

ACTION PLAN



Bonneville Power Administration 2016-2021 Energy Efficiency Action Plan

March 2017



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Executive Summary

The Bonneville Power Administration (BPA) and its public power utility customers (customers) have been a leading force in promoting energy efficiency (EE) in the Pacific Northwest for four decades. Since the early 1980s, BPA and its customers have acquired more than 1,700 average megawatts (aMW)¹ in electricity savings through EE efforts.

¹ <https://www.bpa.gov/news/pubs/GeneralPublications/gi-BPA-Facts.pdf>

In February 2016, the Northwest Power and Conservation Council (the Council) released its Seventh Northwest Conservation and Electric Power Plan (Seventh Plan), which forecasts regional electricity demand and resource strategies for the next 20 years. The Seventh Plan's preferred resource strategy calls for the region to acquire 1,400 aMW of EE by 2021,² and BPA is pursuing a plan to achieve a portion of that goal (580.7 aMW). The following document is BPA's Action Plan for achieving its goal.

PURPOSE OF EE ACTION PLAN

The EE Action Plan serves as BPA's roadmap for achieving energy efficiency savings from 2016-2021. The Action Plan outlines the channels for which savings will be achieved and forecasts expected costs for those savings. The EE Action Plan is not a long term strategic document, but a tactical plan that explains areas of opportunities for BPA.

The Action Plan will serve primarily as a tool to help guide BPA's programmatic decision-making and evaluate progress toward achieving its portion of the Council's Seventh Plan savings goals. BPA will re-evaluate the assumptions for each sector and make adjustments at least every two years to coincide with rate periods and to adapt to evolving policy, technology, and market conditions. This approach will allow for adjustments in budgeting and program structure.

BPA'S ENERGY EFFICIENCY BUDGET

To meet savings forecasts, BPA budgets for EE program reimbursements, performance payments, program implementation, research, evaluation, contract support, Northwest Energy Efficiency Alliance (NEEA) support, and emerging technology development. BPA groups the budgets into three categories:

- **Conservation purchases.** BPA programmatic savings reimbursements and Energy Efficiency Incentive (EEI) funds. Includes performance payments and Energy Smart Reserved Power (ESRP).³
- **Market transformation.** Support for NEEA's market transformation initiatives. Market Transformation is the strategic process of intervening in a market to create lasting change in market behavior, by removing identified barriers or exploiting opportunities to accelerate the adoption of cost-effective energy efficiency as a matter of standard practice.
- **Conservation infrastructure.** All support for programs and operations, including third-party program implementation, contract support, market research (Momentum Savings research),

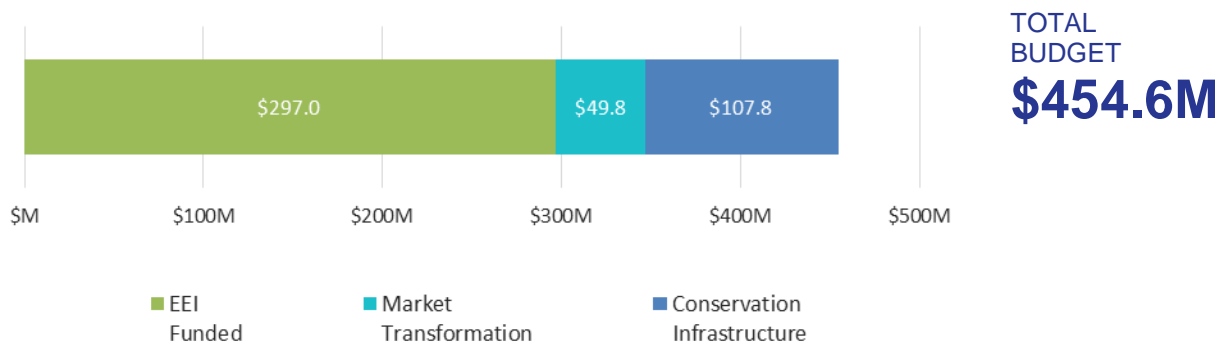
² Seventh Northwest Conservation and Electric Power Plan. Page 1-6, February 25, 2016.
http://www.nwcouncil.org/media/7149937/7thplanfinal_chap01_execsummary.pdf

³ ESRP includes savings from hydroelectric facilities and transmission substations as well as some fish hatcheries and irrigation districts that access power directly from the Federal Columbia River Power System; these facilities have station service or reserved power rather than being customers of a local utility.

evaluation, and emerging technologies (ETs). Conservation Infrastructure costs are not included in the programmatic cost calculations throughout this document (\$M/aMW, \$/kWh and levelized cost).

Although BPA forecasts aMW savings from 2016 to 2021,⁴ it is setting budgets for the next four years—in alignment with BPA’s Integrated Program Review process—to 2019. Figure ES 1 projects the total program budget for the period from 2016 to 2019. The figure reflects the total public power budget estimated to achieve BPA’s share of the Seventh Plan goal. All costs in this document are reported as nominal dollars.

Figure ES 1: Budgets by Source, Combined (\$ Millions): 2016-2019

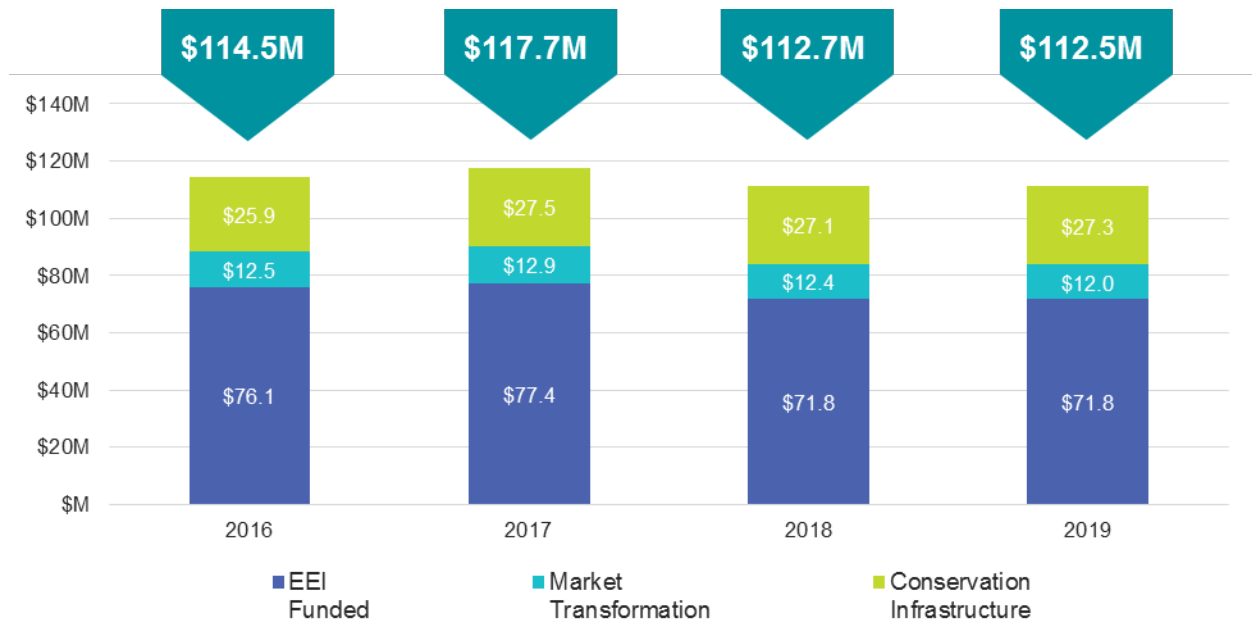


Note: Due to rounding, numbers may not add to the total.
Source: BPA Integrated Program Review, 2016

⁴ All references to years in this Action Plan are fiscal year.

Figure ES 2 projects the public power program budget each year from 2016 to 2019.

Figure ES 2: Budget by Source and Year (\$ Millions): 2016-2019



Note: Due to rounding, numbers may not add to the total.

Note: Only EEI costs are included in programmatic cost calculations (\$M/aMW, \$/kWh and levelized cost)

Source: BPA Integrated Program Review, 2016

SUMMARY OF SAVINGS FORECASTS

Programmatic activities offer the largest contribution to BPA’s energy savings potential. BPA estimates programmatic savings will account for 351.6 aMW, or 61% of BPA’s total savings. Since 2012, BPA has budgeted for 75% of the EEI-funded programmatic savings, and utilities were responsible for self-funding the remaining 25%.⁵ ⁶ Beginning in 2018, utilities will be responsible for self-funding 30% and BPA will budget for 70% of the programmatic savings. As such, BPA divides programmatic savings into two

⁵ Actual self-funding from 2012 to 2014 was 29%. From 2016 to 2017, BPA estimated actual self-funding at 25%. From 2018 to 2019, BPA estimated self-funding at 30%.

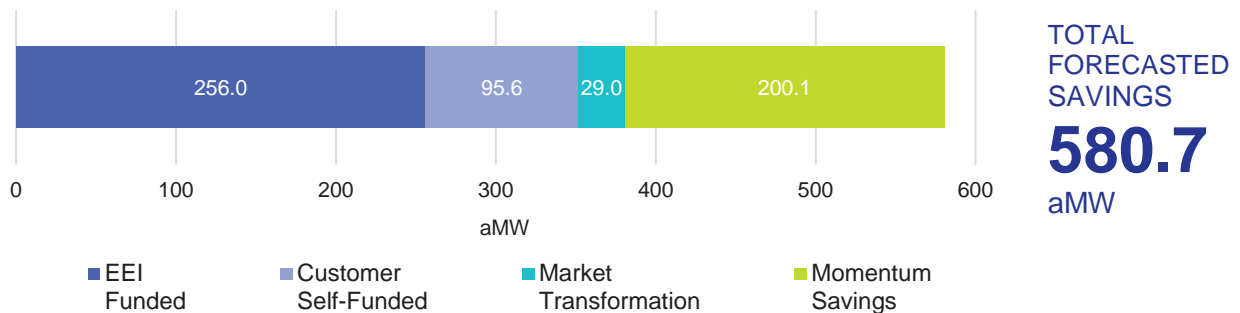
⁶ The Energy Efficiency Post-2011 Review (Post-2011 Review) was a public process to review and consider improvements to the BPA EE policy framework and associated implementation elements put in place on October 1, 2011. After considering the workgroup recommendations, BPA proposes revisions to the Energy Efficiency Post-2011 Implementation Program. BPA accepted public review and comment on the Proposed Revisions through July 19, 2014. After considering the public comments, BPA adopted revisions to the Implementation Program. Further information located at https://www.bpa.gov/EE/Policy/post2011/Post2011_Implementation-Program_FINAL.pdf

categories by funding source: BPA EEI-funded programs and customer self-funded programs. BPA EEI-funded programs are programs developed by BPA and reimbursed by BPA through the EEI. Customer self-funded programs are programs developed by the customers or BPA and for which customers do not seek reimbursement from BPA. Customers still report these savings to BPA, and BPA claims these savings in their reporting to the Council.

BPA also tracks and accounts for savings related to Momentum Savings and market transformation (defined in Section 2.2). BPA expects that Momentum Savings and market transformation activities will account for approximately 229.1 aMW, or 39% of BPA’s energy savings goals over the Seventh Plan period. BPA estimates Momentum Savings achievements of 200.1 aMW, and market transformation savings achievements of 29.0 aMW. BPA achieves market transformation savings through its investment in NEEA.

Figure ES 3 outlines BPA’s combined estimated savings forecast for programmatic, market transformation, and Momentum Savings activities from 2016 to 2021.

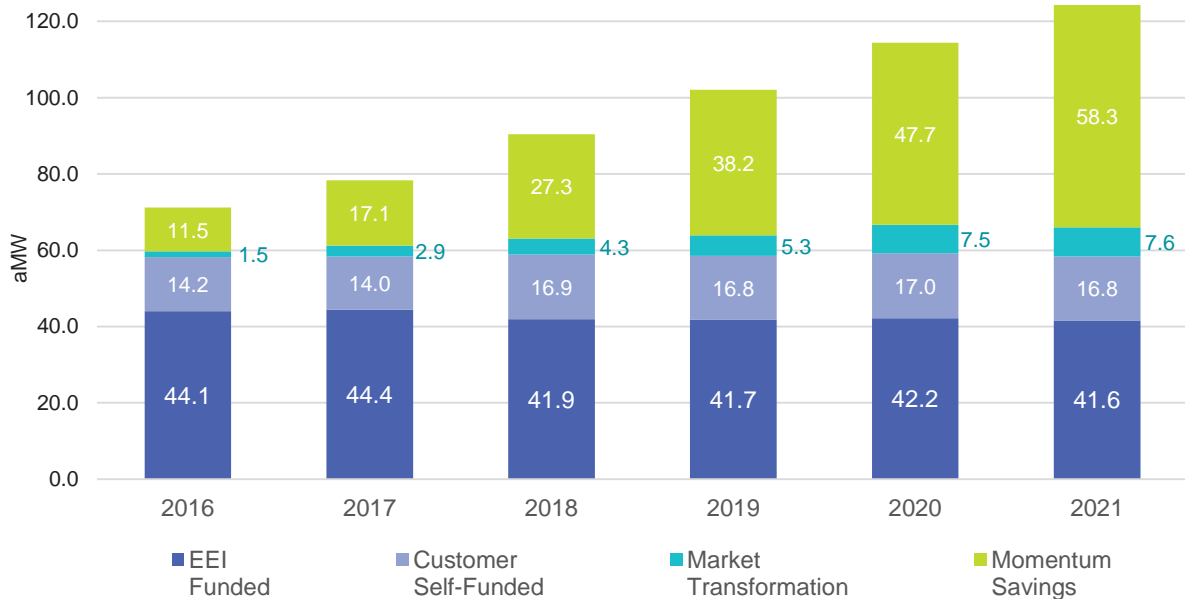
Figure ES 3: BPA Savings Forecast by Source, Combined (aMW): 2016-2021



Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

Figure ES 4 outlines BPA's yearly estimated savings forecast for programmatic, market transformation, and Momentum Savings activities from 2016 to 2021.

Figure ES 4: BPA Savings Forecast by Source and Year (aMW): 2016-2021



Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

In the following sections, BPA provides a summary of the primary activities that it will target to meet the total public power share savings forecast of 580.7 aMW by sector. BPA describes sector-level strategies in-depth in Section 2.3 of this document.

Residential Sector

BPA estimates residential sector programmatic savings of 78.1 aMW from 2016 to 2021. Residential sector opportunities consist primarily of unit energy savings measures recommended by the Regional Technical Forum (RTF). Key measures include lighting, showerheads, heating, ventilation, air conditioning, and Performance Tested Comfort Systems™. BPA obtains regional infrastructure support for these measures through the Simple Steps, Smart Savings™ program (defined in Section 3.1); regional collaboration for utility-, contractor-, and consumer-level support for ductless heat pumps; and the promotion of contractor training for quality installation of high-efficiency heat pumps and duct sealing.

Commercial Sector

BPA estimates commercial sector programmatic savings of 114.9 aMW from 2016 to 2021. Over the Action Plan period, the commercial sector will employ a more holistic customer approach and will diversify

technologies beyond lighting and delivery channels to include more than downstream rebate measures and custom program offerings. A key to success in this sector will be strengthening and leveraging the trade ally networks.

Industrial Sector

BPA estimates industrial sector programmatic savings of 104.0 aMW from 2016 to 2021. To meet this goal, BPA will continue to build the Energy Smart Industrial (ESI) program network of technical service providers to target specific subsectors of the market to develop partnerships and collaborations. In addition, ESI will focus on consolidating quality control assessments, automating routine processes, streamlining cost documentation procedures, and implementing evaluation, measurement, and verification protocols.

Agricultural Sector

BPA estimates agricultural sector programmatic savings of 25.3 aMW from 2016 to 2021. BPA will continue to offer a variety of measures for irrigation pump testing and system analysis, sprinkler hardware upgrades, turbine pump variable frequency drives (VFDs), scientific irrigation scheduling (SIS), lighting, and custom project opportunities. BPA estimates irrigation measures such as SIS and irrigation sprinkler hardware will contribute a majority of the agricultural program's aMW savings.

Federal Sector

BPA estimates federal sector programmatic savings of 14.1 aMW from 2016 to 2021. The strategy to achieve federal sector savings includes developing structured communications plans to increase uptake, and assessing and capitalizing on current program strengths. BPA will achieve much of the savings in the federal sector from commercial and industrial channels. As such, BPA distributes some of the cost and savings achieved from the federal sector program to the commercial and industrial sectors.

Distribution System Efficiency Sector

BPA estimates distribution system efficiency programmatic sector savings of 4.3 aMW from 2016 to 2021. The program will focus on measurement and verification and Volt/volt-ampere reactive⁷ optimization for customers interested in distribution efficiency. BPA provides a set of resources for when customers decide to include distribution efficiency in their EE and system plans.

⁷ Volt-ampere reactive, or VAR, is a unit used to measure reactive power in alternating current.

Unallocated Savings

This Action Plan takes into account one change since the 2012 Action Plan update⁸ related to the methods BPA used to determine the programmatic savings forecast: each BPA sector lead applied a bottom-up approach to achieve cost-effective energy savings forecasts. The approach took into account the BPA 2016-2019 budget, expected program growth and participation, and anticipated technology proliferation.

Once BPA completed the bottom-up approach, the estimated cost for the total programmatic savings forecast was less than BPA's allocated programmatic budget. BPA is near certain that customers will spend the remaining budget above the total of the sector cost estimates, but BPA is uncertain in which sectors customers will choose to invest. Rather than trying to true up the sector estimates by inflating the costs and savings, BPA is introducing a new line item to account for budget not forecasted to be spent in any particular sector but that BPA is confident it will use to generate savings. This line item is called unallocated savings. Unallocated savings will account for 11.0 aMW from 2016 to 2021. These savings are part of programmatic savings and are the direct result of the anticipated spending of the portion of BPA's budget that was not claimed in any particular sector's plan.

⁸ Bonneville Power Administration, *2012 Update to the 2010–2014 Action Plan for Energy Efficiency*, March 1, 2012. www.bpa.gov/EE/Policy/EEPlan/Documents/BPA_Action_Plan_FINAL_20120301.pdf

Figure ES 5 shows the total programmatic savings forecasts by sector from 2016 to 2021; the figure also includes unallocated savings, Momentum Savings, and market transformation.

Figure ES 5: BPA Savings Forecast by Sector, Combined (aMW): 2016-2021

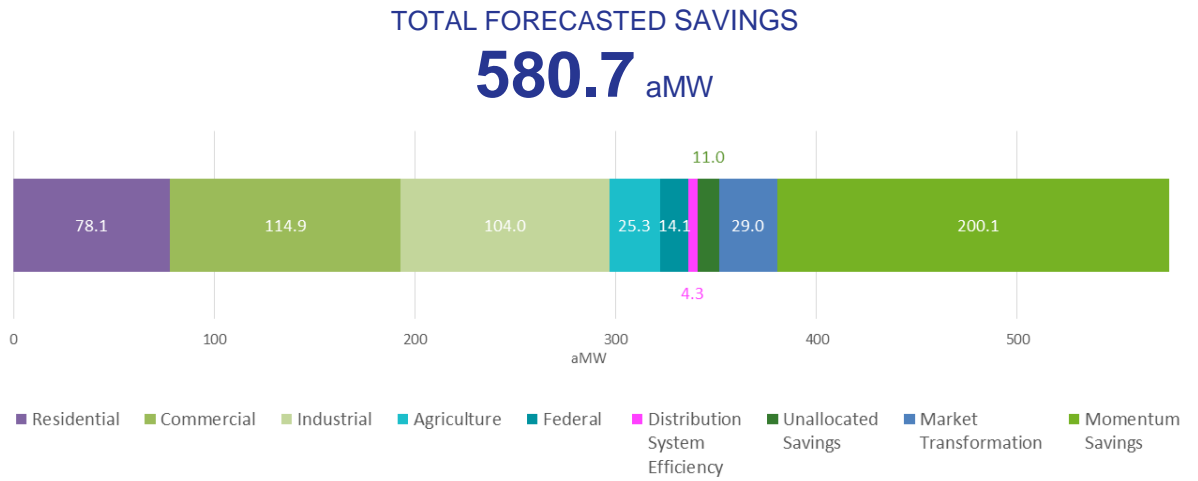
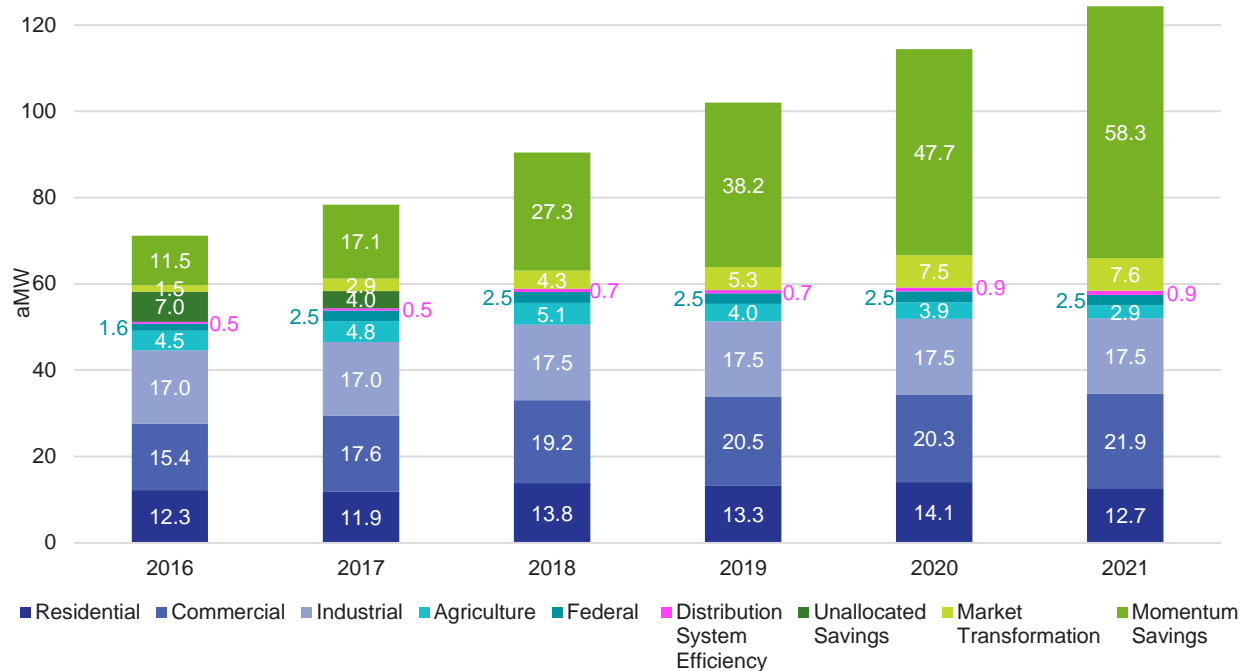


Figure ES 6 shows the yearly BPA savings forecasts by sector from 2016 to 2021. The figure also includes unallocated savings, market transformation savings, and Momentum Savings.

