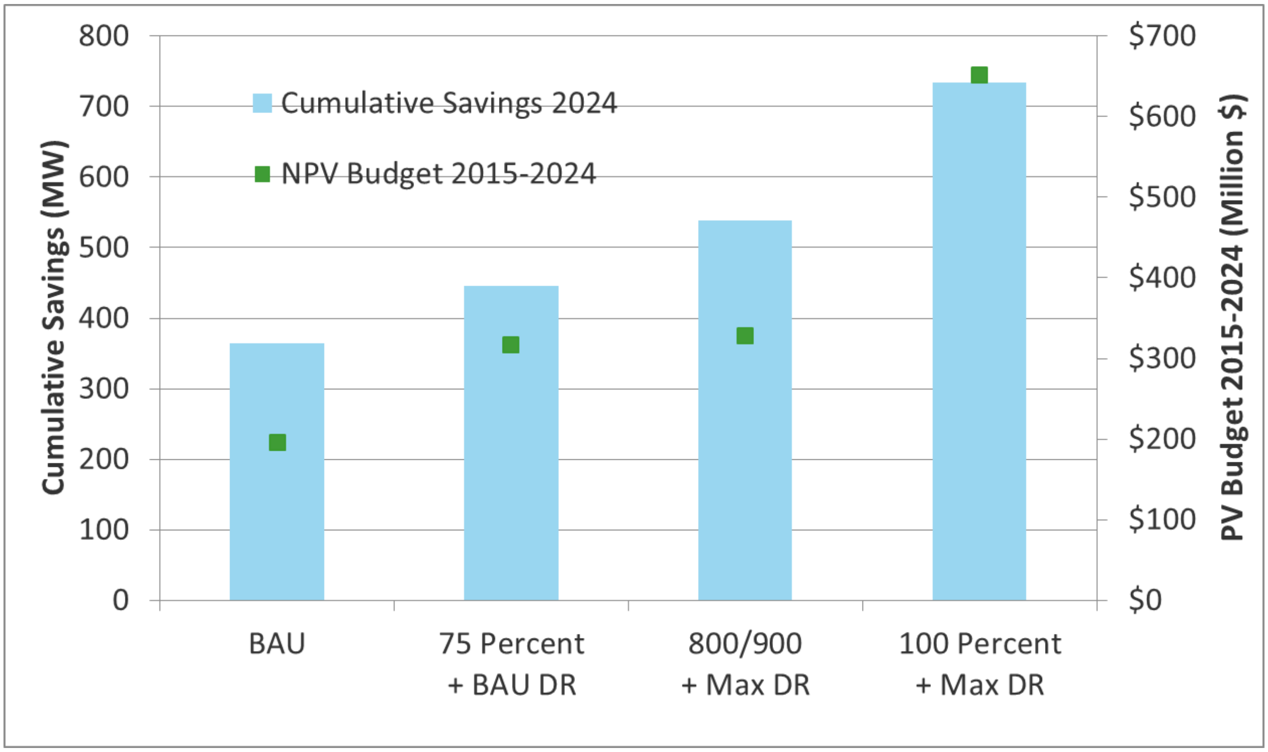


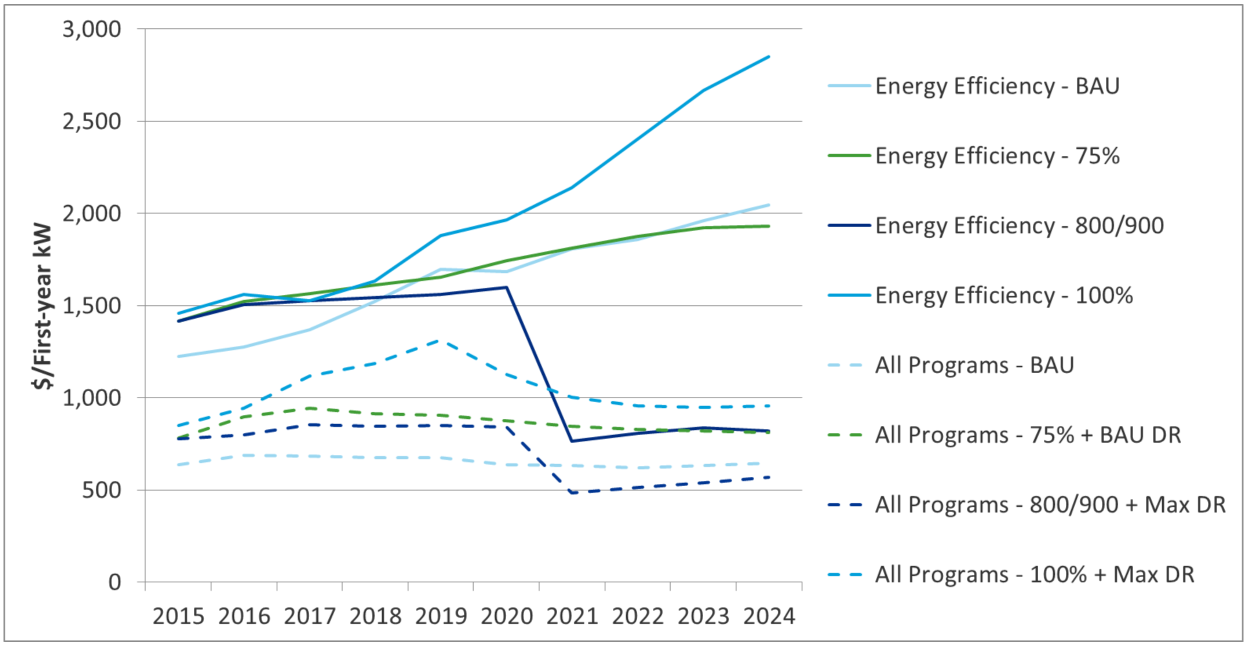
Table 3-4 shows the cost per first-year kilowatt for Green Buildings, demand response, and energy efficiency programs over time for the business-as-usual scenarios. Energy-efficiency has by far the highest cost per kW of the three, with Green Buildings having the lowest. This pattern holds true through the other scenarios, with the exception of the last four years of the 800/900 scenario, which scale back program effort dramatically and reduce the cost per first-year kW to close to DR levels.

Figure 3-6 shows the cost per first-year kW over time for business-as-usual and the three scenarios, looking at energy efficiency alone (solid lines) or bundled with Green Buildings and demand response (dashed lines). Energy-efficiency costs are generally increasing over time, with the exception of the scaled back 800/900 scenario from 2021 to 2024, which shows up as a dramatic decrease in costs per first-year kW.

Table 3-4
Cost per First-Year kW—BAU Scenarios

	Green Buildings	Demand Response	Energy Efficiency
2015	171	260	1225
2016	171	541	1275
2017	158	586	1370
2018	155	632	1521
2019	155	678	1698
2020	155	723	1686
2021	155	725	1806
2022	155	766	1858
2023	155	808	1959
2024	161	849	2045

Figure 3-6
Cost per First-Year kW by Scenario



4. 2012 Study vs. Update

The following chart summarizes baseline energy use and the various potentials calculated in the 2012 and the current study. Base energy use has declined, largely due to the impact of achieved savings over the past three years. Technical potential is similar to that found in the 2012 study. Economic potential has declined slightly due primarily to the change in avoided costs. The three achievable scenarios show a dramatic decline in potential. A key factor in the decline is how we ramped up the program to the higher incentive level. In the 2012 study, incentive levels and budgets were stepped up completely to the new level in year one. Austin Energy expressed concerns about their ability to ramp up their programs so quickly. This study ramps up incentive levels and budgets over five years. As a result, we see these markedly lower potentials, despite the fact that the forecast horizon is one year longer than that of the previous study.

