Potential Studies – Aligning achievable potential with local market conditions and policy or planning objectives through an innovative approach to economic screening

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ABSTRACT

Traditional energy efficiency (EE) market potential studies developed with a "bottom-up" methodology typically employ rigid economic screening criteria (frequently requiring a TRC ratio of 1.0 or greater) for individual measures or technologies. However, in some markets, including those with mature program offerings or aggressive regulatory and policy drivers for EE, the use of such criteria may not accurately capture the market potential available or align with real-world implementation practices. Traditional measure-level screening may also limit program planning opportunities to achieve deeper energy savings through measure bundling by eliminating measures that could be logical, cost-effective additions when applied at the aggregate project level.

In our recently completed EE market potential study, the Los Angeles Department of Water and Power (LADWP), Nexant, and Cadmus worked together to develop an innovative approach for tailoring the achievable market potential analysis to include consideration of both local market conditions and policy imperatives. Local and regional regulations and policies, as well as internal utility priorities that emphasize more aggressive adoption of energy efficiency all necessitate program interventions that encourage deeper savings from participants. In addition, many of the utility's program offerings are mature and have a strong emphasis on direct install, whole-building, and bundled measures. Taking these factors into consideration, the study's objective was to quantify the realistic achievable EE potential, which required developing a unique approach to economic screening.

Introduction

LADWP commissioned a comprehensive assessment of the long-range electric energy efficiency potential for their service territory from 2014-2033[1] to support its business plan and energy efficiency goals for 2020 and beyond. LADWP retained Nexant, in collaboration with its subcontractor, The Cadmus Group, Inc. (the Nexant team), to perform this work. The study encompassed the residential, commercial, institutional (City of Los Angeles buildings and facilities), and industrial sectors. The results of the study took into account annual program expenditure levels necessary for achieving the cumulative targets for energy savings and peak demand reduction potential, but excluded demand response potential.

Although the timeframe of the study was 20-years, a primary objective of the study was to estimate cumulative savings potential achievable by 2020 and 2023. LADWP had recently adopted a goal of 10% cumulative savings of the load forecast between 2010 and 2020, with an aspirational target of 15%. This study included an assessment of the feasibility and cost-effectiveness of achieving these savings targets, as well as additional achievable potential scenarios at various degrees of program intervention. Subsequently, the study developed a range of program-level planning scenarios with varying cost and delivery assumptions to determine the range of budgetary requirements to achieve the 15% savings target, and to identify an optimized scenario to guide EE program planning and budgeting.

[1] Representing LADWP's fiscal years(FY) 2013-14 to 2032-33

Background

The overall objective to the EE potential study was to assess the energy efficiency potential using industry standard categories of EE potential as follows:

- *Technical potential* - the quantification of savings that can be realized if energy efficiency measures passing the qualitative screening are applied in all feasible instances, regardless of cost.
- *Economic potential* - a subset of technical potential, where measures that are determined to be cost-effective are applied in all feasible instances.
- *Maximum achievable potential* - the energy savings that can possibly be achieved through assuming maximum market penetration of all measures.
- *Program potential* - the energy savings that can possibly be achieved through utility program interventions or the adoption of increasingly stringent codes and standards.

Frequently, the methodology used in potential studies is to derive each successive category of EE potential as a subset of the previous category, as illustrated in Figure 1:

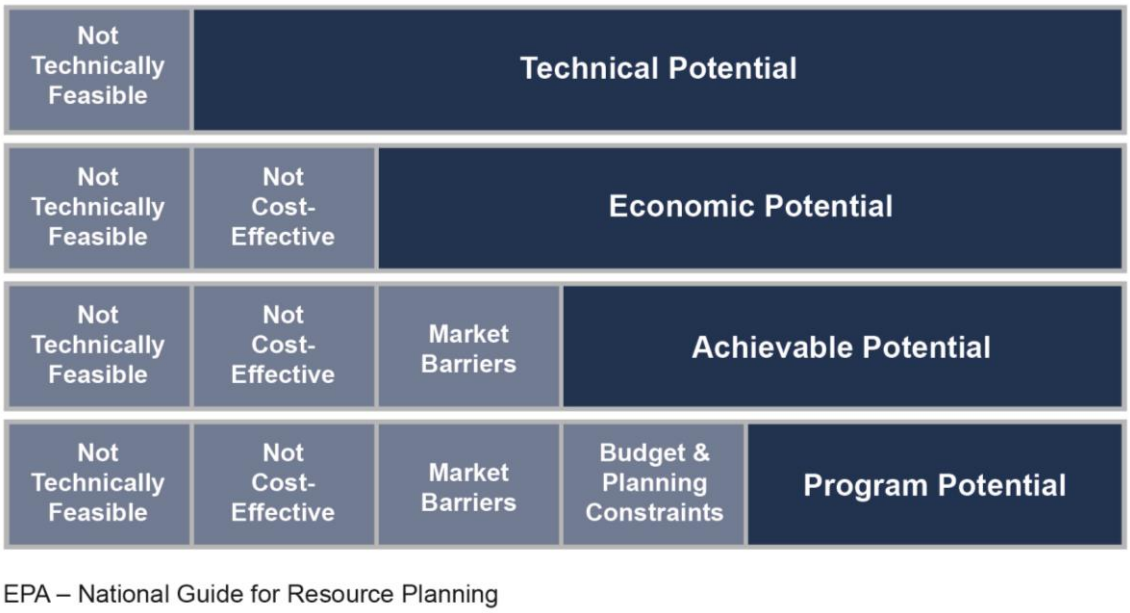

Figure 1: Categories of EE Potential

Approach

The study followed a hybrid "top-down/bottom-up" approach to determining EE potential. The analysis began with a top-down disaggregation of the utility's current energy forecast into its constituent customer-class and end-use components. Next, the team developed a bottom-up compilation of a comprehensive database of technical and market data on all energy efficiency measures applicable to all end uses in the various market segments being analyzed. We then examined the effects for a range of energy efficiency approaches and practices relevant to each end use, while accounting for fuel shares, current market saturations, technical feasibility, and costs. Finally, these unique impacts were aggregated to produce EE potential estimates at end use, customer class, and system levels.

The approach used to quantify impacts varied for each category of EE potential listed above, with technical and economic potential following industry standard approaches. Technical potential included the application of all technically feasible measures regardless of economics. Economic potential was derived from the technical potential and included a measure-level cost-effectiveness screening that required a Total Resource Cost (TRC) test benefit cost ratio of 1.0 or greater.

As noted above and illustrated in Figure 1, many potential studies are assembled in a linear fashion, with economic potential developed as a subset of technical potential, and achievable potential developed as a subset of economic potential. However, based on initial planning discussions between LADWP and the Nexant Team on the objectives of the study and application of results, an alternative approach was sought for calculating achievable potential, as described below and shown in Figure 2.

Based on local market conditions and policy imperatives, LADWP wanted a calculation of achievable market potential that would accurately quantify the savings opportunities that exist for their customer base and included consideration of the following characteristics for their service territory:

- Mature local regional market for EE technologies
- Prevalence of "bundled" measure offerings, either promoted by contractors or through utility or regional program interventions
- Internal utility priorities emphasizing more aggressive EE adoption that focuses on achieving deeper savings from participants[2]
- LADWP's current program offerings that include strong emphasis on direct install, whole building, and bundled measures

Traditional rigid measure-level economic screening, such as the method used in this study for calculating economic potential, may eliminate measures that could be logical, cost-effective additions when applied at the aggregate project level. Therefore, rather than limit achievable potential to the measure-level screening used to develop the economic potential, LADWP sought an approach that would focus on cost-effective opportunities at the customer level, which could capture synergies that exist from the installation of multiple measures together or over time, and result in a package of EE opportunities that are desirable and cost-effective to an individual customer or facility.

Figure 2 below summarizes the overall approach to the study, including the divergence of achievable and program potential from the economic screening used to determine economic potential.

[2] In 2012, LADWP adopted a set of guiding principles for the EE portfolio that first and foremost stated that LADWP would develop and deliver comprehensive energy efficiency opportunities for all customer segments, regardless of relative cost-effectiveness. Rather, using a portfolio approach, LADWP would balance investments across segments such an overall cost effective portfolio would be maintained, regardless if some customer segments were less cost-effective to serve than others.