Figure ES 6: BPA Savings Forecast by Sector and Year (aMW): 2016-2021





1 Introduction

The Bonneville Power Administration (BPA) and its public power utility customers (customers) have been a leading force in promoting energy efficiency (EE) in the Pacific Northwest for four decades. Since the early 1980s, BPA and its customers have acquired more than 1,700 average megawatts⁹ (aMW) in electricity savings through EE efforts.

The Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act) directs the Northwest Power and Conservation Council (the Council) to develop a “regional conservation and electric

⁹ <https://www.bpa.gov/news/pubs/GeneralPublications/gi-BPA-Facts.pdf>

power plan” and to review the plan not less than every five years.¹⁰ In February 2016, the Council released its Seventh Northwest Conservation and Electric Power Plan (Seventh Plan). The Seventh Plan provides guidance for BPA and the region’s utilities to develop resources considering cost and risk. The Seventh Plan also contains a series of actions for the region to undertake in order to fulfill the recommendations of the Action Plan, including a regional EE goal.

The Seventh Plan’s preferred resource strategy calls for the region to acquire 1,400 aMW of EE by 2021. This document is BPA’s Action Plan for achieving a portion of the regional goal. This section defines the objectives of the Action Plan, highlights its guiding principles, and explains how BPA developed the Action Plan. It also provides a summary of successes since the last Action Plan and outlines opportunities, drivers, and challenges facing BPA in achieving its savings goals over the Council’s Seventh Plan period.

1.1 BPA AND THE SEVENTH PLAN

BPA collaborated closely with the Council throughout the development of the Seventh Plan, offering data and expertise as inputs to this Action Plan, participating in advisory committees, and providing comments during the public comment period.

The Seventh Plan is the starting point in the development of BPA’s savings goals from 2016 to 2021. It assists BPA in understanding regional savings opportunities and aids in the development of sector-level strategies. BPA will continue to engage with the Council over the Seventh Plan period, reporting on savings achievements toward the regional goal and collaborating on efforts outlined in the Action Plan.

1.2 OBJECTIVES

BPA designed the portfolio of programs, offerings, and activities outlined in this Action Plan to assist in meeting BPA’s share of the EE goals established in the Seventh Plan. The Action Plan serves as a roadmap to guide BPA and its customers in meeting the goals over the six-year period. In addition to this principal objective, the Action Plan seeks to:

- Outline scalable strategies that support BPA in meeting regional savings goals in a least-cost way
- Generate a shared perspective and ownership of the regional conservation goals among stakeholders
- Create alignment between sector- and portfolio-level priorities within the BPA EE organization

¹⁰ For more on the “statement of basis and purpose” described in Section 553 of the Federal Administrative Procedures Act to accompany agency decisions on final rules and information on how the Council considered and responded to the comments received during the development of the Seventh Power Plan see: <http://www.nwcouncil.org/media/7150259/nwppcc-statement-of-basis-and-purpose-for-7th-plan-and-response-to-comments-final.pdf>.

- Identify the research activities, initiatives, and resources needed to achieve the Seventh Plan goal

1.3 GUIDING PRINCIPLES

A number of overarching principles guided the development of this Action Plan. The primary principle is from the Long-Term Regional Dialogue Policy¹¹ that states:

BPA will pursue conservation equivalent to all cost-effective conservation in the service territories of those public utilities served by BPA and will accomplish this in partnership with public utilities at the lowest cost to BPA.

Other principles influencing this plan include the following:

Lowest-cost acquisition. BPA continues to evaluate technologies and programs with the greatest potential to provide energy savings at the lowest cost and strives to acquire energy savings as efficiently as possible. The Action Plan prioritizes activities and resource allocation to achieve this objective.

Leadership and innovation. The Northwest has been a leader in using EE as a resource to meet the region's power needs. BPA will continue to play an instrumental role in this achievement through cutting-edge research on new technologies, creative savings opportunities, technical rigor, and coordination.

Conservation at the utility level. BPA's role as a regional provider of wholesale electricity dictates its role as a facilitator rather than an implementer of EE initiatives (with limited exceptions such as the federal sector, which is discussed in Section 3.5). As such, BPA will continue working with customers to acquire EE and empower customers to provide programs and services to their end-use consumers.

Regional infrastructure. BPA will continue to design and implement programs in coordination with customers where there are economies of scale. BPA's strategies include providing a higher level of implementation support, technical tools, marketing, project support, and trade ally coordination to its customers to assist them in working with their end-users.

Broad and balanced initiatives. BPA continues to offer a broad and balanced set of initiatives and incentives to fulfill the unique needs of its diverse customers.

Strong relationships. To achieve the aggressive goals established in the Seventh Plan and foster economic development, BPA will continue to collaborate regionally with customers, stakeholders, and EE

¹¹ Bonneville Power Administration, *Bonneville Power Administration Long-Term Regional Dialogue Final Policy*, July 2007. www.bpa.gov/power/pl/regionaldialogue/07-19-07_RD_Policy.pdf

organizations in the Northwest. Regional collaboration will minimize redundancy, maximize efficiency, and leverage each entity's strengths to make stronger working partnerships.

1.4 ACTION PLAN DEVELOPMENT METHODOLOGY PROCESS

BPA began planning its portfolio of EE programs for the Seventh Plan period by assessing what BPA currently offers and developing a strategy to meet its portion of the regional goals identified in the Seventh Plan. To develop a strategy, BPA:

- Reviewed new technologies in the Seventh Plan and technologies that are no longer in the Seventh Plan (technologies no longer in the Seventh Plan contribute to the new baseline)
- Compared energy savings potential with BPA's historical achievements
- Assessed potential savings and costs of new technologies and programs
- Assessed program retirements for measures that have reached market maturity

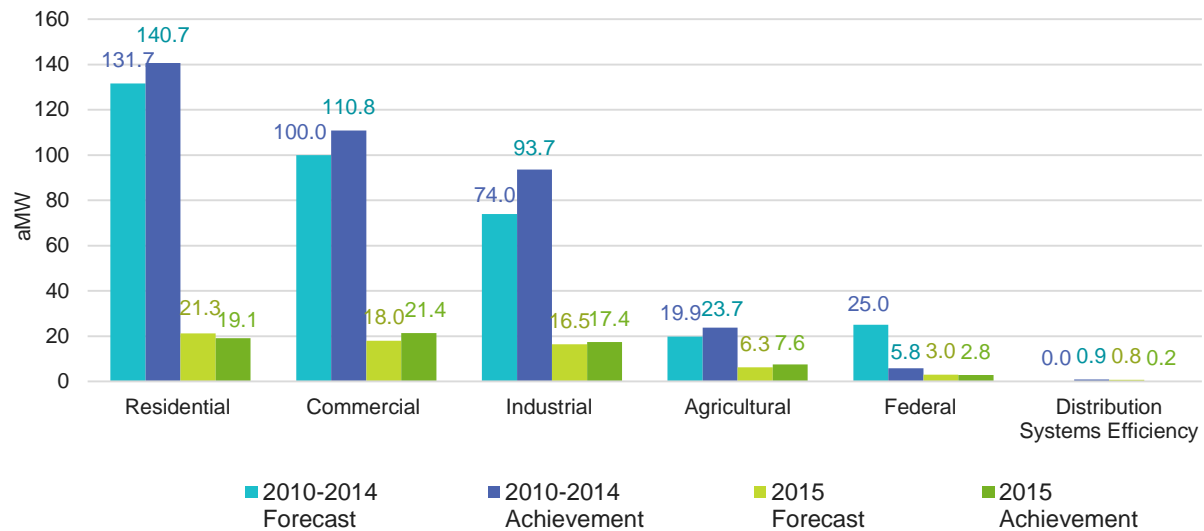
Based on these assessments, BPA program sector leads developed a 'bottoms up' approach of estimated savings in public power service territory. Starting at the measure category level (e.g. ductless heat pumps, commercial lighting, agricultural hardware), annual estimates of savings and costs were input and then summed across sectors. Forecasts of market transformation and momentum savings were then added, ensuring that savings were not double counted across savings types. Costs forecasts were then compared to currently available budgets.

BPA reviewed and approved the Action Plan by creating a sponsor team that consists of BPA planning, programs, policy, engineering, and marketing managers. The sponsor team guided the content creation process by gathering input from policy and planning specialists, marketing, engineering, and other departments within BPA.

1.5 SUMMARY OF PAST ACTION PLAN SUCCESS

BPA relies on its customers to meet its savings goals. Public power successfully met and exceeded the Council's Sixth Power Plan EE goals; achieving over 600 aMW of the 504 aMW goal. Of that achievement, BPA and its customers acquired 375.6 aMW of programmatic savings from 2010 to 2014. In 2015 BPA saved an additional 68.5 aMW, achieving a total of 444.0 aMW of programmatic savings between 2010 and 2015.¹² **Error! Reference source not found.** summarizes the Sixth Plan and 2015 programmatic savings achievements by sector.

¹² The Sixth Plan identified a five-year EE target and Action Plan period from 2010 to 2014. Although not specifically identified in the Action Plan, BPA continued to achieve savings toward the Sixth Plan in 2015 while the Council completed their analysis and development of the Seventh Power Plan (which took effect in 2016).



Source: BPA FY 2014 RED Book

BPA’s collaboration with numerous organizations that make up the EE delivery system in the region and the support of many internal BPA groups including engineering, marketing, contracting, and planning and evaluation have supported achievements since the last Action Plan. The 2010 Action Plan and the 2012 update to the plan quantified BPA’s share of the Council’s Sixth Plan target from 2010 to 2014. It identified priorities and described the overarching strategy and sector-specific plans to meet BPA’s share of the savings. Many of the successes cut across program sectors, while others fall within specific program sectors. This section outlines successes that cut across BPA and successes within program areas from the 2010 to 2014 Action Plan cycle as well as BPA’s work throughout 2015 in the gap year between the Sixth and Seventh Plans.

Crosscutting Achievements

Some of BPA’s achievements from 2010 to 2015 cut across sectors and affect multiple stakeholders. These include:

- During the post-2011 public review process, BPA committed to a structured process for developing new regional programs that are transparent, collaborative, and guided by customers. Throughout the last Action Plan cycle and the following year, BPA had great success with developing new regional programs following the structured process.
- BPA’s Implementation Manual (IM) establishes guidelines and requirements for implementing EE projects in the region. BPA now publishes the IM annually on October 1 (instead of every six months), which reduces the burden of change on both customers and BPA.
- BPA has improved inter-rate period budget flexibility. With this increased flexibility, customers now have the option to roll over as much as 5% of their rate period Energy Efficiency Incentive

(EEI) budgets to the next year to accommodate the possibility that some projects are not completed by the end of the rate period.

1.6 OPPORTUNITIES, DRIVERS, AND CHALLENGES

A number of market, institutional, and technological factors will influence the outcomes of EE initiatives during the Seventh Plan period. BPA has identified the following factors as driving and supporting accelerated acquisition of conservation or having the potential to substantially change BPA's EE strategy as presented in this Action Plan. This list does not include all potential risks to achieving BPA's EE forecasts—there could be unforeseen risks that BPA has not identified. These factors, and a range of other uncertainties that exist in forecasting any energy savings, may affect the actual savings achieved.

Alignment with Customer Priorities

BPA depends on its customers to successfully implement EE programs and projects. As such, BPA strives to develop programs that align with the interests of customers. BPA's wide range of customers each has unique priorities, driving BPA to create programs and offerings that meet these diverse needs. For example, many smaller utilities, particularly those in rural areas, have few staffing resources and may have constraints that pose significant challenges to delivering EE services and programs. Additionally, for some utilities that have stable or decreasing loads, EE may not be a high priority.

Policy Trends

The state of Washington passed I-937, the Energy Independence Act, in 2006. The act requires large utilities to obtain 15% of their electricity from renewable sources by 2020 and to undertake all cost-effective conservation.¹³ This new regulation is a major driver of EE achievement in the region, and BPA recognizes that this Action Plan complements actions many of its customers in Washington are already undertaking.

The United States has introduced several energy and climate-related legislative initiatives, such as the Environmental Protection Agency's Clean Power Plan, since the last Action Plan. It is uncertain whether pending legislation, if passed, would affect BPA's efforts to achieve EE goals. In most cases, it appears the new laws would benefit BPA by creating new efficiency standards or by promoting energy efficient technologies. BPA will continue to track federal legislation and standards development, and will adjust its activities and savings assumptions as warranted.

¹³ According to the Northwest Power Act, a cost-effective measure or resource must be forecast to be reliable and available within the time it is needed and to meet or reduce the electrical power demand of consumers at an estimated incremental system cost no greater than that of the least costly, similarly reliable and available alternative or combination of alternatives.

Energy Efficiency Environment

Many conditions affect the energy environment and may influence the outcomes of BPA's savings forecasts. These include:

- Fuel prices for natural gas are currently low, reducing the cost-benefit for implementing EE initiatives.
- The perception from some end-use customers is that upfront costs of EE are increasing while utility incentive levels are trending downward. Many utility programs lack the infrastructure or resources to implement on-bill financing, low- or no-interest loans, or other financing mechanisms that would reduce these upfront costs.
- Low or zero load growth, or even load defection, makes it difficult for some utilities to make a strong case for increasing or maintaining current program budgets.

Certain end-use customer segments, technologies, and other areas have made significant efficiency advances. One example is light-emitting diodes (LEDs). BPA has seen high adoption rates from LEDs in recent years and recognizes that it may be difficult to achieve additional energy savings from LED technology.

Emerging Technologies

The Council expects about 50% of the Seventh Plan 20-year savings projections (2035) to come from emerging technologies (ETs) and from measures that are new to the Seventh Power Plan.¹⁴ Regional collaboration is more important than ever before, so BPA is creating a regional research agenda. The goal of the agenda is to make sure common needs are clear and there is a shared cost. The organizations involved in regional collaboration include the Emerging Technologies Coordinating Council, Electric Power Research Institute (EPRI), Northwest Energy Efficiency Alliance (NEEA), and Consortium for Energy Efficiency (CEE). These organizations work together to maintain a pipeline of new technologies to incentivize as the market shifts to more efficient practices. Testing new technologies can take multiple years and the effect of these new technologies on savings is yet unknown.

Focus 2028

BPA Focus 2028¹⁵ is a forum for regional leaders to establish a common understanding of the types of industry changes and strategic choices BPA may face to maintain its financial strength and cost competitiveness. The forum discussions may influence how BPA will approach EE in the coming years, as it considers how to better account for the multiple benefits of EE, assesses the sources of funding, and

¹⁴ Seventh Northwest Conservation and Electric Power Plan, Chapter 12: Conservation Resources, released February 25, 2016: http://www.nwcouncil.org/media/7149940/7thplanfinal_allchapters.pdf

¹⁵ Information about Focus 2028 can be found at the Focus 2028 website: <https://www.bpa.gov/Finance/FinancialPublicProcesses/2028/Pages/default.aspx>

tries to optimize the effect of all investments made in EE. Outcomes from the forum may result in updates to this Action Plan.

In October 2016, the Administrator provided a letter¹⁶ to the region on the outcomes of the Focus 2028 process related to energy efficiency. In the letter, the Administrator identified a number of areas in which BPA would be working with customers over the next few years to evolve the EE program. As these conversations and decisions unfold, BPA will update the EE Action Plan accordingly during its update process.

Demand Response

The Northwest needs a better understanding of how demand response (DR) can assist in reducing power use. Traditionally, BPA has not had a consistent need for DR because of BPA's abundant hydro capacity and low capacity costs, which reduced the value proposition of DR. This situation is slowly changing, however, as the BPA power and transmission systems become more constrained. There are indications that DR might become useful and valuable to BPA in the near future. One potential use could be for winter peak period capacity supply, as documented in the Council's Seventh Plan. During the Action Plan period, BPA will be exploring that use of DR in more detail.

There may also be opportunities for DR expansion in the BPA service territory beyond its use for winter capacity supply. Those opportunities include the following:

- A deferral of transmission investments (or investment decisions) for transmission line builds, repairs, and upgrades (referred to as non-wire opportunities)
- Third-party balancing supply beyond the federal hydro system (which has limitations) to help integrate/balance wind and solar generation; BPA understands that the rise of renewables means the rise in importance of fast response firming resources, such as DR and battery storage, to ensure BPA's ability to serve customers when the wind stops blowing or when clouds block the sun

BPA faces both opportunities and challenges in the use of DR for capacity. Although the region is facing a capacity shortage for reasons that are well discussed in the Seventh Plan, analysis completed by BPA shows the BPA system is not facing a winter or summer capacity shortage through 2026. In fact, BPA power planners are projecting a winter and summer surplus under most conditions five and eight years out. However, given the many load, market, price, and technology uncertainties that affect the power system, it is smart to continue testing DR use to reduce or shift both summer and winter loads, and for other BPA power system purposes. BPA plans to continue to place a high priority on testing various DR uses during the Action Plan period, to be ready to rapidly implement and ramp up DR if BPA identifies the need.

¹⁶ https://www.bpa.gov/EE/Policy/Documents/EE%20Focus%202028%20Closeout%20letter_final.pdf

Integrated Demand-Side Management

BPA is developing a long-term integrated demand-side management (IDSM) strategy that integrates the tools, assets, and strategies associated with the planning, deployment, and use of EE, DR, distributed generation (DG), and distributed storage (DS)—both stationary and mobile—to support the planning and operation of BPA’s electric power grids. An IDSM strategy will mean more cost-effective, reliable, and flexible solutions to meet needs in an uncertain future.

BPA’s IDSM initiative is pursuing a future in which BPA has the expertise, systems processes, and tools to proactively consider, plan, develop, and implement DSM through either individual or integrated programs. In anticipation of evolving technological and societal expectations and to make meaningful contributions to BPA’s current and future power, transmission, and environmental obligations, BPA has created a governance team to lead IDSM efforts. The governance team is developing an Action Plan for integration of DSM in fiscal year FY 2017. Currently, the governance team is evaluating BPA’s DSM activities, assessing DSM impacts to BPA, advancing BPA’s analytical capabilities for economic valuations, determining internal practices for IDSM, and exploring external DSM business relationships.

Seventh Power Plan Action Items

The Seventh Power Plan includes an Action Plan which describes the recommended actions to implement the Council’s Seventh Plan.¹⁷ Over 70 action items are identified in the Power Plan, with BPA playing a key or lead role in many of the items. Many of the items support BPA programs and will help in the achievement of savings towards BPA’s goals. BPA is working in coordination with the Council staff to prioritize and implement a number of the items recommended, recognizing resource requirements and constraints. Progress made on action items will be included in the update to EE Action Plan.

Value of Energy Efficiency

During times of low load growth and market prices, it is even more important to fully quantify the value that energy efficiency provides beyond first year energy savings. BPA has developed a utility specific tool to assist utilities in understanding the benefits of EE. BPA is also coordinating with the Council to develop additional support or tools that can be developed to uncover benefits like reducing system risk, improving adequacy and supporting the environment with the goal of using these tools to communicate the value of energy efficiency.

¹⁷ http://www.nwcouncil.org/media/7149934/7thplanfinal_chap04_actionplan.pdf

1.7 ORGANIZATION OF THE ACTION PLAN

BPA divided the remainder of the Action Plan into four sections. Section 2 describes new initiatives underway at BPA and identifies the sources of energy savings to meet the Seventh Plan goals. Section 3 describes the six sector strategies in detail. Section 4 discusses the role of ETs, and Section 5 presents the program evaluation plan for the next five years. Section 6 discusses DR efforts within BPA. Finally, two appendices are included that provide additional BPA reference sources and give a list of abbreviations and acronyms.



2 Components of Energy Efficiency Programmatic Savings and Costs

The Seventh Plan's primary resource strategy is to acquire 1,400 aMW of EE by 2021. This section first reviews BPA's budget to acquire a portion of that goal (580.7 aMW), and then discusses BPA's forecasted savings and estimated costs.

2.1 ENERGY EFFICIENCY BUDGET

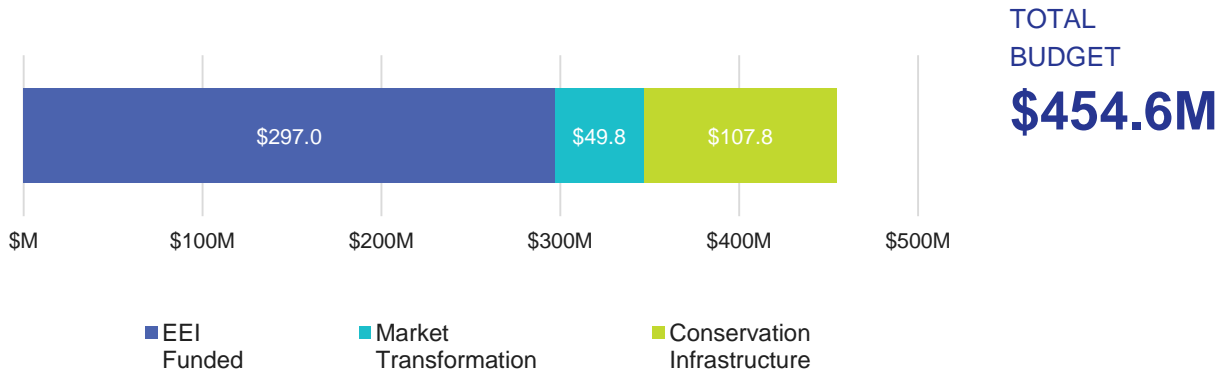
BPA establishes the budget for EE through the Integrated Program Review (IPR) process, a BPA-wide public process that occurs every two years and informs the rate case. At the time of this Action Plan, BPA has set the IPR budgets through 2019 (the BP18 rate case). The Action Plan does not project anticipated budget outcomes of the future IPR process through 2021. The budget numbers presented in this plan are subject to change based on the IPR process, Focus 2028, or other BPA changes. The 2016-2019 budget is reflective of the four-year EE budgets determined through the IPR and is grouped into three categories:

- **Conservation purchases.** BPA programmatic savings reimbursements and EEI funds. Includes performance payments and Energy Smart Reserved Power (ESRP).¹⁸
- **Market transformation.** Support for NEEA's market transformation initiatives. Market Transformation is the strategic process of intervening in a market to create lasting change in market behavior, by removing identified barriers or exploiting opportunities to accelerate the adoption of cost-effective energy efficiency as a matter of standard practice.
- **Conservation infrastructure.** All support for programs and operations, including third-party program implementation, contract support, market research (Momentum Savings research), evaluation, and ETs. Conservation Infrastructure costs are not included in the programmatic cost calculations throughout this document (\$M/aMW, \$/kWh and levelized cost).

Figure 1 outlines the total budget for each category for the 2016-2019 period, and Figure 2 shows the budget by source for each year; \$454.6 million reflects the total budget to achieve BPA's share of savings.