Table 4-1
Results Comparison: 2012 Study vs. 2014 Update, Energy Efficiency Only

	2012 Study 2012-2020	Update 2015-2024
Base Energy Use (MW)	3,727	3,529
Technical Potential (MW)	956	963
Economic Potential (MW)	744	677
BAU Scenario (MW)	231	98
75 Percent Scenario (MW)	366	180
100 Percent Scenario (MW)	492	351

Some of the difference stems from the program budget and savings number used to calibrate the model. The 2012 analysis used 2011 program numbers for the calibration. The 2014 update looked at both 2013 and 2014 results to calibrate the model. The savings values used to calibrate the 2014 model were markedly lower than those used to calibrate the 2012 model, but with comparable or higher incentive budgets. The relationship between the 2012 and 2014 calibration targets naturally carried through to the respective forecasts: The update forecast produces lower savings potential than the 2012 study.

Table 4-2
Comparison of Calibration Targets: 2012 Study vs. 2014 Update

	Calibration Target for 2012 Study 2011 Program Data	Calibration Target for 2014 Study 2014 Program Data
Residential Existing		
Admin + Marketing Budget	$2,243,221	$4,451,008
Incentive Budget	$7,585,714	$6,589,813
MWh Savings	22,691	14,112
MW Saving	15.61	8.1
$/MW	630	1,363
Non-Residential Existing		
Admin + Marketing Budget	$1,138,038	$8,289,278
Incentive Budget	$3,395,974	$7,560,280
MWh Savings	68,844	72,305
MW Saving	14	19.7
$/MW	320	805

5. Alternative Avoided Cost Forecast

In addition to the base avoided cost forecast, we ran an alternative avoided cost forecast through technical and economic potential. While our base forecast uses nodal avoided costs, the alternative forecast takes a traditional, system-wide approach and reflects higher avoided capacity costs but lower avoided energy costs compared to the nodal forecast. Figure 5-1 compares energy and demand avoided costs between the two forecasts.