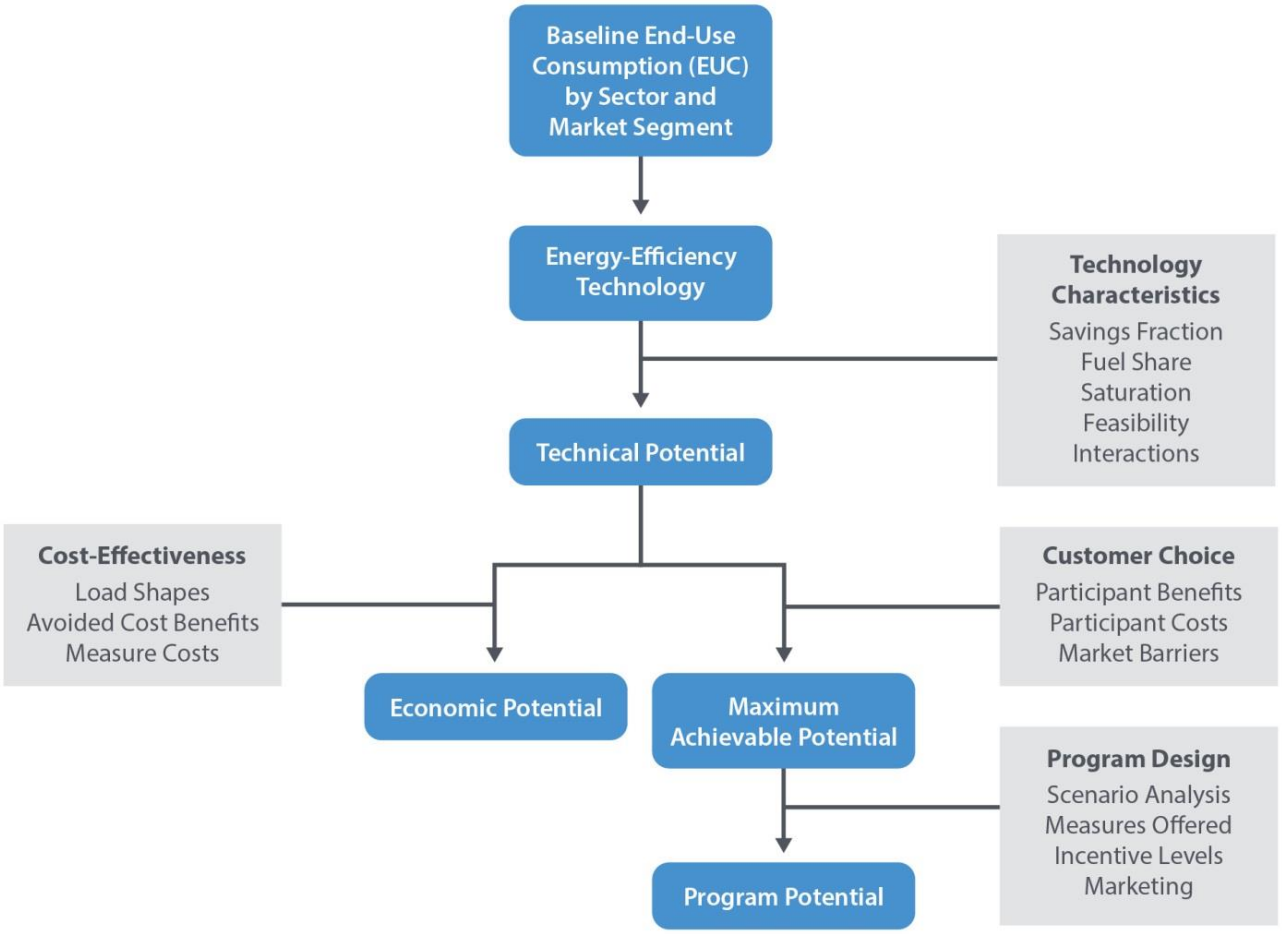

Figure 2: Methodology for Estimating Technical, Economic, Maximum Achievable and Program Potential

Determining Achievable Potential

Focusing on the concept of bundled cost-effectiveness at the customer level, LADWP and the Nexant Team considered several initial approaches for the economic screening for achievable potential.

The first considered creating logical measure bundles that a single customer could implement and evaluating the cost-effectiveness of the bundle in aggregate. Several bundle types were deliberated, including:

- Aligning with existing LADWP programs (CA Advanced Home Program, Consumer Rebate Program, Home Energy Improvement Program, etc.).
- By end-use (lighting, HVAC, water heating, etc.).
- By sub-sector (single-family, multi-family, office, retail, restaurant, etc.).

While the bundle types considered each made logical sense for select measures or technologies, this approach introduced too much uncertainty and subjectivity in assembling the bundles for the results to be deemed credible or to be applied across all measures and sectors.