¹⁸ ESRP includes savings from hydroelectric facilities and transmission substations as well as some fish hatcheries and irrigation districts that access power directly from the Federal Columbia River Power System; these facilities have station service or reserved power rather than being customers of a local utility.

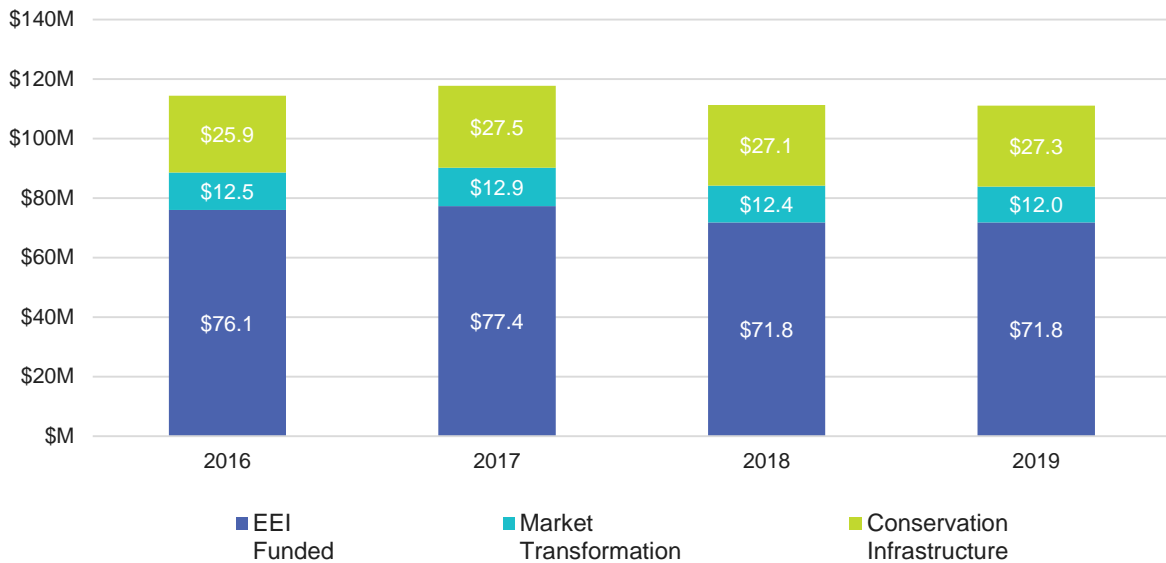
Figure 1: BPA Budgets by Source, Combined (\$M): 2016-2019



Note: Due to rounding, numbers may not add to the total.

Source: BPA Integrated Program Review, 2016

Figure 2: BPA Budgets by Source and Year (\$M): 2016-2019



Note: Due to rounding, numbers may not add to the total.

Source: BPA Integrated Program Review, 2016

2.2 SAVINGS FORECASTS

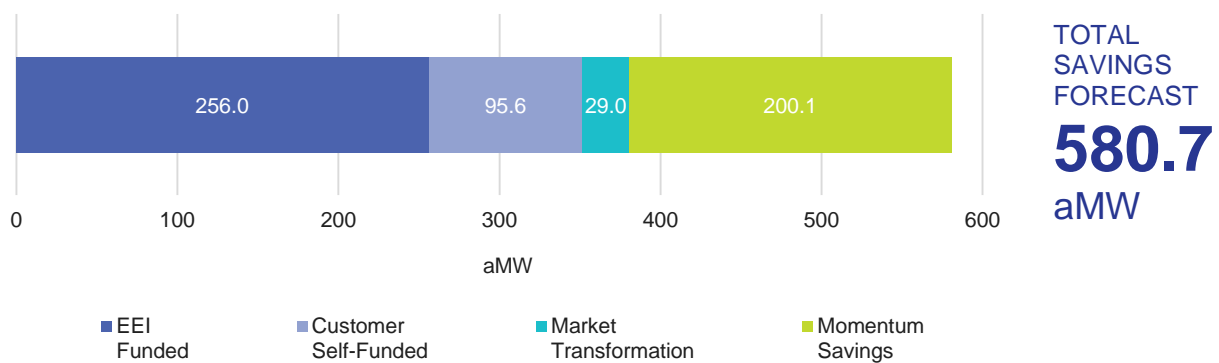
BPA meets the Seventh Plan EE savings goals through three mechanisms: programmatic savings, market transformation, and Momentum Savings. BPA details these mechanisms and the EE savings forecast for each in this section. While BPA strives to develop the most accurate forecast possible (and

has overachieved goals since the Council's Fifth Plan), BPA acknowledges the uncertainty of the forecasts given the complexity in estimating EE savings and costs for the variety of reasons identified in Section 1.6.

Figure 3 shows BPA's combined savings forecast for programmatic, market transformation, and Momentum Savings activities from 2016 to 2021 (580.7 aMW). BPA estimates total programmatic savings to account for 351.6 aMW. BPA divides programmatic savings into two categories by funding source: EEI-funded programmatic savings (256.0 aMW) and customer self-funded programmatic savings (95.6 aMW). EEI-funded programmatic savings are savings reimbursed by BPA through the EEI. Customer self-funded programs are programs developed by BPA or customers but for which customers will not seek reimbursement from BPA. Customers still report these savings to BPA, and BPA claims these savings.¹⁹

In addition to programmatic savings, BPA forecasts 200.1 aMW of Momentum Savings and 29.0 aMW of market transformation savings.

Figure 3: BPA Savings Forecast by Source, Combined (aMW): 2016-2021^{20 21}



Note: Due to rounding, numbers may not add to the total.

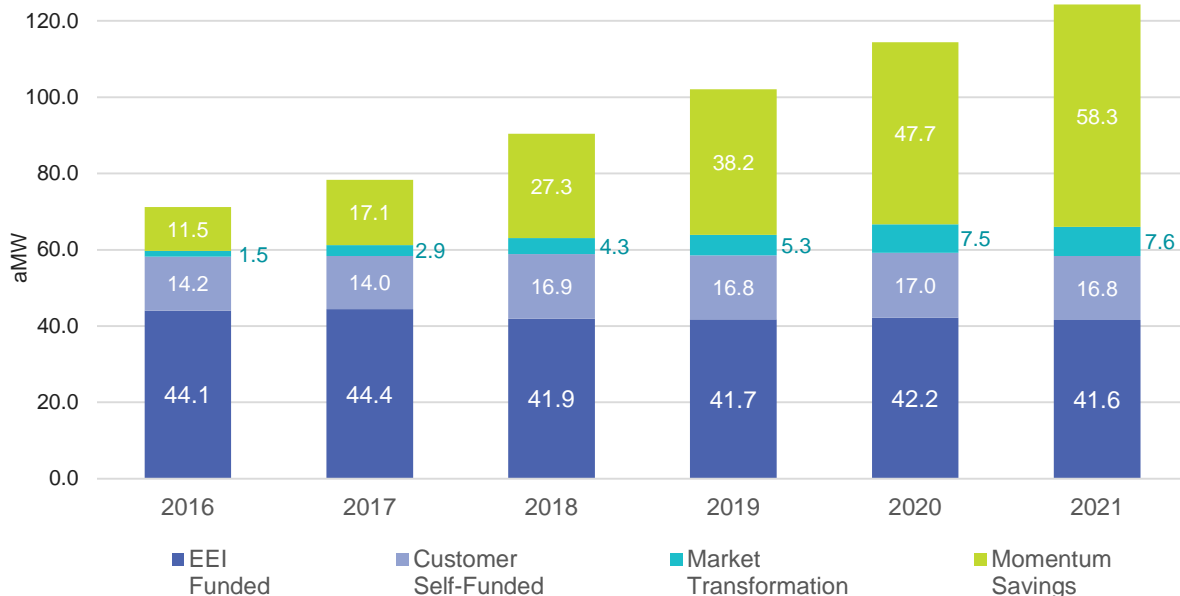
Source: BPA analysis, 2016

Figure 4 shows BPA's forecasted savings from programmatic, market transformation, and Momentum Savings activities by year from 2016 to 2021.

¹⁹ Since 2012—and determined through post-2011 policy—BPA has funded 75% of the programmatic savings, and utilities have self-funded the remaining 25%. Actual self-funding from 2012 to 2014 was 29%. From 2016 to 2017, BPA estimated actual self-funding at 25%. From 2018 to 2019, BPA estimated self-funding at 30%.

²⁰ The total varies by 1 aMW as a result of rounding.

Figure 4: BPA Savings Forecast by Source and Year (aMW): 2016-2021



Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Programmatic Savings

Programmatic activities offer the largest contribution to BPA’s energy savings potential, and BPA estimates programmatic savings of 351.6 aMW. Programmatic savings are energy savings achieved through BPA’s customers and funded through BPA EEI reimbursement and direct utility funding. BPA and public power achieve these savings through a mix of unit energy savings (UES), calculated measures, custom projects, and third-party programs in various sectors.

Estimates of programmatic savings begin with the Seventh Power Plan supply curves. BPA assesses changes to the mix of available and cost effective measures; measures that are new to Plan, no longer cost effective, or have been removed from the Plan and incorporated into the Seventh Plan baseline.

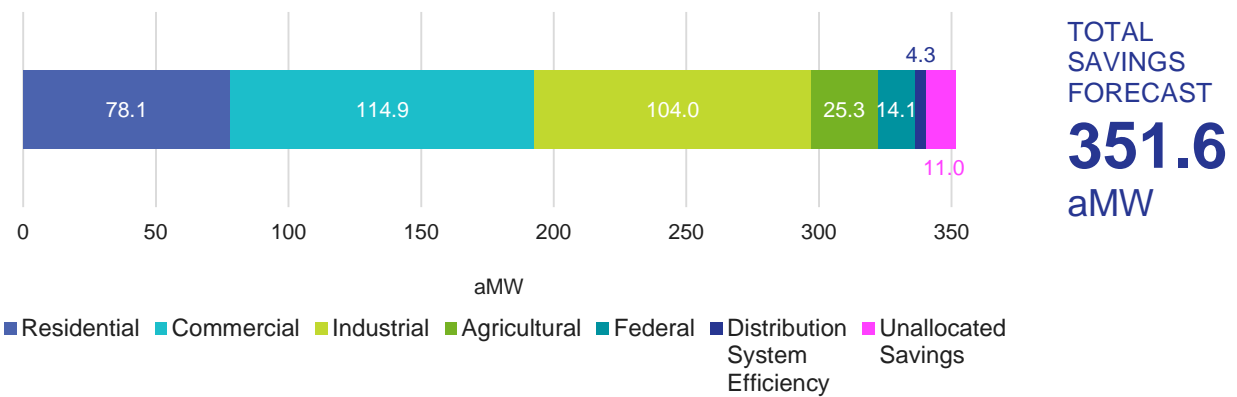
This Action Plan employed a specific method to determine the programmatic savings forecast: each BPA sector lead applied a bottom-up approach to achieve cost-effective energy savings forecasts. The approach took into account the BPA 2016-2019 budget, expected program growth and participation, and anticipated technology proliferation. Once all programmatic opportunities are identified, savings are shared with NEEA and the momentum savings team and removed in these savings types to ensure that these savings are not double counted. More information on the development of Momentum Savings forecasts is discussed further in the Momentum Savings section below.

Once BPA completed the bottom-up approach, the total programmatic savings forecast required less expenditures than BPA’s allocated programmatic budget. BPA is near certain that customers will spend the remaining budget above the total of the sector’s cost estimates and generate associated savings, but BPA is uncertain in which sectors customers will choose to invest. BPA is introducing a new line item to account for budget not forecasted to be spent in any particular sector but that BPA is confident customers will use to generate savings. This line item is called unallocated savings. These savings are a part of programmatic savings, and are the direct result of the anticipated spending of the portion of BPA’s budget that was not claimed in any particular sector lead’s plan.

In addition, there were savings identified in 2018 and 2019 that are not included in the EE Action Plan. A few aMW per year (1-2 aMW) were identified as potential programmatic savings by sector leads but were not included in the Action Plan as these savings were not achievable using the projected available budget and cost estimates for those years.

BPA will achieve the majority of the total savings forecast from the commercial, industrial, and residential sectors, with contributions from the agricultural, federal, and distribution system efficiency sectors. Figure 5 shows the breakdown of programmatic savings.

Figure 5: BPA Savings Forecast by Sector, Combined (aMW): 2016-2021

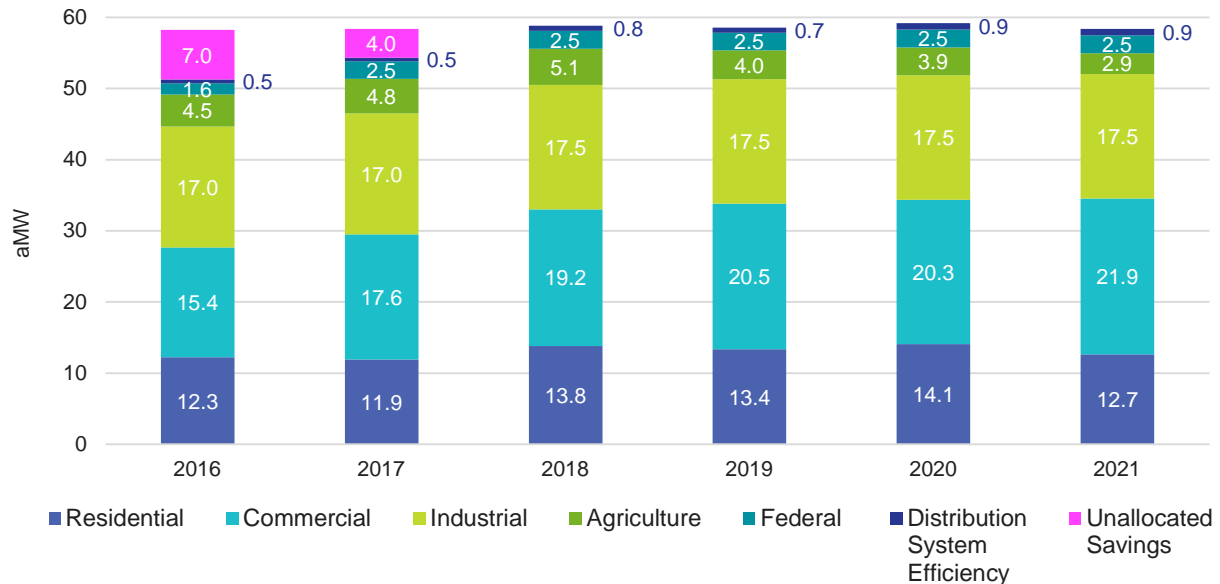


Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 6 shows BPA savings broken out by sector and year.

Figure 6: BPA Savings Forecast by Sector and Year (aMW): 2016-2021



Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

Market Transformation

NEEA develops and delivers programs that capture savings associated with market transformation in the regions served by its funding utility members. NEEA has been leading market transformation efforts in the Northwest since 1997. BPA provides funding to NEEA to undertake market transformation actions that push markets toward more efficient technologies.

Over the Seventh Plan period, NEEA predicts it will achieve 27.5 aMW of market transformation savings to BPA. NEEA’s Seventh Plan savings estimates are the result of several influences:

- **NEEA’s budget declined and its overall goals decreased.** A reduction in budget from the 2010 to 2014 Business Plan led NEEA to reduce its total regional savings goal by 27% in its 2015 to

2019 Business Plan.”; and add a footnote to this sentence stating “Total Regional Savings goal is based on NEEA baseline methodology vs. Council Power Plan methodology.”²²

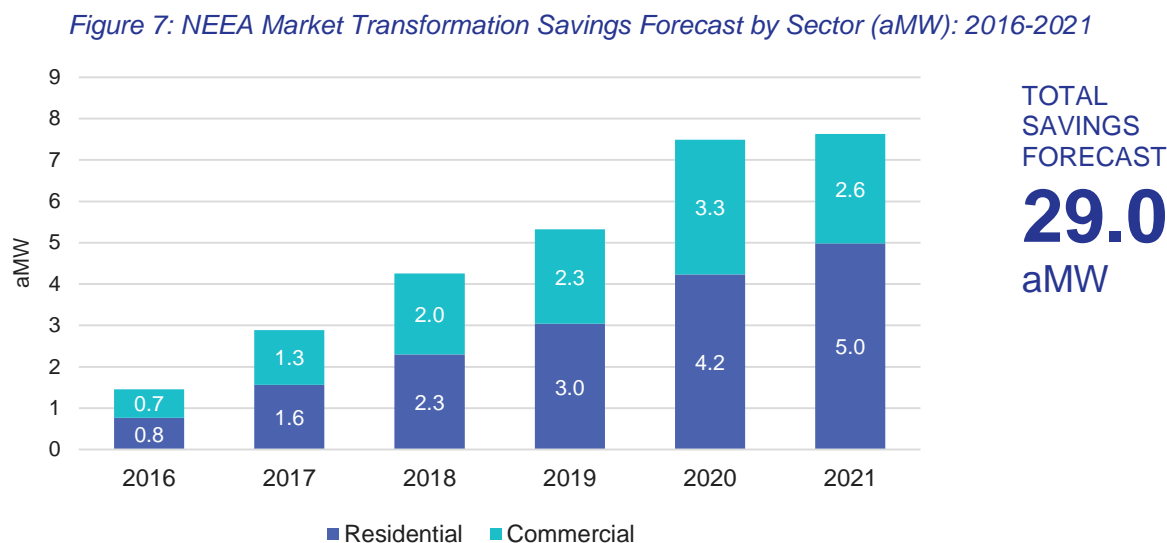
- **A new Power Plan reset the baseline.** The Council reset the Seventh Plan baseline to include savings anticipated from new codes and standards as well as televisions, residential lighting, and desktop power supplies. Resetting the baseline to market conditions in the Seventh Plan means that NEEA no longer captures a significant portion of the savings from previous market transformation work.²³
- **Efficiency is getting more difficult.** Thanks in large part to the success of codes and standards, the era of large, easy-to-capture EE programs (e.g., compact fluorescent lamps, commercial lighting retrofits, residential weatherization) appears to be ending. Although efficiency opportunities remain, by and large, the remaining EE potential is available in smaller increments, is more diverse, and is integrated into larger systems and behaviors that must simultaneously be addressed to capture the savings.
- **The forecast excludes new projects.** NEEA has a policy to not report savings forecasts for initiatives that have not reached the market development phase.²⁴ Prior to market development, NEEA tests the market transformation theory and gathers information about the product and market conditions, which makes the savings forecasts highly variable.
- **Momentum Savings from NEEA.** Nearly 40 aMW of savings over the six year period are identified as momentum savings from NEEA. A detailed explanation of these savings is located below.

²² NEEA's Business Plan is a five-year roadmap to achieve its goals. The 2015 to 2019 Business Plan is located at: <https://neea.org/docs/default-source/default-document-library/neea-2015-19-business-plan---board-approved.pdf?sfvrsn=2>.

²³ NEEA estimates that savings from new standards that it influenced will bring more than 100 aMW from 2015 to 2019. These savings have been included in the Seventh Plan load forecast and measure baseline.

²⁴ During the market development phase of the market transformation process, NEEA develops comprehensive strategies to overcome identified market barriers through opportunities and leverage points. NEEA also develops an implementation plan that identifies specific market interventions and appropriate market actors to implement these activities. NEEA ramps up its initiatives in the market development phase and is able to report energy savings.

Figure 7 shows the market transformation savings forecast by sector for 2016-2021. NEEA does not expect savings within the industrial and agricultural sectors.



Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Momentum Savings

Momentum Savings are cost-effective savings that occur above the Seventh Plan baseline and are neither incentivized by utility programs nor included in NEEA's market transformation activities. Momentum Savings are a key component of the Action Plan as they build on and enhance programmatic savings.

Quantifying Momentum Savings allows the region to capitalize on the investments made in EE and target future investments more effectively. The success of past investments and other market forces means that some markets no longer require an incentive for every efficient measure delivered in the region. In these markets, the region's work has created momentum—programs can now do less and still move the market and capture the savings, allowing program managers to invest their time and funds into markets or technologies that need more intervention to advance the market for efficiency.

Components of Momentum Savings

Momentum Savings encompass three types of savings within the market. These include the following:

- Momentum Savings from NEEA
- Momentum Savings from new standards
- Momentum Savings from market effects

Momentum Savings from NEEA

NEEA conducts market transformation efforts throughout the region to remove barriers and achieve sustained adoption of efficiency and the associated energy savings. In markets where NEEA, BPA and utilities are collaborating, resulting energy savings are reported in several categories in order to avoid double counting and without regard to the attribution of cause and effect. Momentum Savings from NEEA are reported in markets for which NEEA has initiatives and quantifies savings and where the current market is above the Council baseline. Momentum savings from NEEA are include in BPA's Momentum Savings.

Momentum Savings from New Standards

Standards have a dramatic and lasting impact on energy demand in the region.²⁵ Federal and state efficiency standards have all but eliminated the most inefficient products from the market. Standards also continue to evolve, increasing in stringency for existing regulations and expanding scope to cover previously unregulated products. Momentum Savings from federal codes and standards count toward BPA's EE achievements as long as the Council has not accounted for the given code or standard in the Seventh Plan baseline.

Momentum Savings from Market Effects

Momentum Savings from market effects are driven by changing market dynamics and new technologies at accessible prices that drive market adoption. Some of this market adoption is the result of program efforts, economies of scale, product availability, and consumer familiarity. Beyond the market adoption and savings directly tied to programs, Momentum Savings from market effects occur where the current market baseline is above the Council baseline and after accounting for Momentum Savings from NEEA and federal standards. One source of significant Momentum Savings from market effects is the lighting market, where the emergence of LEDs at lower price points coupled with regulation removing less efficient technologies from the market has led to large sources of Momentum Savings.

Methodology

This section describes the high-level methodologies for calculating Momentum Savings from NEEA, codes and standards, and the market. At the highest level, the calculation of Momentum Savings in a given market follows this equation:

$$\text{Total Market Savings} - \text{Total Program Savings} = \text{Momentum Savings}$$

²⁵ For example, BPA analyzed appliance standards over a 25-year period and found that the efficiency resource is on par with an entire Bonneville dam—1,500 aMW. This resource is enough to power more than 1 million homes and illustrates the magnitude of savings that standards can deliver.

Where:

Total Market Savings is the difference in the annual electricity consumption (aMW) between hypothetical energy consumption estimates as defined by the Seventh Plan and actual market consumption estimates as defined using distributor sales data.

Total Program Savings are electricity savings directly attributed to efficiency programs in the region and measured against the Council's defined baseline.

BPA has developed models that quantify Momentum Savings from market effects from 2010 to 2015 for several markets within the residential, commercial, and agricultural sectors. BPA has focused on lighting and heating, ventilation, and air conditioning (HVAC) end-uses to date. These models also underlie the Momentum Savings from market effects forecast for the Action Plan.²⁶

To estimate Momentum Savings for this Action Plan, BPA took into account several key market forces to avoid double counting. First, BPA reviewed the Seventh Plan supply curves and load forecasts to determine where the Seventh Plan baselines incorporated upcoming changes as a result of federal standards. BPA did not include Momentum Savings from new standards in the Action Plan forecast for measures where the Seventh Plan accounted for upcoming federal standards. BPA developed savings estimates for future standards based on the US Department of Energy's (DOE's) docket containing the expansions occurring in energy regulation.