Figure 5-1: Comparison of Base and Alternative Avoided Cost Forecasts

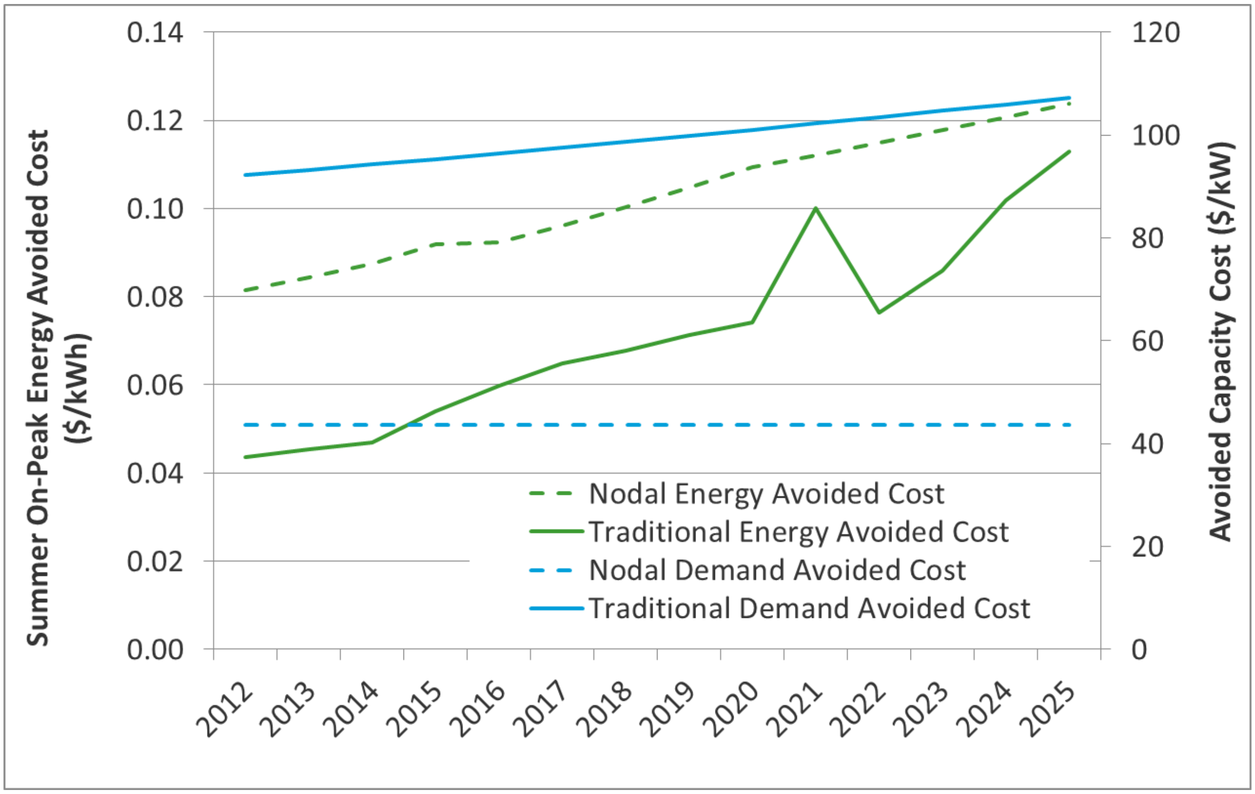


Table 5-1 compares the results of the two avoided cost scenarios. The overall effects on technical and economic potential are small. The changes to technical potential are due to a different measure implementation order (the analysis assumes that measures will be implemented in order of cost effectiveness, as measured by TRC). Overall, economic potential decreases by about five percent, but the results at the sector level are more dramatic and more mixed. While residential economic potential and industrial potential both increase, commercial potential decreases under the alternative avoided cost scenario. The mixed results are due to the relative impacts of energy avoided costs (which decrease under the alternative scenario) and capacity avoided costs (which increase).

Table 5-1: Comparison of Avoided Cost Scenario Results

	Technical Potential MW	Economic Potential MW
Base Avoided Costs		
Residential	542	381
Commercial	359	255
Industrial	62	41
Total	963	677
Alternative Avoided Costs		
Residential	571	405
Commercial	327	194
Industrial	66	46
Total	964	645

6. Conclusions

As the results of this study indicate, there is a significant amount of DSM potential remaining in Austin Energy's service territory. The residential and commercial sectors provide the largest sources of identified potential savings. While savings potentials in the industrial sector are lower, this segment is more complex and less understood that the other sectors, and our bottom-up analysis may understate, to some degree, all the custom energy efficiency opportunities available in this sector.

Our estimate of the savings under the BAU scenario project 2013 and 2014 budgets and programs into the future. It does not reflect future changes Austin Energy may make to its programs in response to changes to the market and program uptake. Although we matched Austin's budgets and savings closely for the calibration years, the model showed lower levels of savings in the forecast's later years. To a large extent, this result shows that Austin Energy could become a victim of its own success. As more of the market is converted to high efficiency, fewer and smaller opportunities remain for additional savings. This is particularly true of energy efficiency retrofits. The result of this effect can be seen in Figure 3-3 as the curve, which shows savings over time, flattens out in later years of the program.

Austin Energy may be able to offset this possibility through a number of approaches, for example by shifting program efforts away from saturated technologies toward technologies for which more opportunity remains, such as custom measures. As emerging technologies enter the market or become more cost-effective, Austin may also find program opportunities there. However, while some savings could be achieved through low-cost strategic changes, it is likely that reaching its current 2024 goals will require offering higher incentives to attract hard-to-reach customers to the program, which will require higher program budgets.

One goal of this study was to provide data to determine whether Austin Energy's current Climate Protection Plan goal of 800 MW of demand savings by 2020 can be increased to 1,000 MW or 1,200 MW by 2024. We found that at 100-percent incentives, the program could achieve 1,168 MW by 2024 at a cost of $790 million over the 10-year period, taking into account achieved savings and Austin Energy's forecasted demand response and Green Building savings. This is short of the 1,200 MW goals, even with the extreme level of program effort and budget assumed for the 100 percent scenario. Assuming a more feasible level of 75 percent incentives, combined with the Max DR scenario, overall savings come to 998 MW by 2024.