In order to accomplish the goal of creating a cost-effective package of measures that a single customer could implement and maintain objectivity in measure selection, the second approach considered evaluating cost-effectiveness at the sector level, i.e. creating a cost-effective set of measures for a residential

customer, a commercial customer, or an industrial customer. This approach continued to rely on measure-level results, and is similar in general structure to the methodology used in the 2013 California Energy Efficiency Potential and Goals Study for the California investor owned utilities, which relaxed the measure level cost-effectiveness thresholds for individual measures in various EE scenarios considered[3].

To implement this approach, the analysis initially considered all technically feasible measures that contributed to the technical potential and determined the sector level cost-effectiveness with the full inclusion of all measures. This analysis resulted in a TRC ratio below 1.0 for all sectors, therefore additional economic screening was necessary. Ranking the measures based on TRC ratios revealed that a handful of measures with very low cost-effectiveness were the primary cause of the failing the sector level TRC ratios. Subsequently the Nexant team conducted an iterative exercise across each sector to screen out the measures with the lowest TRC ratios until reaching a sector-level ratio of at least 1.0. The analysis settled on a measure-level TRC threshold ratio of 0.3 or higher, which produced a passing TRC for the commercial and industrial sectors[4].

The residential sector required additional adjustments to incorporate the same minimum measure-level TRC threshold as the other sectors while achieving a sector-level passing TRC ratio. Therefore, applicability caps were developed for measures with TRC ratios between 0.3 and 1.0. The additional applicability factors for the residential measures were derived through another iterative process to produce a sector-level ratio greater than 1.0. As shown in Table 1 below, residential measures with a TRC ratio between 0.3 and 0.5 would at most achieve 5% market penetration, measures with a ratio between 0.5 and 0.8 would achieve a 15% market penetration and those between 0.8 and 1.0 would achieve a 30% market penetration. These expected penetration levels were not meant to represent actual adoption rates of each applicable technology, but as a simulation of how the residential market would prioritize measures based on their relative economic benefits.

Table 1: Residential Sector Applicability Factors

Benefit-to-Cost Ratio	Applicability Adjustment
Up to 0.3	0%
0.3 to 0.5	5%
0.5 to 0.8	15%
0.8 to 1.0	30%
1.0 and above	100%

[3] The relaxed TRC thresholds in the 2013 California Energy Efficiency Potential and Goals Study appeared to be developed based on specific measure considerations, such as the inclusion of low-income measures, or the expectation of certain emerging technologies to become cost-effective at some point in the future; as well as an input variable used in the market scenario analysis. Therefore, while similar in methodology, the rationale for adjusting measure-level TRC screening appears to be different in the California study than the LADWP study.

[4] The study considered one additional scenario with a more relaxed TRC threshold of 0.15 to assess an extreme scenario for program potential; however this scenario did not result in a cost-effective sector or portfolio-level TRC ratio

Results

Utilizing the methodology and parameters described above, the study developed technical and economic potential estimates for LADWP's service territory, as well as achievable potential scenarios that included a maximum achievable potential scenario and five scenarios of program potential based on varying levels of program intervention.

Table 2 summarizes the measure-level TRC threshold applied for each scenario and the sector-level and portfolio-level TRC results for the program potential scenarios. As shown in the table the four program potential scenarios with a minimum measure-level TRC threshold of 0.3 all resulted in passing TRC ratios at both the sector and portfolio levels.

Table 2: TRC results for Program Potential Scenarios

Program Potential Scenario	Measure TRC Threshold	TRC Ratios				
		Res.	Com.	Inst.	Ind.	Total
Achievable Low	0.3	1.9	1.4	1.7	3.0	1.6
Achievable Medium	0.3	1.7	1.2	1.5	2.6	1.4
Achievable High	0.3	1.6	1.2	1.5	2.6	1.3
Achievable Advanced	0.3	1.4	1.0	1.2	2.2	1.1
Achievable Extreme	0.15	0.8	0.9	1.2	2.0	0.9

Figure 3 provides a summary of the long-term (20-year) EE savings potential as a percentage of baseline energy sales. As shown below, because of the strict measure-level screening for the economic potential as compared with the sector-level approach to achievable and program potential, the maximum achievable and the two most aggressive program potential scenarios meet or exceed the economic potential identified.