Second, BPA developed a forecast for Momentum Savings from NEEA initiatives that overlap with BPA Momentum Savings research and removed these from the Action Plan estimate. For example, BPA used the anticipated savings from NEEA's Reduced Wattage Lamp Replacement initiative to forecast total units (kilowatt-hours) saved over the Action Plan period by using existing sales data. BPA then removed this unit amount from the nonresidential lighting Momentum Savings forecast.

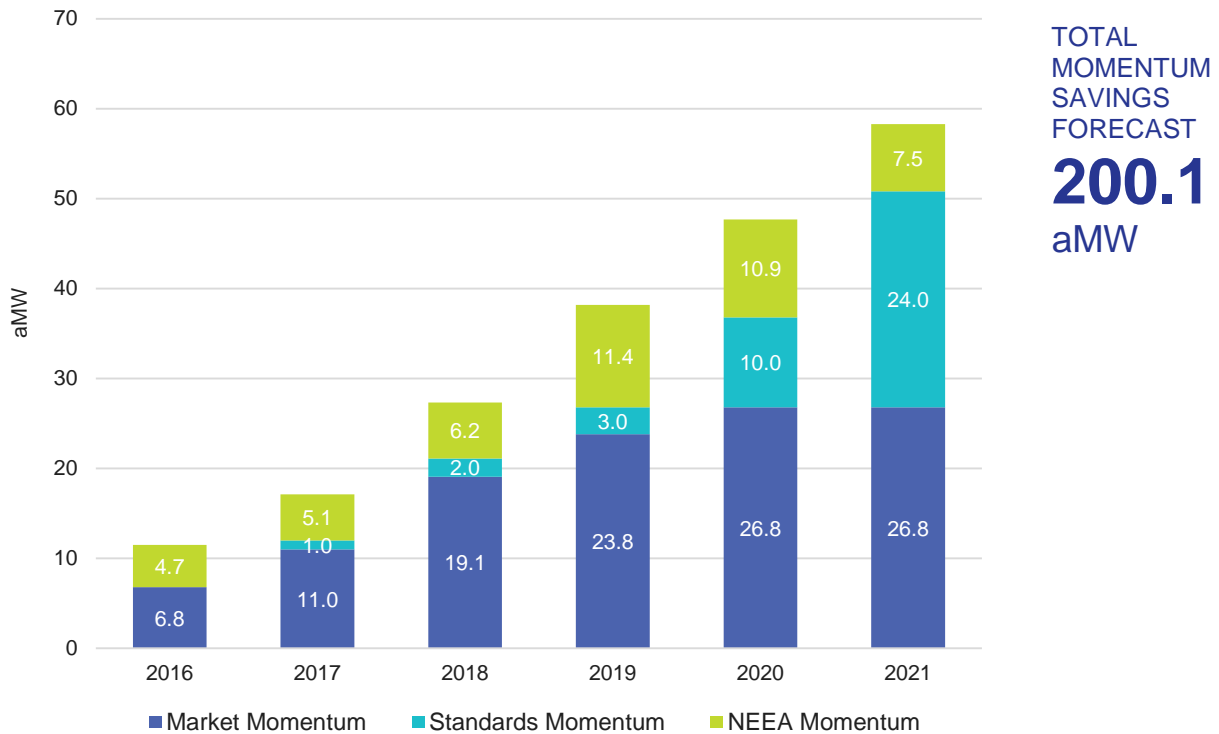
Third, BPA reviewed program savings in each sector. BPA then subtracted program savings from Momentum Savings to avoiding double counting.

Forecast

BPA estimates total Momentum Savings will be 200.1 aMW from 2016 to 2021, as Figure 8 shows. A description of the forecasted Momentum Savings within each program sector follows.

²⁶ More information about how BPA calculates Momentum Savings is calculated can be found in a white paper: available at: https://www.bpa.gov/EE/Utility/research-archive/Documents/Momentum-Savings-resources/Overview_on_Momentum_Savings_white_paper.pdf

Figure 8: BPA Momentum Savings Forecast (aMW): 2016-2021



Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Residential

The total forecasted Momentum Savings from 2016 to 2021 for the residential sector is 90.1 aMW. BPA expects lighting to be a significant source of Momentum Savings from market effects, as LED adoption rates are growing at a rapid rate and will increase through 2020. Efficiency gains from federal appliance standards also contribute to the residential Momentum Savings from new standards forecast. The DOE has adopted several residential appliance standards that will go into effect in the final years of the plan, increasing Standards Momentum Savings from new standards. In addition, BPA expects NEEA's market transformation initiatives in ductless heat pumps (DHPs), heat pump water heaters, and newly constructed homes to lead to Momentum Savings from NEEA.

Commercial

The commercial sector will contribute 109.4 aMW in Momentum Savings to the total six-year goal. Similar to the residential sector, lighting makes up a significant portion of the Momentum Savings from market effects as a result of rapidly rising LED adoption rates in nonresidential applications. In addition, the US DOE recently adopted a standard governing the efficiency of commercial packaged air conditioners and heating equipment. This standard is the most impactful standard the DOE has ever adopted,²⁷ creating significant energy savings. The first phase of the standard takes effect in 2018, and the second phase takes effect in 2023, which will continue to increase the Momentum Savings from new standards for commercial in later years. In addition, BPA expects NEEA's market transformation initiatives in lighting and commercial buildings to lead to Momentum Savings from NEEA.

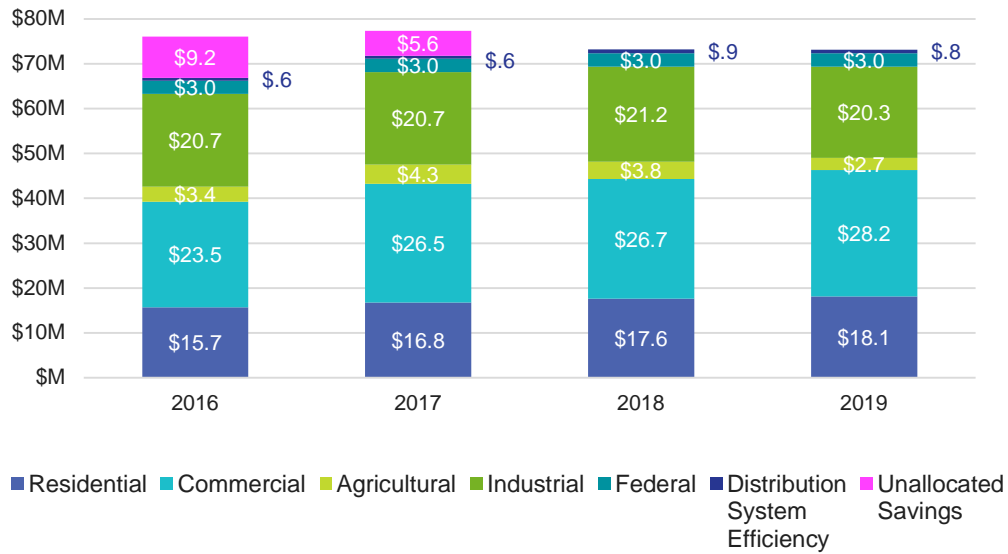
Industrial and Agricultural

BPA is not forecasting any Momentum Savings from market effects for the industrial and agricultural sectors at this time, as it is doubtful that BPA can quantify either of these markets with the data sources currently available. However, BPA will attribute savings to these sectors when other Momentum Savings research identifies savings from specific measures. For instance, BPA expects to attribute some Momentum Savings to the industrial sector through BPA's nonresidential lighting Momentum Savings from market effects research.

2.3 COSTS ESTIMATES

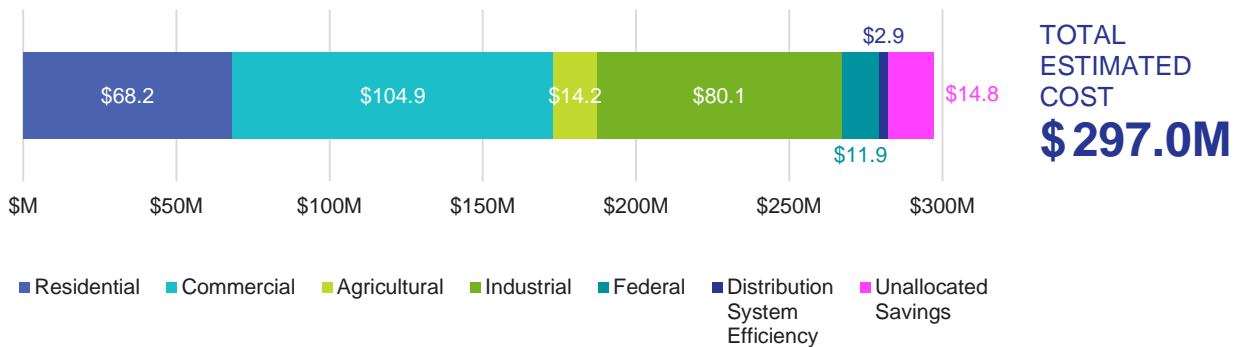
BPA sector leads estimated program costs by examining historical and forecasted reimbursement levels, and program delivery and administrative costs (including performance payments, program implementation, research, evaluation, and contract support). BPA used this examination to reach the best realistic estimate of program cost given market conditions, historical program uptake, anticipated new opportunities, and technological or other constraints. The BPA planning department then compared the sector leads' cost estimates to the BPA 2016-2019 budget allotted for EE activities.

²⁷ US Department of Energy, "Energy Department Announces Largest Energy Efficiency Standard in History," December 15, 2015. www.energy.gov/articles/energy-department-announces-largest-energy-efficiency-standard-history



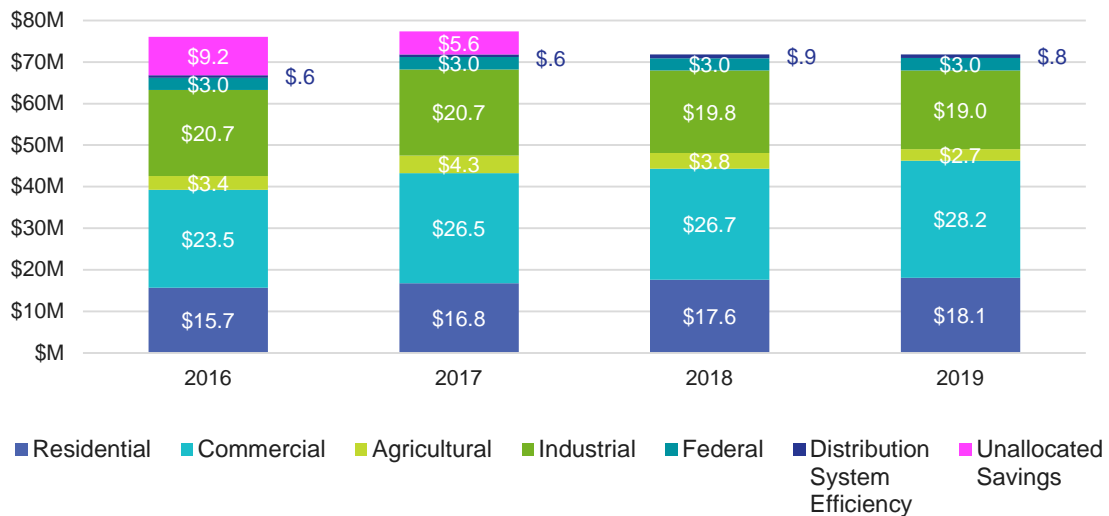
Figures 13-15 show BPA’s estimated cost for EEI-Funded programs only. The total estimated cost to BPA for 2016-2019 is \$297.0 million. Figure 9 shows the breakdown of these costs by sector. Figure 10 shows the breakdown of costs by sector and by year. Figure 11 shows average costs. Conservation infrastructure costs are not included in the programmatic cost calculations.

Figure 9: BPA Cost Estimates, Combined (\$ Millions): 2016-2019



Note: Costs include only BPA EEI-Funded programs.
Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

Figure 10: BPA Cost Estimates by Year (\$ Millions): 2016-2019

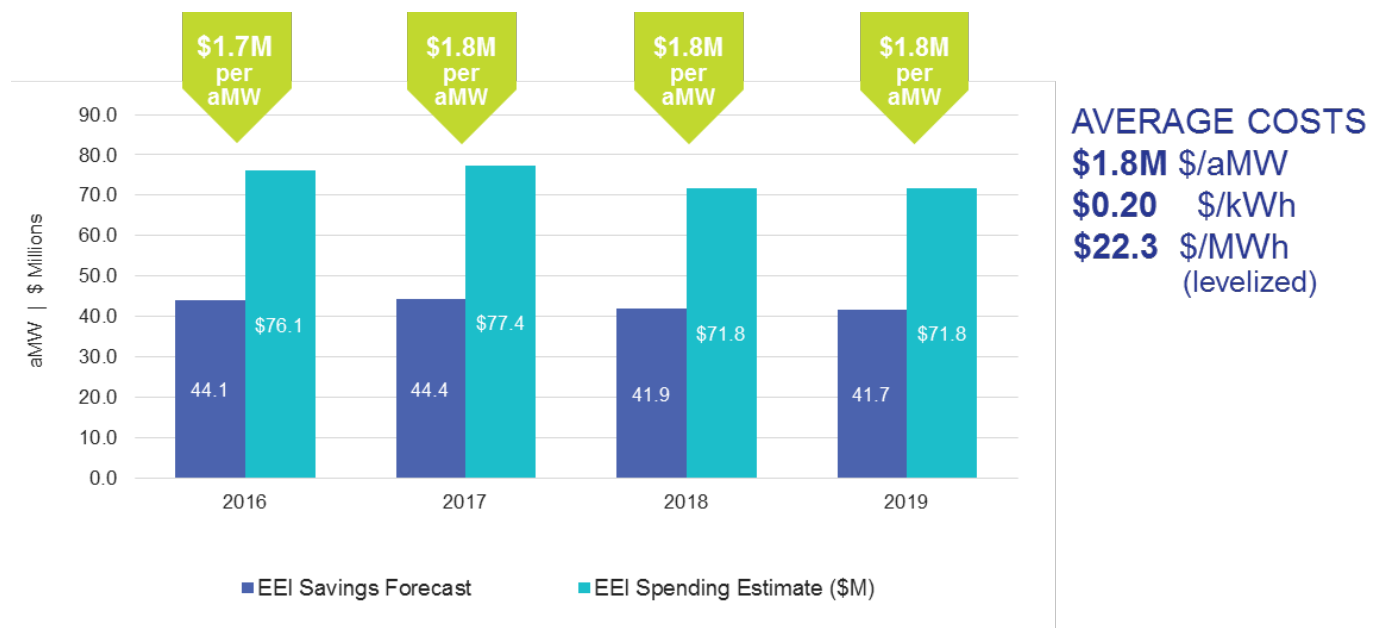


Note: Costs include only BPA EEI-Funded programs.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 11: Programmatic Savings and BPA Cost Metrics, Combined: 2016-2019



Note: Savings and costs include only BPA-Funded programs (self-funded savings not included).

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016



3 Sector Strategies

This chapter presents BPA's strategies to capture market potential, meet the needs of its customers, and achieve EE savings goals in the Seventh Plan period. This chapter also highlights accomplishments from the 2010-2014 Action Plan as well as BPA's work throughout 2015.

3.1 RESIDENTIAL SECTOR STRATEGY

This section presents the strategies the residential sector will employ in the Seventh Plan period to meet its savings forecast (185.7 aMW²⁸). It provides an overview of the residential program landscape, discusses the strategic opportunities that exist in the market, and outlines the planned approach to meeting the savings forecast. Finally, it presents the savings estimates, budgets, and metrics to gauge performance over the Seventh Plan period.

Residential Sector Landscape

BPA's residential sector provides regional infrastructure support in key areas such as retail lighting and showerheads with Simple Steps, Smart Savings™, and HVAC support through DHPs and Performance Tested Comfort Systems (PTCS®).

Many residential sector program measures have evolved in recent years and are distributed through multiple mechanisms. For example, BPA promotes LEDs and showerheads through midstream retail promotions as well as direct mail and direct installation program models. BPA's customers select the measures to promote based on the perceived value to their end-users. Customers take into account service territory, budget capacity, and other factors.

Accomplishments Since 2010 Plan Publication

The residential sector prioritizes EE programs that enable customers to successfully gain program interest from end-users and allow BPA to deliver cost-effective EE as a resource for the region. This requires that BPA support measures with high energy savings while watching out for attractive ETs and maintaining a full menu of measure and program support for all customers.

From 2010-2015, BPA collaborated with customers to save 159.7 aMW and deliver more than 18 new measures and policy changes to support its customers' EE programs. Highlights of the sector include:

- The Simple Steps, Smart Savings program included participation from 52 utilities from 2010 to 2015.
- The residential program diversified the programmatic measure portfolio in part to prepare for the rapid change in markets and the reduction of lighting savings potential as a result of the new Seventh Plan baseline.
- The sector team developed new measures for DHPs in new applications, PTCS heat pump conversions, variable speed heat pumps, heat pump water heaters, LED bulbs and fixtures, advanced power strips, exterior insulated doors, prescriptive duct sealing, and low-e storm windows.

²⁸ Includes programmatic, market transformation and Momentum savings

- BPA changed certain policies to provide more value and flexibility to customers. Changes included allowing utilities to use EEI funds for low-income weatherization, renewing BPA support for PTCS quality assurance (QA), expanding opportunities with BPA-qualified measures (such as including townhouses in the definition of single family), and removing permanently installed electric heat from the DHP and weatherization requirements.
- Since 2008, 95 BPA utilities have collaborated with 926 HVAC technicians to install 30,800 DHPs.
- Since 2006, 103 public utilities participating in the PTCS program have logged more than 90,000 heat pump or duct sealing jobs with the help of 4,122 PTCS-certified technicians.

Current Landscape Assessment

For the first time, the residential sector may not be BPA's leading sector for the acquisition of EE. Decades of successful utility programs and updated federal standards have moved market baselines in residential lighting, home appliances, weatherization, and new construction. Measures for refrigerators, freezers, and electric storage water heaters were recently retired. In the Seventh Plan, LED lighting is the largest new contributor of savings to the residential sector. However, the residential savings potential in the Seventh Plan is less than two-thirds that of the Sixth Plan. Codes and standards and past programmatic accomplishments have driven the reduction in potential savings. For example, the Seventh Plan eliminated the savings categories for televisions as a result of efficiency gains made during the Sixth Plan. In addition, the Seventh Plan reduced the savings potential for residential new construction shell upgrades as a result of the implementation of energy codes and standards across the region. Finally, updated Regional Technical Forum (RTF)²⁹-approved savings for UES measures in weatherization and HVAC have decreased significantly, resulting in less programmatic savings from the same measures.

Preparing for the Seventh Power Plan requires fresh thinking and new strategies to ensure that BPA efforts make the best use of utilities' and consumers' limited dollars. The biggest opportunities for savings for the residential sector in the Seventh Plan continue to be in lighting, HVAC (including weatherization), and water heating.

Existing Efforts

BPA organizes current residential sector strategies into broad technology categories, with delivery focused primarily on UES measures implemented by BPA's customers. These categories include lighting, refrigeration and plug load, water heating, HVAC and weatherization, and new homes. BPA describes the existing efforts within each of these categories in the following sections.

²⁹ The RTF is an advisory committee established in 1999 to develop standards to verify and evaluate conservation savings. More information can be found at <http://rtf.nwcouncil.org/>.

Lighting

The residential lighting program delivery will continue through a combination of retail promotion, direct mail, and direct installation efforts. In 2015, BPA's focus shifted to LEDs, as compact fluorescent lights (CFLs) are expected to phase out of the market beginning in 2016. BPA also developed LED fixture measures in 2015 and will continue to refine measures as LED technology matures.

Building upon the successful "Change a Light" CFL promotion (2006-2010), BPA expanded the Simple Steps, Smart Savings program to help the region coordinate delivery of CFLs, LEDs, light fixtures, showerheads, and appliances. Delivery mechanisms were diversified to meet a wider utility audience, including retail promotion, direct mail, and direct installations.

Appliances and Plug Load

After years of promoting ENERGY STAR refrigerators and freezers, the refrigeration programs have successfully transformed the marketplace, and the measures were retired in 2016. Refrigerator and freezer recycling to retire old and unnecessary second (and third) refrigerators and freezers will continue through FY 2017.

Plug load is a new category of savings that seeks to address a wide range of technologies that are plugged into outlets throughout residential homes and continuously drawing phantom electrical loads when not in use. The first measure approved to address this need is an infrared sensing power strip designed to reduce energy consumption in peripheral devices connected to home entertainment centers.

BPA continues to offer modest incentives for efficient clothes washers and recently added measures for efficient clothes dryers. As federal codes evolve, continued support for clothes washers is uncertain; however, the market for efficient clothes dryers is expanding, and BPA will continue to offer incentives for new dryer technology.

Water Heating

In 2015, BPA retired its electric storage water heater measure as the result of an update to federal standards. Heat pump water heaters were introduced as a new and viable alternative for electric water heating. As consumers become more familiar with this new technology, BPA expects uptake to increase over the coming years. Thermostatically controlled shutoff valves (TSVs) offer a new savings opportunity in water heating and were added to BPA's UES measure list October 2016. Although not a new technology, energy efficient showerheads also factor heavily in the Council's potential as an opportunity for water heating savings.

HVAC and Weatherization

Like lighting and water heating, the residential HVAC arena has experienced a huge makeover since 2010. BPA's focus moving forward is on gathering data on PTCS heat pumps, duct sealing, and DHPs to understand how program design can address issues identified by QA.

When the RTF updated the Simplified Energy Enthalpy Model (SEEM) modeling tool in 2015, the savings attributed to weatherization and HVAC equipment measures (insulation, windows, air sealing) decreased by as much as 50%. Still, residential weatherization programs have long been a backbone of customer service value for utilities, and few utilities have expressed intention to end their residential weatherization programs. However, most assume that their program activity will decrease as a result of lower incentive levels.

BPA continues to look for ways to expand HVAC and weatherization measure and program opportunities to improve the equity of access to EE across the region. Over the past five years, low-income measures expanded to include more complex weatherization measures than were previously included in the program. Additional work is underway to find ways to increase low-income program activity and to reduce program barriers for utilities, low-income agencies, and consumers.

Multifamily weatherization and HVAC opportunities span both residential and commercial sectors and have a great deal of untapped potential. BPA will explore this program area to assist interested utilities where the best opportunities exist.

New Homes

BPA is collaborating with NEEA on a standard modeling protocol pilot to test whether an energy savings performance based approach to incentives—in addition to measure-based incentives—can help utilities achieve additional energy savings from new construction by promoting the overall efficiency of homes.

In 2012, working with NEEA, Northwest Energy Works, and regional factories, BPA funded several prototype homes to exceed the current Northwest energy efficient manufactured (NEEM)³⁰ home. This preliminary work is now feeding into a NEEA-led initiative to revise the high-performance manufactured homes specification to be more accessible to Northwest factories and increase uptake. BPA is also partnering with NEEA on the rollout of a new NEEM specification, which will integrate cost-effective measures that seek to continue to transform the manufactured home market to higher efficiency.

BPA also sees opportunities in multifamily new construction to explore a range of measures from cost-effective HVAC to cutting-edge building science that provides a pathway to net-zero construction. BPA will explore these opportunities during the Seventh Plan period. Figure 12 highlights BPA's residential sector program structure.

³⁰ The NEEM program is the longest running residential energy efficiency program of its kind in the nation. Beginning in 1988, there are over 200,000 certified houses built today, and the most ENERGY STAR Homes in the country. Northwest Energy Works has been an integral part of the design, implementation, and program management of this heralded program since its inception.

Figure 12: Residential Sector Structure



Source: BPA, 2016

Market Research

Market research continues to point to lighting, HVAC (including weatherization), and water heating as priority focus areas for residential sector energy savings, peak reduction, and value to consumers. Market research helped BPA identify and track the rapid decline of CFLs. It also helped identify a new trend in supply chain practices for LEDs where factories are opting to sell directly to retailers and bypass quality inspection oversight and ENERGY STAR specifications. Research into the HVAC market will help BPA assess the impacts of the 2015 federal standards change³¹ for air source and variable speed heat pumps. NEEA's Market Progress Evaluation Reports³² for DHPs and heat pump water heaters provide additional research to inform technology and program strategy.

³¹ For more information on the federal standards change for consumer central air conditioners and heat pumps visit: <https://energy.gov/eere/buildings/appliance-and-equipment-standards-program>

³² Accessible at: www.needa.org/resource-center/market-research-and-evaluation-reports.

Strategic Opportunities and Planned Approach

This section outlines BPA's approach to meeting residential EE program goals. The section identifies new and planned efforts including how ETs, research and development (R&D), and Momentum Savings contribute to savings forecasts.

New and Planned Efforts

The following are new or planned efforts that are underway or pending in the key strategic areas of HVAC, lighting and appliances, weatherization, and water heating.

HVAC

- Assess opportunities for ducted applications for mini-split heat pumps
- Renew development of measures for DHPs in new construction
- Research opportunities for simplifying the PTCS program to meet utility and contractor needs in addition to better aligning the program with Air Northwest³³
- Coordinate DHP and PTCS heat pump program offer with Air Northwest
- Develop a new measure and program strategy for smart thermostats
- Look for opportunities for savings in zonal electric homes including promoting retrofit of bi-metal line voltage thermostats with electronic line voltage thermostats
- Assess energy savings opportunities of inverter-driven mini-split systems with both ductless heads and ceiling/wall cassettes using short duct runs
- Study non-energy impacts (NEIs) in an effort to monetize NEIs for use in a total resource cost test
- Assess potential for DHP applications in existing multifamily buildings

Lighting, Appliances, and Electronics

- Manage the decline and departure of CFLs in the Simple Steps, Smart Savings program
- Continue market research to track market and performance issues with LED lamps and integrated fixtures
- Continue retail program support
- Expand direct mail and other opportunities to support small, rural customers
- Explore potential for lighting controls
- Continue outreach efforts to involve smaller chains in rural areas
- Continue creating innovative value for retailers in the face of small incentives
- Coordinate with regional initiatives that may provide more value than BPA can offer alone

³³ Air Northwest is sponsored by BPA and the Northwest public power utilities. Air Northwest is the premier resource for HVAC EE information in the Northwest.

Weatherization

- Stay aware of issues within single family and manufactured weatherization programs
- Assess opportunities for new insulation and air sealing materials and techniques
- Analyze regional multifamily weatherization programs for potential measures
- Investigate methods for greater utilization of multifamily program offerings to increase savings achieved in this difficult-to-reach segment
- Study NEIs in an effort to monetize them for use in a total resource cost test

Water Heating

- Continue promotion of heat pump water heaters by leveraging NEEA marketing support
- Continue to promote showerheads and TSVs, including promotion of direct mail delivery opportunities

New Homes

- Develop new Zero Energy Ready Multifamily Construction program that aligns with the energy goals of Oregon and Washington
- Implement modeling software based new single family construction program in coordination with NEEA that allows utilities to align with certification programs of their choice or develop programs of their own
- In partnership with NEEA, develop an advanced but implementable specification for new manufactured homes that exceed HUD energy code projections

Emerging Technologies and Research and Development

Over the past decade, BPA has invested in residential ETs to expand measure opportunities beyond the past tried-and-true opportunities such as lighting, appliances, and weatherization. To date, this research work has successfully delivered new program opportunities and measures for DHPs, heat pump water heaters, variable speed heat pumps, and heat pump dryers.

Currently, investment in ETs is advancing research initiatives in the following:

- Smart thermostats
- Carbon dioxide-based heat pump-driven water heaters, and multifunction pool heating systems
- Low global warming potential refrigerant heat pumps
- Better defrost strategies for heat pumps
- New applications for mini-split heat pumps and DHPs
- National Renewable Energy Laboratory regional potential modeling tool
- Multifamily modeling tool
- Several multifamily research initiatives including smart HVAC controls
- Technology-to-market opportunities that leverage US DOE Building Technology Office-funded residential technology research

BPA vets each of these opportunities with both internal and external technology experts and stakeholders to ensure that BPA directs its limited research funds to opportunities with high potential benefit.

Momentum Savings

The forecast for Momentum Savings in the residential sector is 90.7 aMW between 2016 and 2021. BPA anticipates quantifying and claiming these Momentum Savings from two major markets: lighting and HVAC.

Momentum Savings from Market Effects

BPA expects lighting to be a significant contributor to the Momentum Savings achievements, as LED adoption rates are growing at a rapid rate and are expected to increase through 2020. Although Momentum Savings from market effects will capture this natural movement in the market, BPA’s program offerings may need to focus on areas of the market where LED uptake is not as robust, such as specialty lamps. Market momentum for HVAC is limited to efficiency improvements for the HVAC unit only (i.e., box savings), while the residential HVAC program offerings continue to promote quality installation savings from sizing and controls.

Momentum Savings from New Standards

BPA expects efficiency gains from federal appliance standards to contribute about one-quarter of the residential Momentum Savings forecast. During the 2014 to 2015 rulemaking, the US DOE considered six federal standards affecting residential appliances and HVAC equipment. Many of the standards will go into effect in the final years of the Seventh Plan, thus increasing Momentum Savings.

Momentum Savings from NEEA

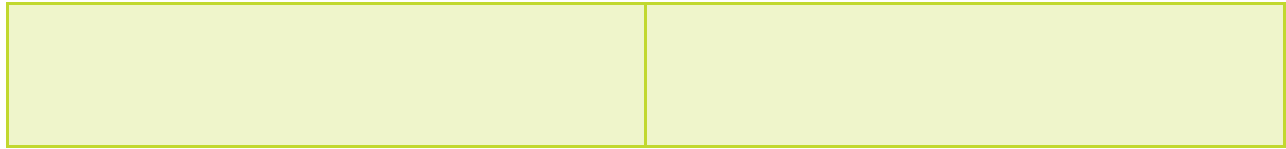
Momentum Savings from NEEA are expected to make up approximately one-third of the Momentum Savings forecast and include improvements to residential building codes. NEEA’s market transformation efforts for the residential sector span several markets including DHPs, heat pump water heaters, and newly constructed homes.

Challenges and Opportunities

Utilities face a myriad of risks, barriers, and challenges that may prevent adoption of residential measures. The following sections detail some of these risks, barriers, and challenges and notes strategies BPA may utilize to overcome them.

Challenge or Risk	How BPA will address
BPA struggles when Power Plan potential is inconsistent with subsequent reductions in measure or program savings, or when the potential is limited by low incremental costs.	Savings reductions continue to occur in once popular measures and programs, forcing BPA to adapt and seek new technologies in new markets to fill the pipeline and replace the old. To help accomplish this, BPA provides

<p>Years of program success has resulted in a higher efficiency baseline, resulting in lower program savings.</p>	<p>leadership in new technology development through its Technology Innovation framework, and Emerging Technology program.</p> <p>BPA will continue to work with public power to find creative new program opportunities and leverage new market research to fill the gap resulting from increasing baselines.</p>
<p>Consumers may be hesitant to invest in new technologies due to uncertainty in the product and high cost.</p>	<p>BPA will work with the region to support and improve these technologies and effectively market and communicate the benefits. BPA has some flexibility in setting it's willingness to pay to help overcome high first-cost barriers.</p>
<p>Some retail programs are struggling due to lack of customer interest.</p>	<p>BPA will continue to research these markets to understand the most effective approach for capturing savings. BPA has recently adapted by expanding its retail model to include on-line product ordering and on-line customized kits ordering.</p>
<p>The complexity of EE programs continues to hinder some consumers ability or interest to participate.</p>	<p>BPA will be working with public power utilities through the Efficiency Forward initiative to identify and implement opportunities for improvement. BPA will work to streamline and consolidate program delivery mechanisms, measures, payments, and requirements to improve the appeal of offerings.</p>
<p>Rapidly evolving markets can result in low quality products and confusion for consumers.</p> <p>Codes and standards change and erode savings potential, making it harder to make goal.</p>	<p>Programs will focus on incenting high quality products that meet regional requirements, and in educating consumers via refreshed marketing materials to help them make the best efficiency choices.</p> <p>BPA coordinates with EnergyStar and CEE to stay abreast of nationwide code and market changes and to develop new higher standards to achieve energy savings.</p>

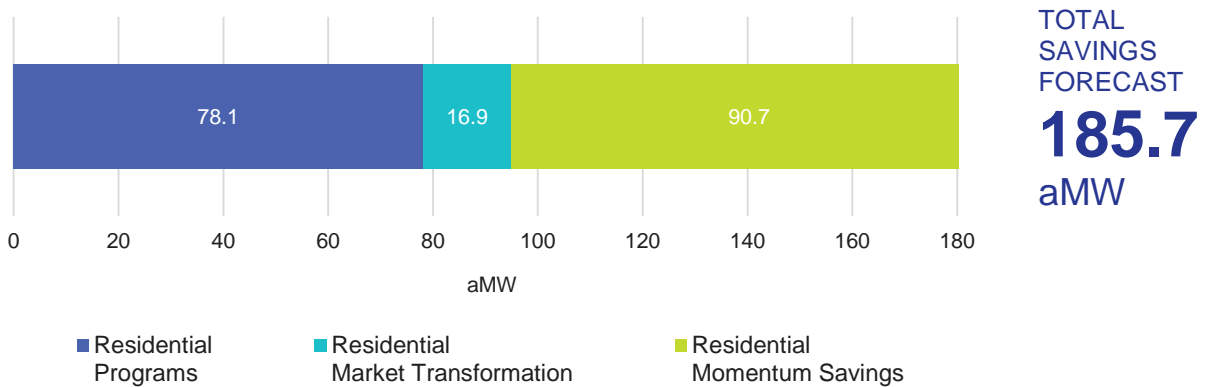


Savings, Costs, and Performance Metrics

The Council identified 494 aMW of cost effective potential regional savings for the residential sector over the Seventh Plan period. BPA estimates its share (42%) of the potential at 207.5 aMW. Taking into account historical trends in program activity, current market conditions and existing resources, BPA developed a savings forecast of 185.7 aMW. BPA’s forecast of expected residential achievements is lower than the Council forecasted potential mainly due to expectations for weatherization and water heating.

Figure 13 shows the forecasted residential sector savings by source from 2016 to 2021.

Figure 13: Residential Programmatic Savings Forecast by Source, Combined (aMW): 2016-2021



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

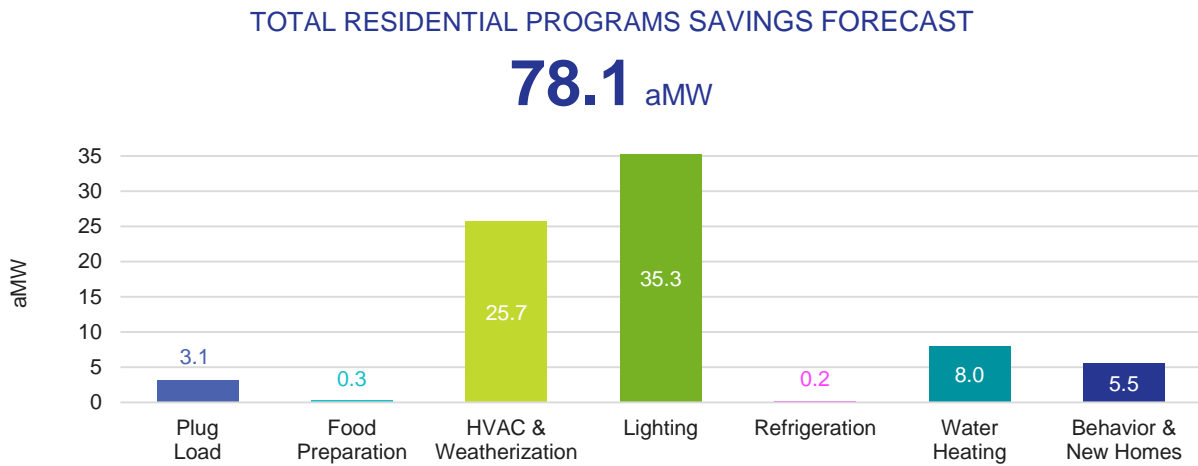
Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Residential Savings Estimates

Figure 14 shows the forecasted residential sector savings for each program area from 2016 to 2021.

Figure 14: Residential Programmatic Savings Forecast by Program, Combined (aMW): 2016-2021



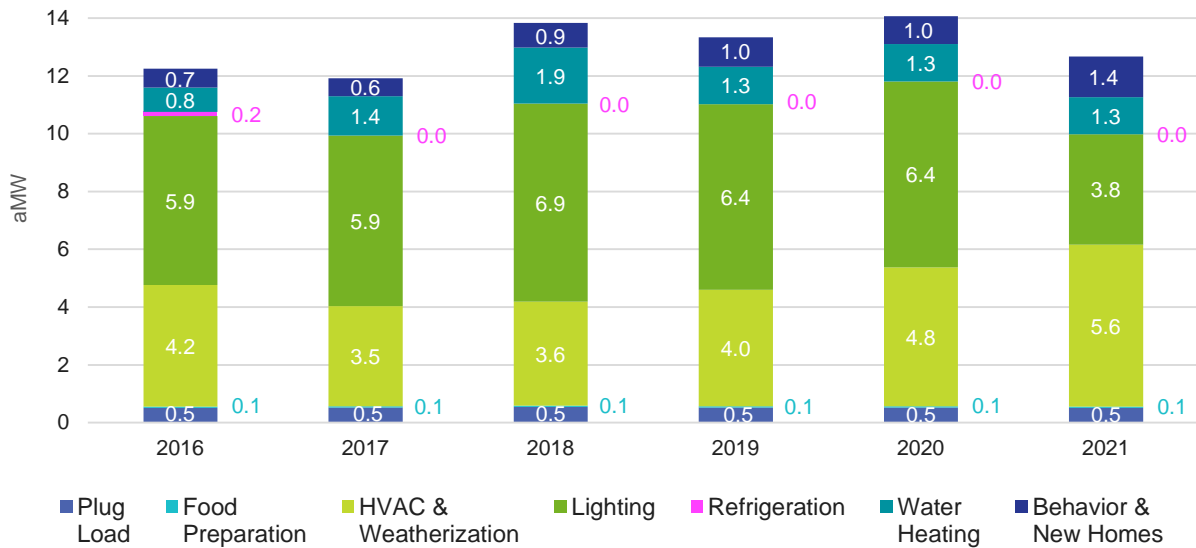
Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 15 shows the forecasted residential sector savings for each program area by year from 2016 to 2021.

Figure 15: Residential Programmatic Savings Forecast by Program and Year (aMW): 2016-2021

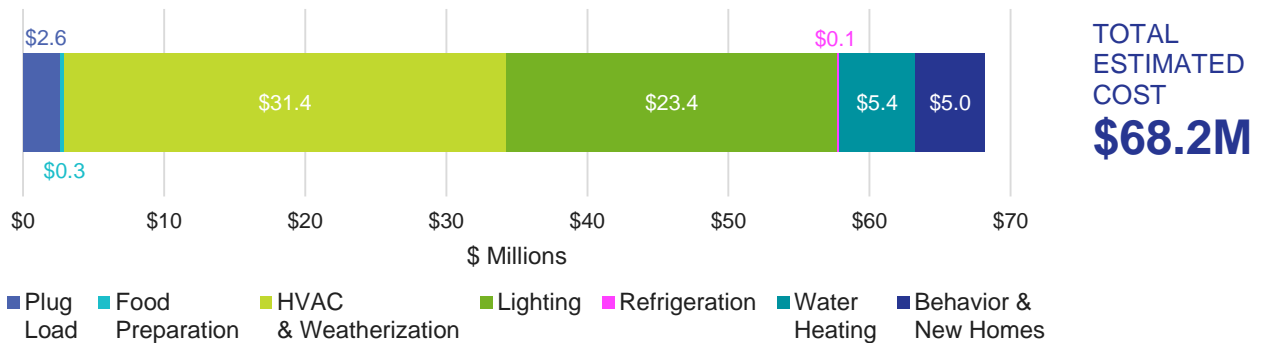


Note: Savings include BPA EEI-Funded and Customer Self-Funded.
Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

Residential Costs

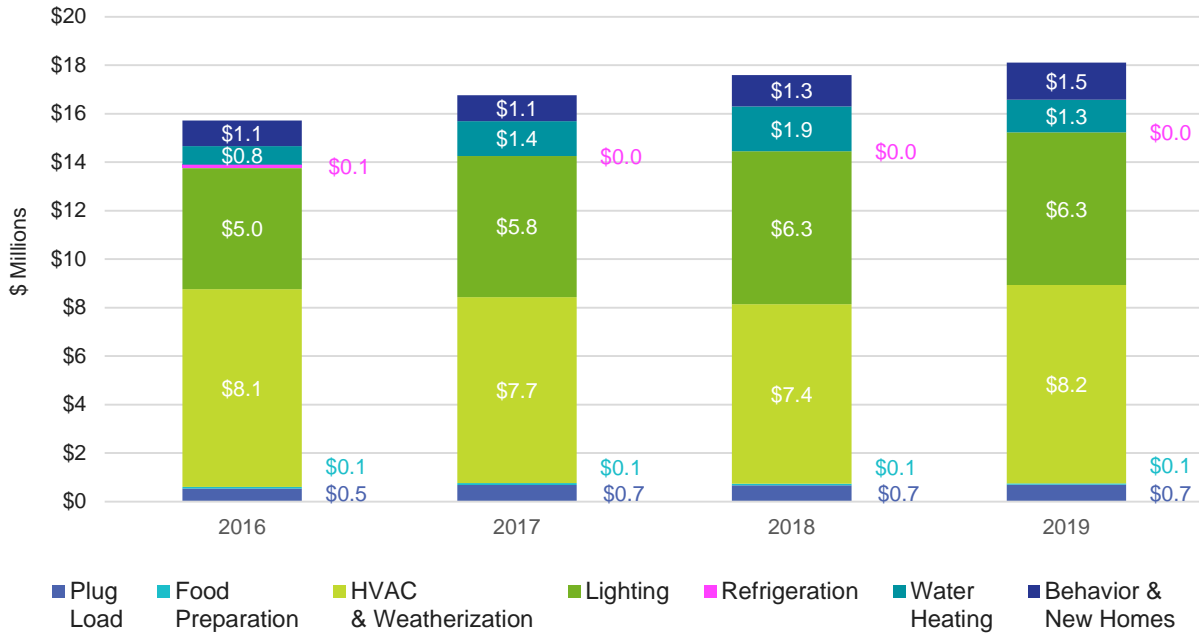
Figure 16 shows the forecasted residential sector budget for each program area from 2016 to 2019. Figure 21 shows these same costs split out by year.

Figure 16: Residential BPA Cost Estimate by Program, Combined (\$ Millions): 2016-2019



Note: Costs include only BPA EEI-Funded programs.
Source: BPA analysis, 2016

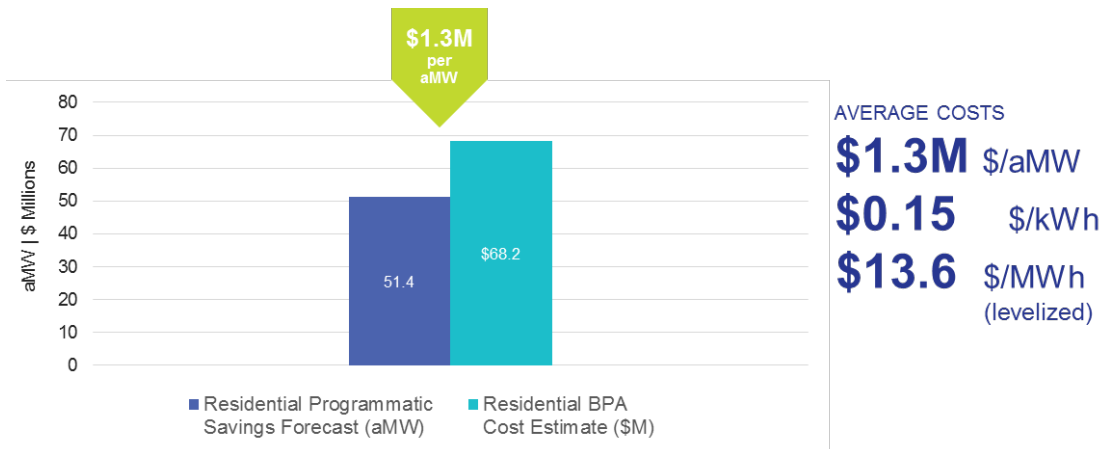
Figure 17: Residential BPA Cost Estimate by Program and Year (\$ Millions): 2016-2019



Note: Costs include only BPA EEI-Funded programs.
Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

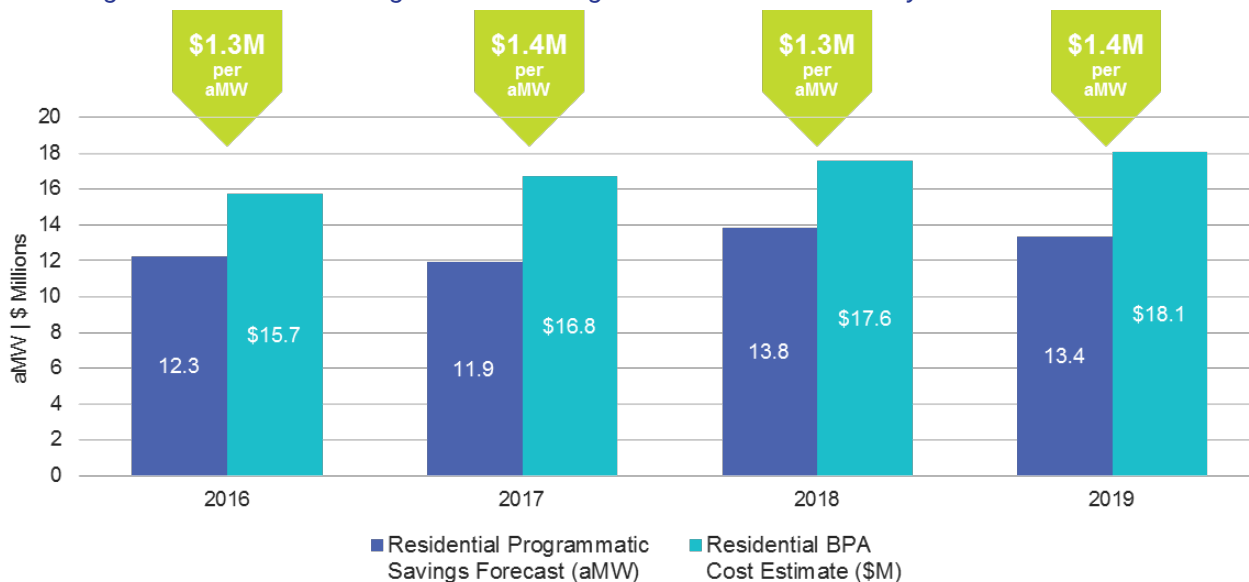
Figure 16 shows the total expected public power savings, and the BPA funded EEI costs. Costs estimates for self-funded savings are not included. As a result, the average costs are lower than if all costs would be accounted for. The costs below represent the cost to BPA for all public power reported savings. Figure 19 shows these costs split out by year.