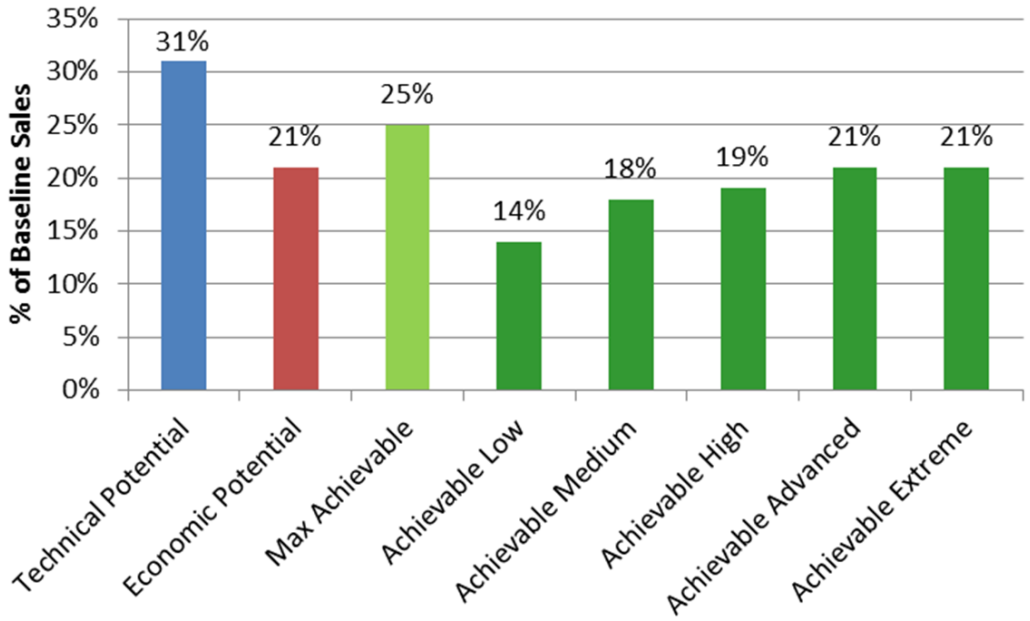

Figure 3: EE Potential –Percentage of Baseline Sales (20-year)

In addition to the long-range savings potential, the study also identified the cumulative EE potential in 2020 to align with the date of LADWP's current 10-year EE savings goal, and in 2023 to identify the current 10-year EE savings potential. This mid-range scenario analysis found that the range of cumulative savings through 2020 with a positive sector-level TRC, inclusive of program accomplishments from 2010 through 2013[5], varies from 10.1% to 15.8% of baseline sales depending on the level of program intervention, as shown in Figure 4. This finding validated that LADWP's aspirational goal of 15% savings over 10 years is achievable and cost-effective. The study results were used to support LADWP's adoption of revised 10-year savings goals, including an updated target of 15% cumulative savings between 2010 and 2020.

[5] LADWP's current 2020 savings goal is based on 10-year program accomplishments; therefore savings achieved in 2010-2013 were included in estimating the targeted 2020 program potential.