Figure 18: Residential Programmatic Savings and BPA Cost Metrics, Combined (2016-2019)



Note: Savings include BPA EEI-Funded and estimated Customer Self-Funded.
Note: Costs include only BPA EEI-Funded programs.

Figure 19: Residential Programmatic Savings and BPA Cost Metrics by Year: 2016-2019



Note: Savings include BPA EEI-Funded and estimated Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Residential Performance Metrics

The residential sector will use the following metrics to evaluate its success:

- Whether sufficient personnel resources (federal and contracted) exist to meet sector and customer satisfaction. BPA will obtain results through customer feedback surveys via BPA’s EE representatives
- End-user participation tracked by customers as end-users participate in BPA programs
- Reported savings

3.2 COMMERCIAL SECTOR STRATEGY

This section presents the strategies the commercial sector will employ in the Seventh Plan period to meet its savings forecast (236.4 aMW). This section provides an overview of the commercial program landscape, discusses the strategic opportunities that exist in the market, and outlines the planned approach to meeting the savings forecast. Finally, it presents the savings estimates, budgets, and metrics to gauge performance over the plan period.

Commercial Sector Landscape

BPA's commercial sector offers a range of programs and measure opportunities to help BPA customers serve their commercial end-use customers and meet their conservation goals. From 2010 to 2015, the commercial sector included the Energy Smart Grocer (ESG) program, lighting programs, custom projects, and UES measures. Many of the successful programs that BPA established from 2010 to 2015 will be expanded upon in the upcoming years. The commercial savings potential in the Seventh Plan is more than 1.5 times that of the Sixth Plan, as the emergence of LED lighting technology has increased the amount of savings available in commercial lighting applications.

Accomplishments Since 2010 Plan Publication

The commercial sector exceeded its savings goals for the 2010 to 2014 Sixth Plan period. The sector saved approximately 110.8 aMW, exceeding the Sixth Plan goal by over 16 aMW. Total commercial savings from 2010 to 2015 was 132.2 aMW. The Sixth Plan identified commercial lighting and grocery opportunities via the ESG program as the two primary drivers of savings. These two programs combined to achieve 75% of the commercial sector savings, as was forecast at the beginning of the 2010 Action Plan period. Commercial lighting accounted for 58% of savings, and grocery via the ESG program represented 17% of savings.

Since 2010, the commercial lighting program has adapted to stay current in a rapidly changing market. BPA successfully released an updated lighting calculator by incorporating new technologies and allowing maximum flexibility to utilities and trade allies. BPA invested in the lighting TAN and leveraged existing ESG program infrastructure to maximize commercial program savings. BPA was successful in engaging utilities and the third-party implementer to ensure the ESG program stayed viable and produced savings while the technology and market shifted. The ESG program remained a key channel for savings, reaching peak market maturity and achieving most of the cost-effective savings potential in the region. As a result of this success, BPA retired the program in April 2016.

Current Landscape Assessment

BPA recently revamped its commercial sector programming. Historically, the commercial sector program consisted of many incentivized technologies for HVAC, refrigeration, and lighting. The suite of incentives was so large that it often overwhelmed and confused customers. In addition, a different BPA program manager managed each technology area. Thus, when customers contacted BPA for their commercial needs, they needed to talk to the program manager for each technology area to build their suite of end-user incentive offerings.

Beginning in spring 2015, BPA conducted strategy sessions with utilities to understand their commercial needs and to design a program that best meets those requirements. From the strategy sessions, BPA learned that there is a wide range of applicable technology for the commercial sector, and there is high customer and end-user interest in expanding program-eligible measures. In response, BPA created a new commercial program by simplifying prescriptive measure offerings (i.e., removing measures that

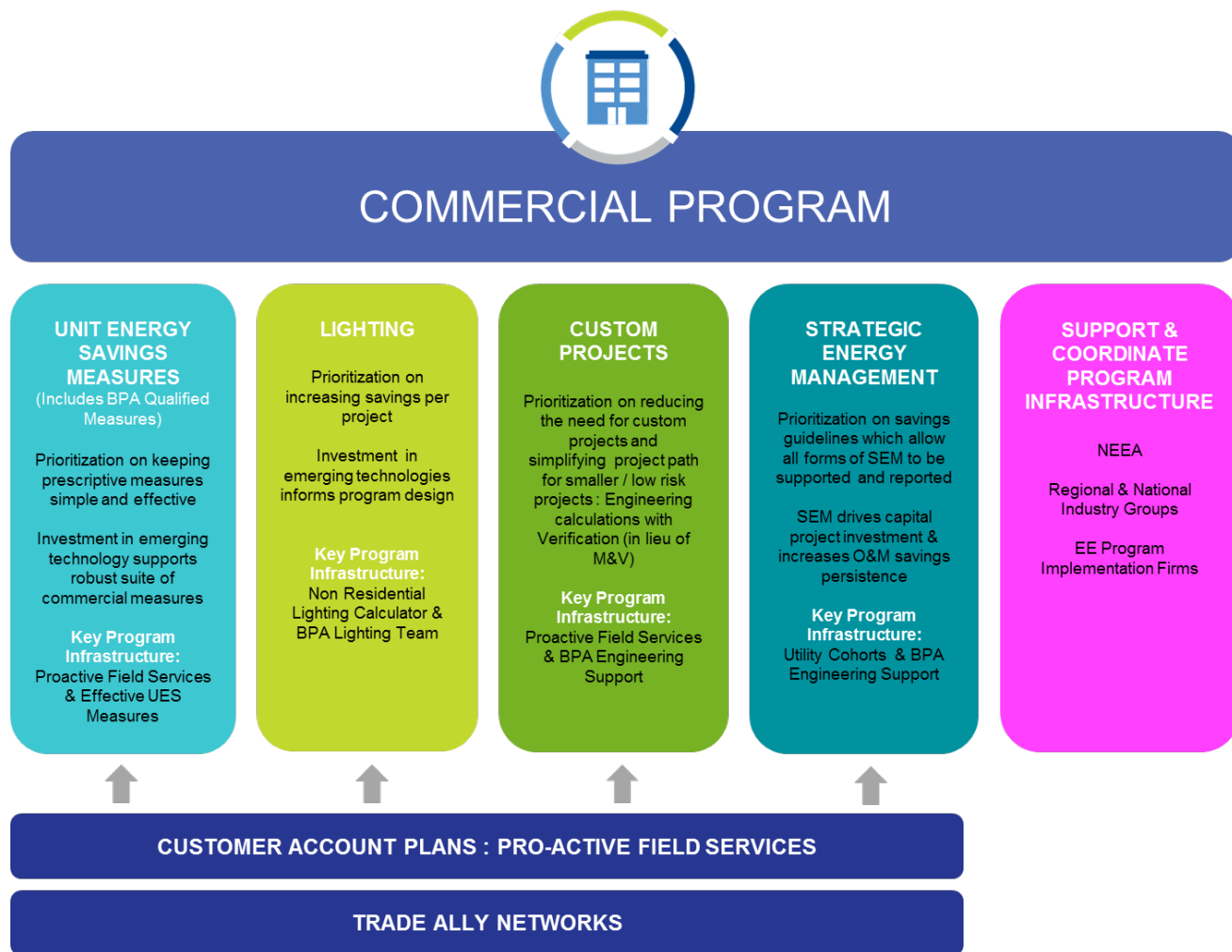
were not used and streamlining program requirements to entice participation), adding new commercial measure offerings, increasing measure incentives, and launching an HVAC TAN.

Existing Efforts

The new commercial sector strategy includes five delivery channels to achieve energy savings. These delivery channels are prescriptive or UES measures, lighting, custom projects, strategic energy management (SEM), and support and coordination through NEEA. BPA program managers manage four of the delivery channels via customer account plans. Proactive field service representatives are responsible for implementing commercial sector account plans for each customer in the same four delivery channels. Dedicated TANs service all customer account plans including the lighting Northwest TAN and the HVAC TAN called Air Northwest³⁴. Figure 20 provides a graphic display of this commercial sector structure.

³⁴ <https://www.airnorthwestvac.com/>

Figure 20: Commercial Sector Structure



Source: BPA, 2016

Market Research

BPA’s Commercial Lighting Market Research Study and the Commercial HVAC Market Research Study will affect commercial sector programs. Both studies are currently underway and expected to complete in 2017. These studies will provide valuable insight into how the efficiency of the market is changing over time. When the studies are complete, BPA will determine how to incorporate the findings in a meaningful way to achieve effective program results given cost-effectiveness and budget limitations.

Strategic Opportunities and Planned Approach

This section outlines BPA’s approach to meeting commercial EE program goals. The section identifies new and planned efforts including how ETs, R&D, and Momentum Savings contribute to savings forecasts.

New and Planned Efforts

BPA will implement its newly created commercial program structure by developing commercial sector customer account plans and utilizing proactive field service partners to support implementing those plans. In addition, BPA will streamline and simplify prescriptive and BPA-qualified (BPAQ) measures to increase uptake. BPA will leverage TANS to increase participation in prescriptive measures, lighting, custom projects, and SEM. The commercial sector will work with NEEA to support and coordinate program infrastructure. Specifically, BPA will:

- **Leverage NEEA as well as regional and national partners.** BPA seeks to follow NEEA initiatives closely so that BPA and NEEA programs complement one another.
- **Align with the residential program on HVAC.** Air Northwest will align and support the residential PTCS initiative because most contractors in the HVAC field work in both the residential and commercial sectors. BPA seeks to align program offerings and requirements so that the application process is parallel across sectors.
- **Align with the residential program on multifamily.** Residential multifamily and commercial multifamily are differentiated only by the total number of building stories. Therefore, multifamily buildings in the residential and commercial sectors are similar. BPA plans to align its multifamily program offerings.

The Power Council's seventh plan recognizes significant savings potential in embedded data centers found in the commercial sector. Over the past few years BPA has supported and led research efforts to better understand savings opportunities and market intervention strategies. While BPA's commercial sector team recognizes the technical achievable potential inherent to embedded data centers, pragmatic delivery of savings has proven ineffective. Given BPA's finite resources and customer focus in other areas, the commercial sector has made a strategic decision to deprioritize this area of ostensible opportunity.

Reasons that support the commercial sectors decision to deprioritize this area of market intervention include:

- Embedded data centers are very niche and BPA's customers are seeking opportunities in other areas of the commercial sector.
- Direct experience and market research reveals decision making related to embedded data centers allows for little influence from utility efficiency programs
- Direct experience and market research reveals a market that is extremely dynamic and rapidly evolving which increases BPA's risk for implementation strategies.
- Through BPA's commercial SEM work there will be opportunities to identify, track, influence and learn from embedded data center projects – but they are not the focus of that program. (i.e. we plan to support opportunities via commercial SEM so we will have some presence)

Emerging Technologies and Research and Development

In response to BPA’s intent to diversify the portfolio of commercial offerings beyond lighting and increase prescriptive measure uptake, BPA is researching the following list of prescriptive measures:

- Variable refrigerant flow HVAC systems
- Commercial DHPs
- Heat pump upgrades
- Connected thermostats
- Windows and secondary glazing systems
- Advanced rooftop controls (i.e., variable speed drives with controls)

All of these measures are currently in BPA’s ET phase and are included in BPA’s IM. The measures will have BPAQ status and will be available to utilities and trade allies starting October 1, 2016.

Momentum Savings

BPA estimates that Momentum Savings will contribute 109.4 aMW savings to the commercial sector from 2016 to 2021. BPA’s estimated programmatic savings alone will not meet the Council’s goal for this sector, so the additive Momentum Savings will be crucial to hitting the sector’s goal. BPA expects lighting to contribute a significant portion of the Momentum Savings from market effects, as LED adoption is increasing rapidly in nonresidential applications. The US DOE recently adopted a standard governing the efficiency of commercial packaged air conditioners and heating equipment that will go into effect in 2018; this standard will create significant energy savings, increasing the Momentum Savings from new standards. Finally, the Momentum Savings claimed from NEEA’s market transformation efforts in lighting and building codes in the commercial sector will contribute to BPA’s commercial sector Momentum Savings forecast.

Challenges and Opportunities

Challenge or Risk	How BPA Will Address
<p>Commercial measures and projects are complex and there has been a lack of program support across the region.</p>	<p>BPA is working to better understand the market and structure programs accordingly. For example, in 2016 BPA launched the Air Northwest trade ally network to better support the HVAC market. Market complexity could also be mitigated with more collective action taken by individual utilities. (i.e. greater utility alignment) With an eye towards greater regional collaboration BPA will work with public utilities and is committed to changing ourselves to align – and not just forcing others</p>

	to align with us.
<p>The lighting market moves rapidly while BPA is slow to respond.</p>	<p>As efficiencies continue to increase in lighting, BPA needs to adjust incentives and program components to continue to attract customers and hit savings goals. BPA has identified collective regional action as the single biggest opportunity for improving the operational efficiencies in lighting. Beyond supporting NEEA lighting initiatives, utilities need to align downstream programs and eliminate differences between programs. Utility program alignment would have the mutual benefit of increasing trade ally participation as well as sending a stronger signal to lighting manufactures to promote the regions lighting efficiency goals.</p>
<p>The commercial sector is broad and diverse. The sector encompasses many different building and business types. Historically, BPA's program has tried to appeal to all commercial segments, which has not been the most effective strategy.</p>	<p>Commercial programs may need to strategically deprioritize certain parts of the market if BPA is not able to engage them effectively. BPA sees opportunity in creating measures which have broad application in the commercial sector. Allowing for implementation with a broad brush might lower the individual savings of compared to smaller niche measures – but creating broadly applicable measures will mitigate the risk inherent in a myriad of different building and business types.</p>
<p>Commercial programs lack web based tools and online tracking systems that would provide ease and transparency to EE programs</p>	<p>BPA will continue to voice the value of these tools and push to have them prioritized and implemented.</p>

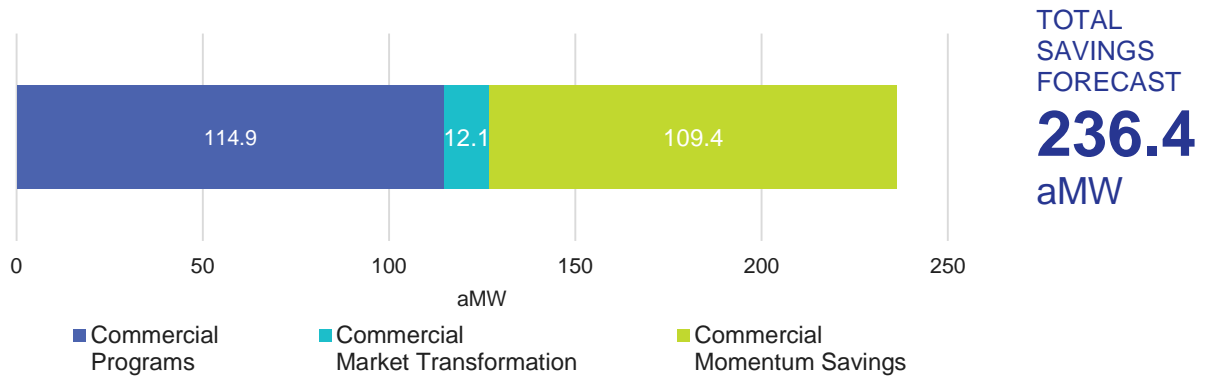
Savings, Costs, and Performance Metrics

The Council identified 531 aMW of cost effective potential regional energy savings for the commercial sector over the Seventh Plan period. BPA estimates its share (42%) of the potential at 223.0 MW. Taking into account current market conditions and existing resources, BPA’s commercial savings potential forecast is 236.4 aMW. This total includes 114.9 aMW from programmatic savings plus 109.4 aMW in Momentum Savings and 12.1 aMW from market transformation.

Commercial Savings Estimates

Figure 21 shows the overall forecasted commercial sector savings, including programmatic, market transformation, and Momentum Savings from 2016 to 2021.

Figure 21: Commercial Programmatic Savings Forecast by Source, Combined (aMW): 2016-2021

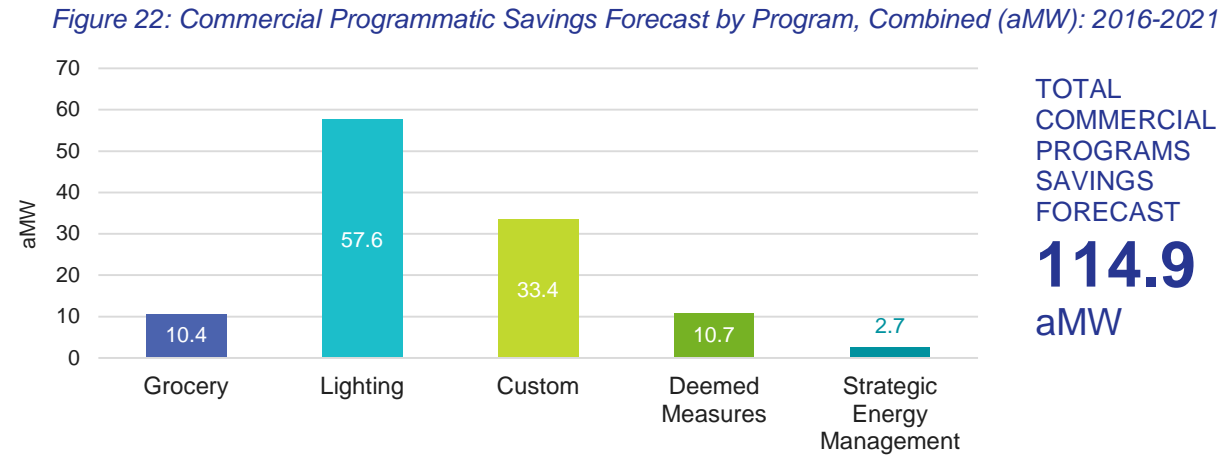


Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 22 shows the forecasted commercial sector savings by program from 2016 to 2021.



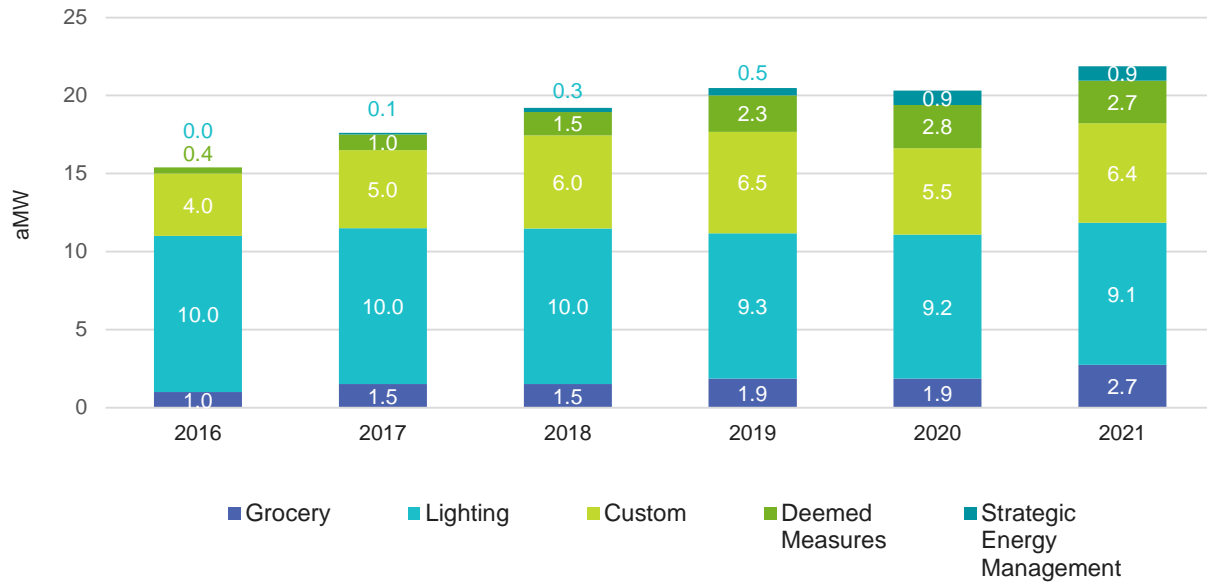
Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 23 shows the forecasted commercial sector savings by fiscal year for each program area from 2016 to 2021.

Figure 23: Commercial Programmatic Savings Forecast by Program and Year (aMW): 2016-2021



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

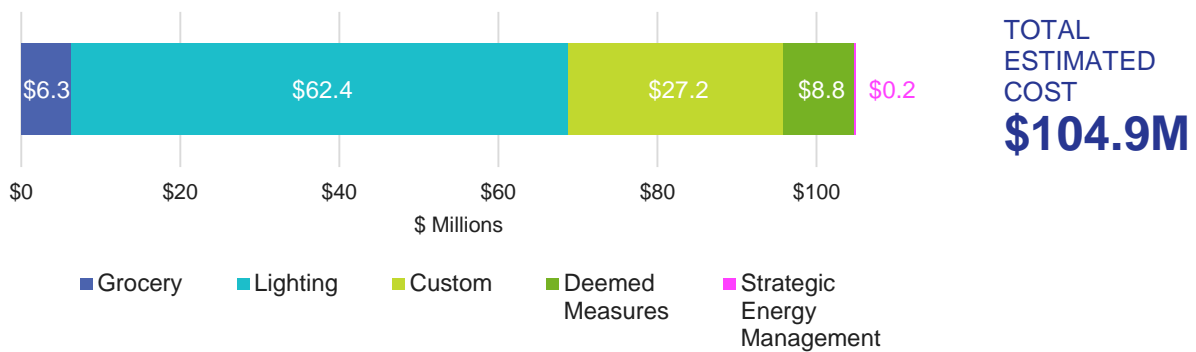
Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Commercial Costs

Figure 24 shows the commercial program costs by program area.

Figure 24: Commercial BPA Cost Estimate by Program, Combined (\$ Millions): 2016-2019

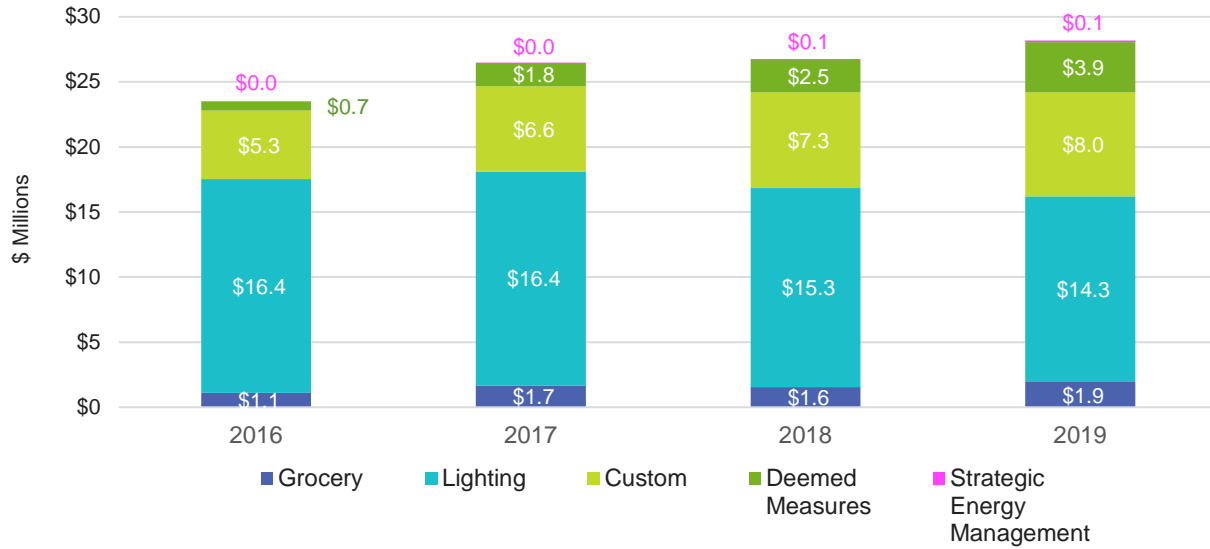


Note: Costs include only BPA EEI-Funded programs.

Note: Due to rounding, numbers may not add to the total.

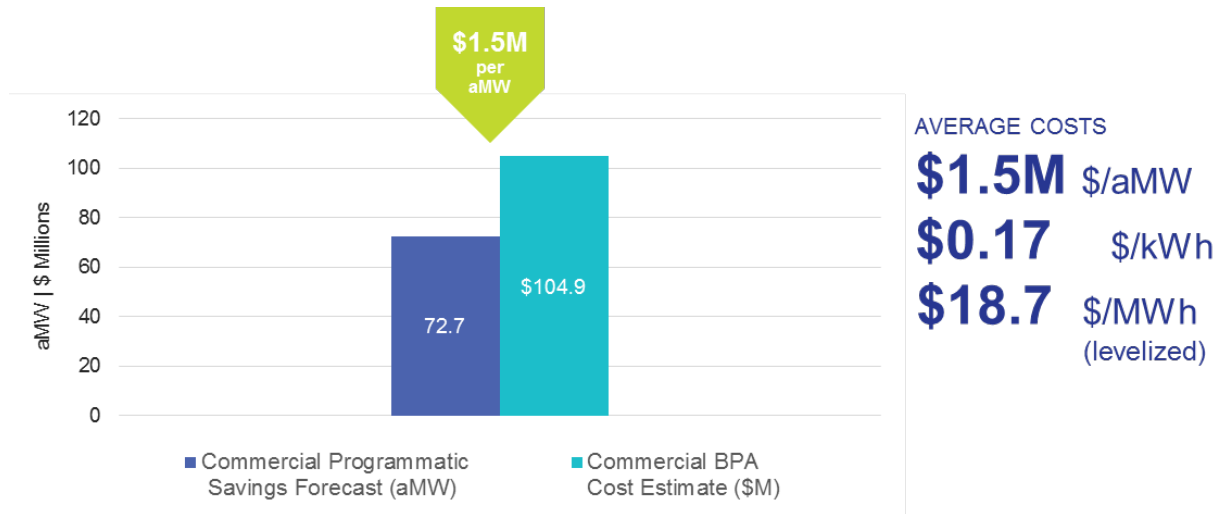
Source: BPA analysis, 2016

Figure 25: Commercial BPA Cost Estimate by Program and Year (\$ Millions): 2016-2019



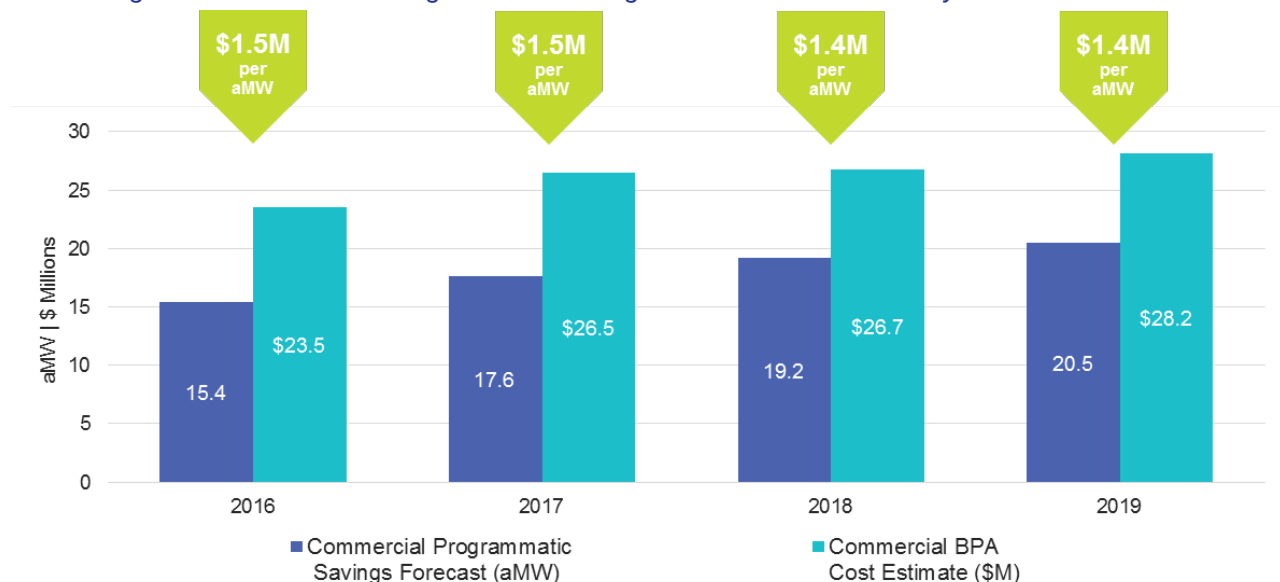
Note: Costs include only BPA EEI-Funded programs.
Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

Figure 26: Commercial Programmatic Savings and BPA Cost Metrics, Combined: 2016-2019



Note: Savings include BPA EEI-Funded and estimated Customer Self-Funded.
Note: Costs include only BPA EEI-Funded programs.
Source: BPA analysis, 2016

Figure 27: Commercial Programmatic Savings and BPA Cost Metrics by Year: 2016-2019



Note: Savings include BPA EEI-Funded and estimated Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Commercial Performance Metrics

The commercial sector will use the following metrics to evaluate its success:

- Actual savings.** The commercial sector uses the BPA monthly savings report as a primary data source for tracking program implementation results. Although BPA no longer supports ESG as a regional initiative, several utilities have continued to work directly in the grocery market. BPA will monitor the grocery segment activity closely to ensure customers are reporting to BPA work performed by third-party implementers. BPA will also closely monitor prescriptive measure activity, given the extent of the changes being made to implementation design.
- Number of participating customers.** The new commercial program design allows BPA program managers to track all activity across the entire lifespan of a project relative to specific customer account plans and custom projects. BPA will track the number of participating customers.
- Trade ally participation.** The commercial sector will track trade ally participation at workshops around the region to measure the level of engagement in the trade ally programs region-wide.
- Lighting project completions.** BPA receives a count of submitted lighting project calculators every six months. This count allows BPA to track progress on lighting project uptake.

3.3 INDUSTRIAL SECTOR STRATEGY

This section presents the strategies the industrial sector will employ in the Seventh Plan period to meet its savings forecast (104.0 aMW). It provides an overview of the industrial program landscape, discusses the strategic opportunities existing in the market, and outlines the planned approach to meeting the savings forecast. Finally, it presents the savings estimates, budgets, and metrics to gauge performance over the plan period.

Industrial Sector Landscape and Context

Public utilities in the Pacific Northwest serve more than 2,000 megawatts (MW) of industrial load, and BPA has a long history of supporting and advancing industrial EE throughout the region. Since 2009, BPA and its customers have offered industrial end-users the ESI program to assist with acquiring industrial sector savings. ESI provides innovative tools, resources, and technical expertise to industrial users of different types, sizes, and budget constraints to pursue cost-effective EE.

Accomplishments Since 2010 Plan Publication

Since the ESI program launch, 113 utilities—representing 99.8% of BPA-served industrial load—have enrolled in the program. BPA acquired 111 aMW of industrial EE savings from 2010 to 2015 by implementing nearly 1,000 EE projects at more than 600 industrial energy user sites.

Current Landscape Assessment

Economic changes in the market affect the amount of capital industrial facilities have to invest in EE, and climate change legislation may affect how quickly industrial facilities transition to efficient technologies. ESI program success may fluctuate in relation to these changing market conditions.

Many industrial facilities in the Pacific Northwest are aging.^{35-36, 37} This reality represents an opportunity for the ESI program, as it indicates that industrial facilities need efficiency improvements. Food processing and pulp and paper facilities make up a large portion of the aging infrastructure. Over the 2010-2015 program period, these facilities took advantage of ESI opportunities, even in areas where utilities have no other industrial end-users. More than 200 food, pulp, and paper facilities representing 82 utilities have shown interest in the ESI program to date. The project pipeline in this sector is healthy: BPA forecasts 74

³⁵ John McClenahan, "Aging Assets: Rebuilding U.S. Manufacturing," *IndustryWeek*, October 7, 2006. www.industryweek.com/companies-amp-executives/aging-assets-rebuilding-us-manufacturing

³⁶ The Economist Intelligence Unit, "The Impact of Aging Infrastructure in Process Manufacturing Industries," 2013.

³⁷ Oracle, "With an Aging Infrastructure, Failure Is an Option," 2014.

custom projects that total more than 3.3 aMW in estimated savings will complete over the next several years.

Existing Efforts

The ESI program continues to support a comprehensive and flexible program approach. Furthermore, the program will strive to improve program engagement in BPA's eastern region from 2016 to 2021.

Build a Flexible Program Approach

Industrial program opportunities vary depending on the end-user's size, type, operating conditions, and business plans. BPA remains flexible and comprehensive in its ESI program approach to appeal to various types of facilities. To this end, BPA encourages a fleet of technical service providers (TSPs). The TSPs are experts in their respective fields; they work to gain the confidence of program participants and understand the factors that affect the magnitude and persistence of energy savings. EE projects can be time-intensive, disruptive, and one of many competing priorities at an industrial facility. Because of a flexible program, TSPs are able to build strong relationships between the utility and end-user to ensure expectations are met.

Increase Rural-Eastern Region Program Engagement

The ESI program is improving its ability to develop the eastern region market by monitoring the project pipeline to predict when ESI and TSP resources are needed for this region. To meet this goal, the ESI program is continuing to develop account plans with smaller utilities. In early 2014, BPA initiated the Rural-Eastern ESI Focus. The ESI program identified 23 utilities—mostly rural, smaller, and in the eastern portion of the state—with no prior engagement with the ESI program. BPA targeted marketing to these utilities, accompanied by newly developed and approved collateral and case studies relevant to the interests and sizes of these utilities. The efforts are primarily focused on lighting, compressed air, and water/wastewater opportunities. As of the end of 2015, 14 of the 23 identified utilities are now participating in the program (61% engagement). This participation is nearly double the target engagement of 33%.

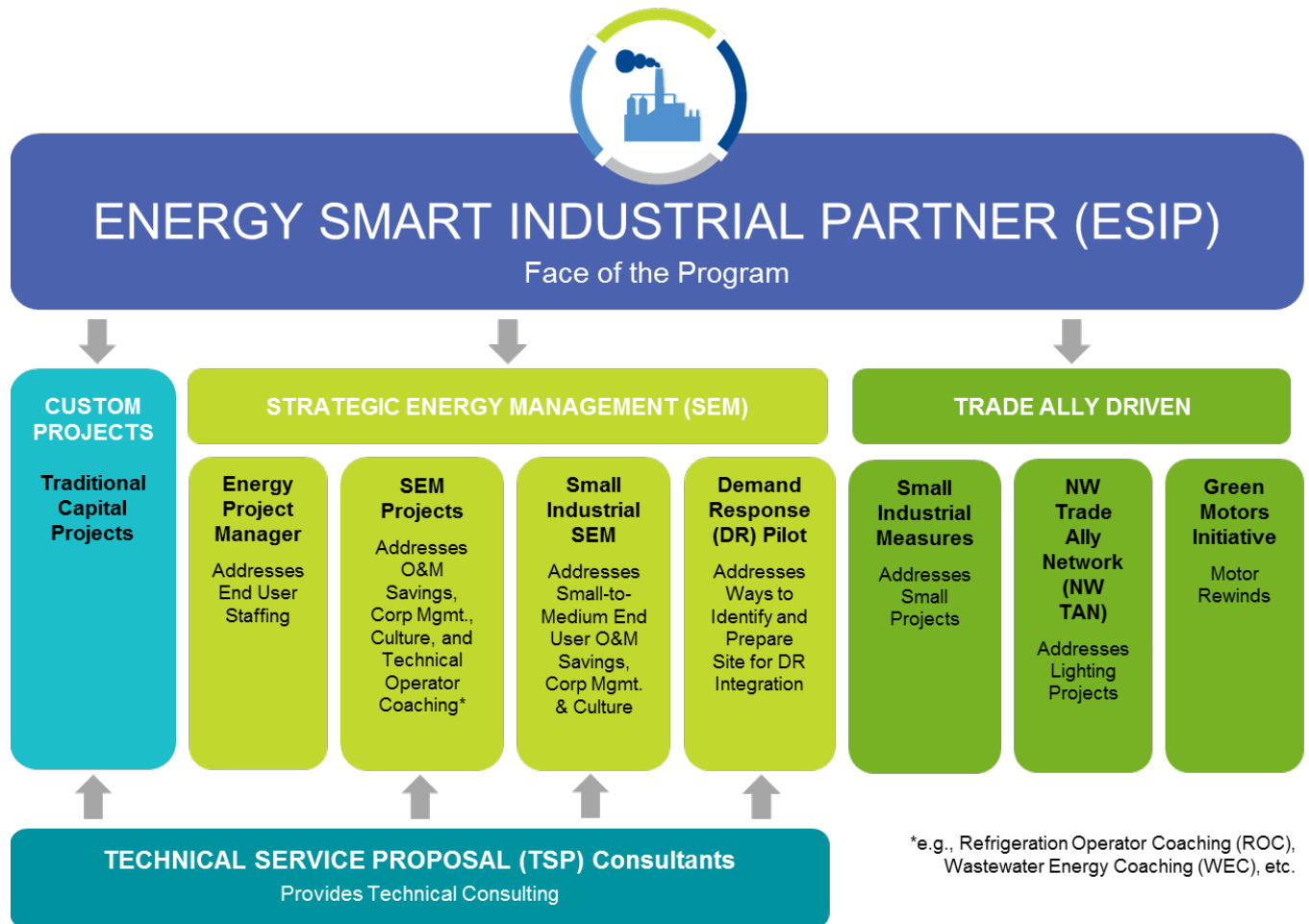
To continue to advance the program goals and to serve the widest range of potential participants, the ESI program consists of six components:

- **Energy Smart Industrial partner.** ESIPs are dedicated industrial EE experts assigned by the ESI program to serve as a single point of contact for utilities, helping coordinate program resources. Utilities define the rules of engagement for ESIP interaction with end-users.
- **Capital projects.** Capital projects encompass retrofit, expansion, and new construction EE projects. The ESI program helps facilities acquire and install the most energy efficient equipment and processes in the industry.
- **SEM.** SEM addresses opportunities to acquire energy savings through improved operations and maintenance (O&M) and overall energy management practices.

- **Small industrial measures.** Small industrial measures provide a cost-effective mechanism for supporting specific efficiency measures when the energy savings for a project are smaller than typical industrial projects. A streamlined process for smaller projects allows ESI to target small-scale industrial facilities and small systems that are historically underserved by traditional industrial efficiency programs.
- **Enhanced lighting.** Enhanced lighting extends the services of the existing Northwest TAN to focus on industrial lighting projects. Industrial lighting specialists help with assessing, assisting, and reporting projects.
- **Enhanced TSP services.** Enhanced TSP services expand and enhance traditional TSP services, such as quick response time and materials work, BPA funding of scoping assessments, detailed assessments, and measurement and verification (M&V) activities, where appropriate.

Figure 28 illustrates the relationship between the ESI program and its components. ESIPs facilitate custom, energy management, and trade ally-driven projects. TSPs provide specialized advice to custom and energy management projects but not trade ally-driven projects. Enhanced lighting, SEM, and small industrial components fall under custom, energy management, or trade ally-driven projects.

Figure 28: Industrial Sector Structure



Source: BPA, 2016

Market Research

BPA conducted two recent studies that will influence industrial sector programming from 2016 to 2021. In 2014, NEEA published the first Northwest Industrial Facility Stock Assessment (IFSA). The IFSA results helped inform BPA’s industrial sector strategy by providing a better understanding of the composition of technologies, size, and subsectors of EE opportunities in the industrial market. For example, the IFSA found that paper and wood product facilities make up 40% of the total Northwest industrial electric energy load.³⁸ Within facilities, load is concentrated in materials processing and handling. Materials processing

³⁸ Northwest Energy Efficiency Alliance, *2014 Industrial Facilities Site Assessment: Report & Analytic Results*, December 29, 2014. www.neea.org/docs/default-source/reports/2014-industrial-facilities-stock-assessment-final-report.pdf?sfvrsn=6

and handling makes up roughly 30% of industrial facility load use.³⁹ These findings are helpful to reference for ESI program marketing and outreach initiatives.

In 2015, ESI deployed a demonstration to investigate the effects of integrating EE with DR. The demonstration recruited four sites participating in energy management components to test the effects of an integrated EE and DR approach on optimizing a facility's energy consumption. The demonstration's findings emphasized the need for a holistic approach to EE and DR to provide maximum benefits to end-users, utilities, and BPA.

Strategic Opportunities and Planned Approach

This section outlines BPA's approach to meeting industrial EE program goals. It identifies new and planned efforts including how ETs, R&D, and Momentum Savings contribute to savings forecasts.

New and Planned Efforts

BPA will continue to build the ESI program network of TSPs and target specific subsectors of the market to develop partnerships and collaborations. In addition, the ESI program will focus on consolidating quality control (QC) assessments, automating routine processes, streamlining cost documentation procedures, and implementing a top-down approach to evaluation, measurement, and verification (EM&V) protocols. These additional initiatives are outlined here.

Consolidate QC. Consolidating the number of QC reviews per project will improve program efficiency. For example, if smaller projects (savings less than 200,000 kilowatt-hours per year) no longer require cost-benefit ratio or payback compliance thresholds, the ESI team could perform both the compliance and technical reviews, eliminating the need to review the project until final invoicing. BPA will review the QC process over the next five years and consolidate reviews where appropriate.

Automate routine processes. Several opportunities exist to use the ESI website to streamline routine processes. This secure file share site employs several timesaving workflows, maintains a single version of project files, and eliminates the need to email files back and forth between utility, ESI QC, and BPA. Expanding the website to offer utilities dashboard-style access to project data could allow them to get up-to-date information on ESI projects and forecast data. For example, utilities using the secure file share site for energy management project approvals could also use the site to submit custom projects for approval. Expanding use of these workflows could save time and decrease the potential for missing projects in the system. As more utilities opt into this feature, BPA will add more workflows to help streamline communication on projects between utilities and ESIPs.

³⁹ Ibid.

Streamline cost documentation procedures. Many industrial end-users use accounting software to manage their business’ financial records. These accounting systems produce a detailed account of costs associated with parts of the business. The ESI team should use end-users’ accounting systems to verify project costs, as it would be more accurate than documenting individual invoices—especially for larger projects with hundreds of invoices.

Apply top-down M&V methodologies. Multiple stakeholders recognize the potential advantages of applying a top-down M&V approach (i.e., meter level) for custom projects that involve high savings as a percentage of the total consumption, have many discrete measures, and develop a robust predictive energy model. BPA is currently piloting this approach on a large custom project and expects significant ESI cost savings as a result of the streamlined M&V process.

Emerging Technologies and Research and Development

Investments in ETs in the industrial sector often present dual benefits for both EE and DR. Advanced refrigeration control systems are one common example, but variable frequency drives (VFDs), advanced lighting controls, and other EE measures often hold significant potential for DR. With more than 700 custom projects installed since the ESI program’s inception, BPA is considering performing a DR technical potential assessment for a select number of previously installed projects. BPA may also consider exploring the addition of a DR potential element to future scoping assessments for large custom projects. These assessments would include both load shape characterization and potential areas for implementable DR.

Momentum Savings

BPA does not expect industrial sector energy savings from either Momentum Savings or market transformation efforts.