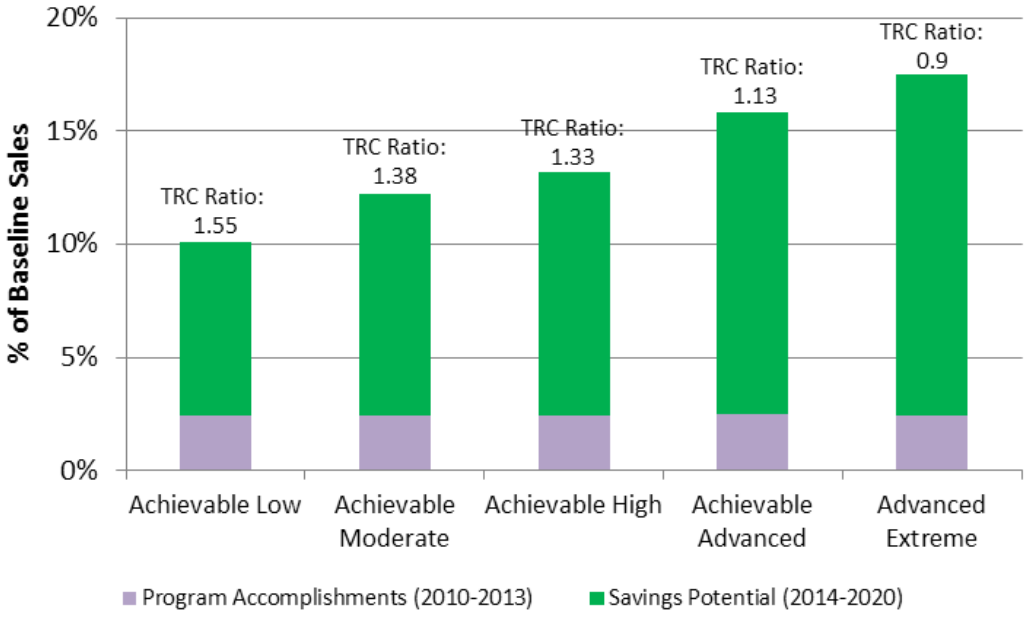

Figure 4: Target Year 2020 Program Potential Scenarios

The 2023 mid-range scenario was utilized to assist LADWP in developing specific program plans and budgets. However while the scenarios developed to determine the overall EE program potential assumed a constant incentive rate and administrative cost across all measures in a particular scenario, it was necessary to refine the adopted scenario into specific program offerings for program planning. Therefore, as a final study task, LADWP and Nexant further refined the program potential scenarios to identify specific program interventions, including measure-specific incentive rates and administration and marketing costs unique to each program, which incorporated the identified cost-effective potential and the 15% savings target for the portfolio.

Using the measures included in the achievable potential, various program planning scenarios were developed to analyze how changing assumptions on program delivery, including incentives, admin/marketing, benefit-cost thresholds, and ramp rates create a range of budgets and delivery approaches required to reach roughly 15% savings by 2020. Through multiple iterations, an optimized program planning scenario was created that aligned the identified program potential with the local market characteristics described above, which include:

- Mature local regional market for EE technologies
- Prevalence of "bundled" measure offerings
- Internal utility priorities focusing on achieving deeper savings from participants
- LADWP's current program offerings that include strong emphasis on direct install, whole building, and bundled measures

The optimized planning scenario builds on LADWP's current programs and continues the focus on bundled program packages and direct install programs, which are consistent with the sector-based approach used to establish the achievable potential estimates. Figure 5 summarizes LADWP's updated 10-year cumulative savings targets that resulted from the identified achievable potential.

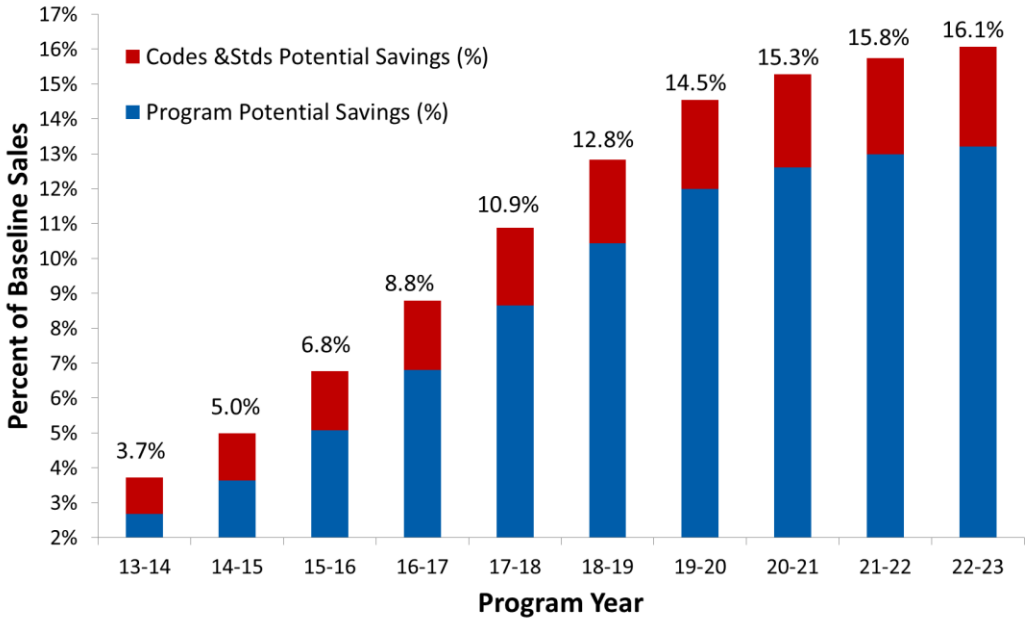

Figure 5: Updated 10-year Savings Targets

Conclusion

Based on the planning objectives established during the initial project development stage and the identification of the market characteristics and policy and planning objectives that currently exist in LADWP's service territory, this potential study adapted traditional approaches for economic screening of EE measures to develop an updated approach to assessing achievable and program potential. The use of this innovative, two-step approach to economic screening produced realistic achievable potential results that better aligned with realistic implementation scenarios in the local market. The results assisted LADWP in the establishment of updated long-term energy efficiency savings targets and provided guidance in the development of program offerings that continue the utility's focus on deeper savings through bundled and whole-building approaches.

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