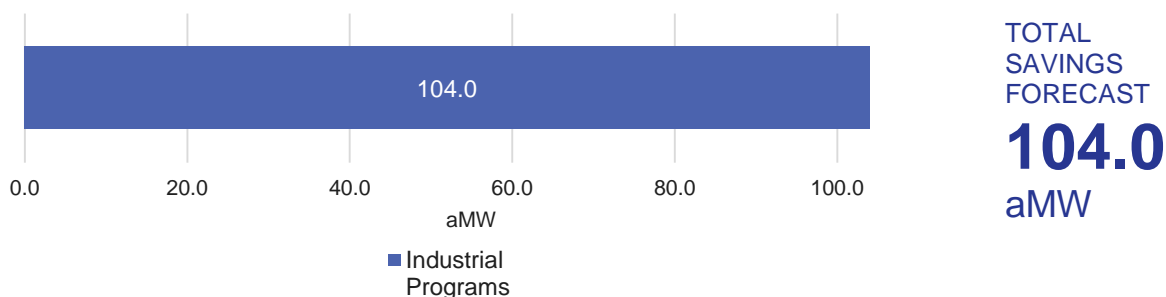
Challenges and Opportunities

Challenge or Risk	How BPA Will Address
Industrial projects often include large upfront investments that cannot be covered with EEI funding. Large facilities are often served by small utilities with limited EEI funding.	BPA will continue to support the use of bi-lateral transfers and utilizing the large project-program, as well as allowing small customers to roll over significant portions of their budgets to support larger projects.

Savings, Costs, and Performance Metrics

The Council identified 290.0 aMW of regional energy savings potential for the industrial sector over the Seventh Plan period. BPA estimates its share (42%) of the potential at 121 aMW. Taking into account current market conditions and existing resources, BPA forecasts a programmatic savings potential of 104.0 aMW. Figure 29 shows the total forecasted industrial sector savings from 2016 to 2021. BPA expects no market transformation savings or Momentum Savings for the industrial sector.

Figure 29: Industrial Programmatic Savings Forecast by Source (aMW): 2016-2021



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

The reasons for the slight difference in the BPA savings forecast (104 aMW) versus the Council estimate (121 aMW) are as follows:

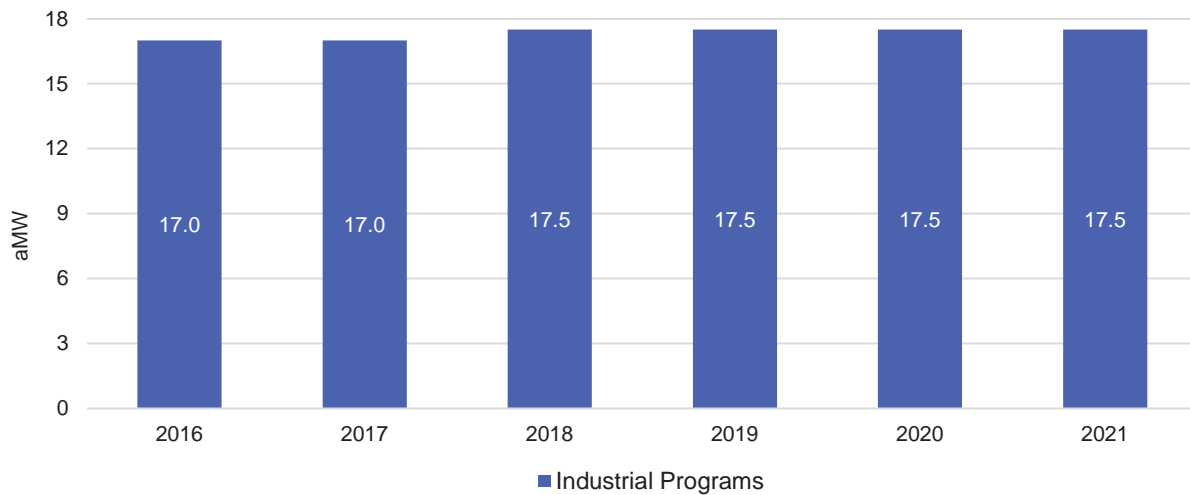
- The Seventh Plan expects equal contributions from SEM and capital projects. In contrast, BPA expects capital projects to contribute more than two-thirds of industrial sector energy savings based on program performance to date.
- Based on program experience and expertise, BPA believes that the Council's estimates for energy management are higher than can be achieved through programs. BPA provided this perspective in its' comments on the draft Power Plan⁴⁰.
- BPA's calculation of cost based on achieved savings is different in from some of the assumptions of energy management in the Seventh Plan. The Seventh Plan classifies some of energy management as a low- or no-cost EE resource. However, acquiring the resource requires program costs to engage facilities, staff time to implement the measures, and M&V costs to ensure the reliability of the resource.

⁴⁰<http://www.nwcouncil.org/uploads/7thplan/1888/Bonneville%20Power%20Administration%20Comments%20on%20Draft%20Seventh%20Northwest%20Conservation%20and%20Electric%20Power%20Plan.pdf>

Industrial Savings Estimates

Figure 30 shows the total forecasted industrial sector savings by rate period from 2016 to 2021.

Figure 30: Industrial Programmatic Savings Forecast by Program and Year (aMW): 2016-2021



TOTAL INDUSTRIAL PROGRAMS SAVINGS FORECAST
104.0
aMW

Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Industrial Costs

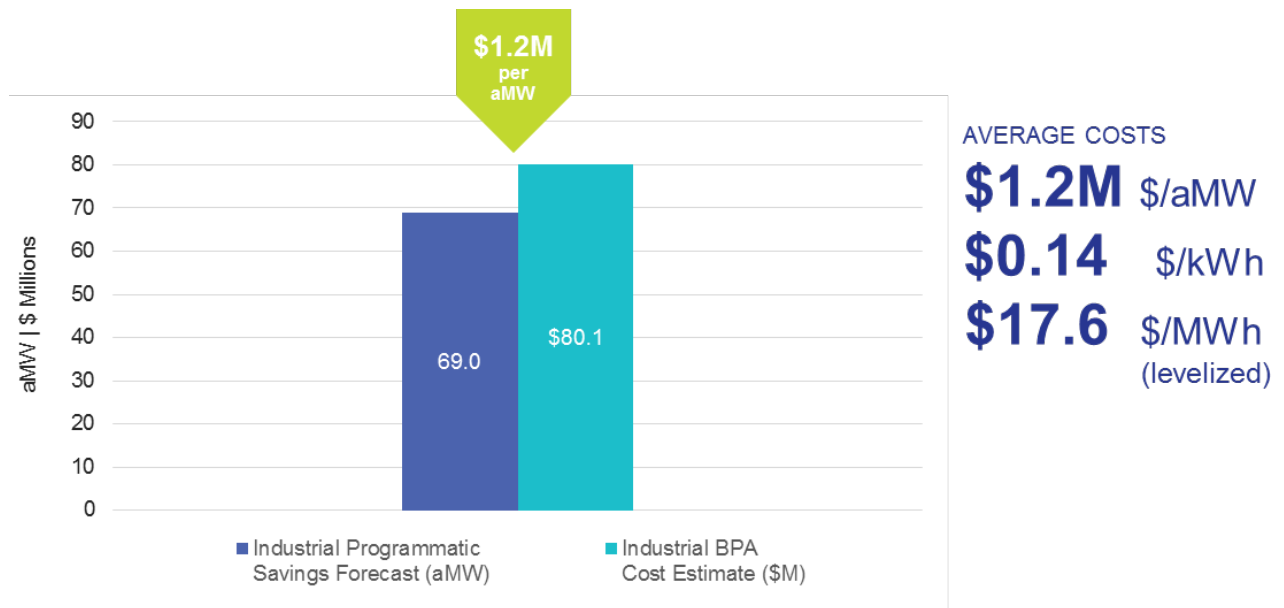
Figure 31 shows the total forecasted industrial sector costs by rate period from 2016 to 2017 and from 2018 to 2019.

Figure 31: Industrial BPA Cost Estimate by Year (\$ Millions): 2016-2019



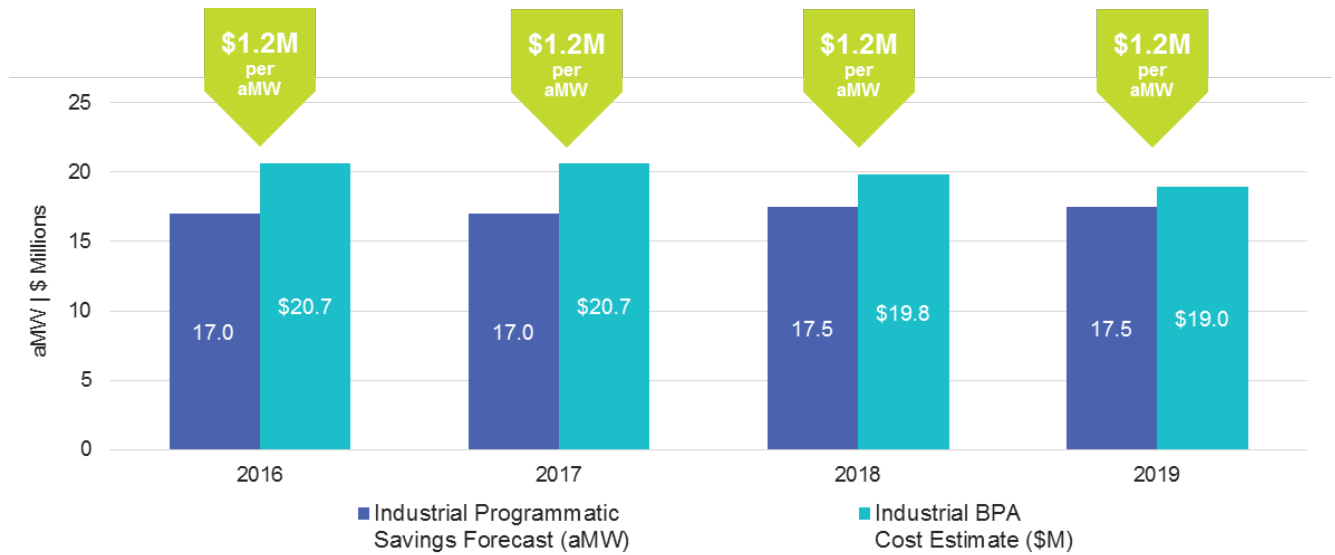
Note: Costs include only BPA EEI-Funded programs.
Note: Due to rounding, numbers may not add to the total.
Source: BPA analysis, 2016

Figure 32: Industrial Programmatic Savings and BPA Cost Metrics, Combined: 2016-2019



Note: Savings include BPA EEI-Funded and estimated Customer Self-Funded.
Note: Costs include only BPA EEI-Funded programs.
Source: BPA analysis, 2016

Figure 33: Industrial Programmatic Savings and BPA Cost Metrics by Year: 2016-2019



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Industrial Performance Metrics

Cost and energy savings are the primary metrics that define program success in the industrial sector. BPA also measures program success by whether utilities are using the program and receiving value as reported in a biannual customer satisfaction survey. Currently, 90 utilities use one or more of the ESI program components, and utility participation is more than 99.8% of the BPA-served industrial load. In addition, the program has created marketing collateral (i.e., case studies), designed project management tools and workflows, and developed an ESI program delivery manual that outlines all the specific details about the program and its regional operation to aid utilities in communicating program value to end-use customers. BPA continues to implement these and other tools to increase customer satisfaction.

3.4 AGRICULTURAL SECTOR STRATEGY

This section presents the strategies the agricultural sector will employ over the over the Seventh Plan period to meet its savings forecast (25.4 aMW). It provides an overview of the agricultural program landscape, discusses the strategic opportunities existing in the market, and outlines the planned approach to meeting the savings forecast. Finally, it presents the savings estimates, budgets, and metrics to gauge performance over the plan period.

Agricultural Sector Landscape and Context

BPA's agricultural sector offers a range of programs and measure opportunities to help BPA's customers serve their agricultural end-users and meet their conservation goals. BPA's agricultural efficiency program offerings include scientific irrigation scheduling (SIS), VFDs, irrigation pump testing and system analysis, hardware upgrades, lighting, seasonal transformer de-energization, and custom opportunities for other types of irrigation projects, dairies, and wineries. Other state and federal programs aiming to improve on-farm efficiency complement BPA's agricultural efficiency initiatives.

Accomplishments Since 2010 Plan Publication

BPA has continuously offered incentives for agricultural efficiency measures (hardware, SIS, and VFDs) and recently hired three part-time agricultural program specialists (APSS) to help some of its utilities with programmatic workload (e.g., marketing, processing invoices, working with Natural Resource Conservation Service). This effort has been focused in central Oregon, south central Idaho (e.g., Burley), and the Spokane area, which has increased the visibility of the BPA program offerings in those areas. BPA agricultural efficiency measures have been submitted by more than 30 utilities, saving BPA 31.3 aMW of electricity from the agricultural program from 2010 to 2015.

Current Landscape Assessment

Roughly 19,000 well pumps in the Pacific Northwest irrigate 5 million acres of land. According to the Seventh Plan, agricultural irrigation load required approximately 570.0 aMW of electricity between 1986 and 2012.⁴¹ Electricity consumption in the sector is forecasted to grow at 1.9% annually. This load could increase to 700 aMW by 2034. Energy savings associated with irrigation measures are also generally considered summer on-peak, which come with demand charges that can add urgency to efficiency initiatives in this sector.

The most robust agricultural regions within BPA territory are Washington and Oregon's Columbia River Basin and Southern Idaho. These regions hold the most distinct cluster of high-value crops (e.g., onions, sugar beets, barley, fresh and processed potatoes, apples, cherries, a variety of vegetables, tree fiber, and alfalfa), as well as the greatest amount of irrigated acreage within BPA territory. Utilities located in these areas are also the most active participants in BPA's agricultural program.⁴²

With nearly 1,000 wineries and vineyards in the Pacific Northwest, wineries are the fastest-growing segment within the agricultural community. Energy-saving enhancements, such as lighting upgrades, HVAC, pipe insulation, compressed air, VFDs, and refrigeration, are all eligible opportunities for utility

⁴¹ Northwest Power and Conservation Council, *Seventh Northwest Conservation and Electric Power Plan, Appendix E*, February 10, 2016. www.nwccouncil.org/media/7149913/7thplanfinal_appdixe_dforecast.pdf

⁴² Navigant Consulting, Inc., Analysis of United States Department of Agriculture (USDA) Data to Inform BPA Agricultural Program Market Characterization, 2015.

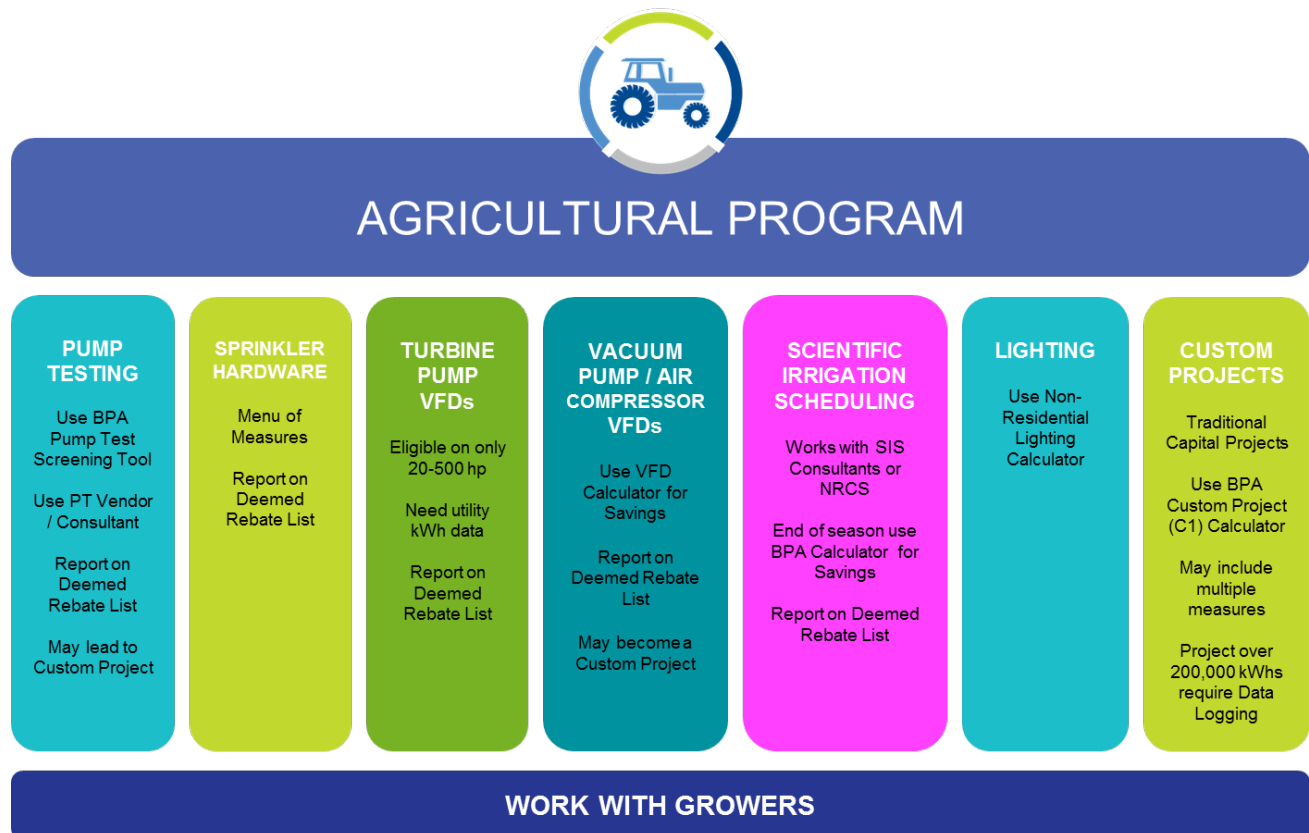
incentives. The expansion of dairies is also increasing demand for silage and other agricultural feed products. The facilities themselves also have upgrade opportunities including lighting, controls, vacuum pumps, air compressors, chillers, and VFDs.

In some areas, the water tables are declining, making it more expensive or impossible to fully irrigate some crops. The food product industry is encouraging and supporting their suppliers in reducing inputs such as water and fertilizer. Finally, the variation in commodity prices affects the profitability of farming, irrigation, and the crop mix.

Existing Efforts

Irrigation measures such as SIS and irrigation sprinkler hardware contributed to the majority of the agricultural program's aMW savings from 2010 to 2015. As Figure 34 demonstrates, BPA will continue to offer a variety of measures and utility incentives for irrigation pump testing and system analysis, sprinkler hardware upgrades, turbine pump VFDs, SIS, lighting, and custom project opportunities. These measures and incentives are not limited to irrigation, as the program is also available for the non-processing side of dairies and wineries.

Figure 34: Agricultural Sector Structure



Source: BPA, 2016

BPA currently conducts the following program activities:

- **Marketing support for utilities and trade allies.** The development of marketing collateral, product sheets, mailers, and the online, customizable marketing collateral tool
- **Outreach and collaboration.** All of the networking, outreach, and collaboration activities that BPA uses to engage utilities, trade allies, and irrigators; one of the major activities within this category is the direct outreach to irrigators that BPA staff and the BPA APSs conduct on behalf of utilities
- **Technical support for utilities.** BPA’s technical assistance provided to the utilities, as well as the assistance provided directly to the irrigators at the request of the utilities
- **Technology pipeline.** All activities relevant to developing and approving new measures for inclusion in BPA programs
- **Market research and evaluation.** Market research and program evaluation activities that contribute to improving BPA’s understanding of the market and its assessment of program effectiveness

Market Research

BPA has conducted a number of agricultural market research studies in the past five years:

- **2010 Evaluation of BPA's SIS program.** This report describes findings on regional irrigation practices and the use of SIS in particular. It also presents an assessment of the SIS program and identifies opportunities for improvements in program design and delivery.
- **2015 United States Department of Agriculture (USDA) Census and Farm and Ranch Irrigation Survey data analysis.** The objective of this analysis was to summarize key trends for the Northwest region as a whole as well as within sub-regions. BPA will use these findings as a first step toward identifying areas that warrant the greatest attention in its programming.
- **2016 Agricultural Market Study.** This in-progress market research is expected to complete in 2016. The goal of the study is to assess the top areas of opportunity for irrigation efficiency in the BPA region and determine if Momentum Savings can be documented in the future.
- **2017 Agricultural SIS Field Study.** This research on the impact of SIS is in progress and BPA expects to complete it in the first quarter of 2017. The goal of the study is to assess water savings from fields participating in SIS compared with the market average. As a result of costs, this study was limited to BPA-served utilities located in parts of Washington and Oregon, specifically to the east side of the Cascade Mountains.

Strategic Opportunities and Planned Approach

This section outlines BPA's approach to meeting agricultural EE program goals. The section identifies new and planned efforts including how ETs, R&D, and Momentum Savings contribute to savings forecasts.

New and Planned Efforts

Two research projects currently underway may dramatically affect the new and planned efforts within the agricultural sector to meet the 2016 to 2021 savings goals. These two studies include the SIS Field Study and the Agricultural Market Study. In addition, the results of the demonstration project and the DR pilot (described in the following section) will affect the agricultural program strategy. BPA intends to consider the results of these studies and determine new and planned efforts to meet the 2021 goal.

Emerging Technologies and Research and Development

The following two ET studies are currently underway:

- **Low Elevation Spray Application (LESA)/Low Energy Precision Agriculture (LEPA) demonstration project.** BPA is funding a demonstration project with Washington State University and the University of Idaho to assess the viability and suitability of LEPA and LESA irrigation technology for broader deployment in the Northwest. LEPA and LESA technologies were originally designed for center pivot irrigation in areas with short water supply and high energy costs. These measures are popular in the Midwest and Texas. In the Pacific Northwest,

the typical center pivot has sprinklers on top of the top pipe or on drop tubes, which are called Mid-Elevation Sprinkler Technology. This study will help determine whether these technologies would be viable in the Northwest region and can help BPA decide whether to pursue these technologies as energy efficient options.

- **DR pilot.** BPA is also conducting a pilot project to reduce electric loads at the times of peak use in a Southern Idaho service territory. Fall River Electric and its irrigators will turn off irrigation pumps on some summer days when loads are forecast to be highest in the month. BPA will pay an incentive per horsepower for pumps that are turned off. BPA will request this DR resource at most five times per month during the pilot project, which will run from June through September 2016. BPA expects the results of the pilot to be available in late 2016.

Momentum Savings

Momentum Savings for the agricultural sector are not currently expected to affect agricultural sector savings forecasts. Results of the 2016 Market Study may reveal opportunities for momentum savings. These opportunities will be included in the update to the EE Action Plan if they are found.

Challenges and Opportunities

Challenge or Risk	How BPA Will Address
The agricultural sector is unique in that the industry is highly dependent on the weather. Weather changes can impact water usage, crop yield and profitability, all which can influence the ability to participate in EE programs.	BPA programs will strive to be flexible and supportive, utilizing program and engineering expertise to work with utilities to uncover cost effective EE savings across a wide range of conditions
Commodity prices are a factor, as most crops grown in the Northwest must compete in a worldwide marketplace. Growers in the region are strongly motivated to keep costs low and maximize profits and may struggle to make significant investments in equipment upgrades or new technologies	BPA will work with utilities to set incentive offerings at a competitive level that may help growers invest in technologies.
BPA is awaiting the results of the SIS Field study which could greatly impact the program.	Extensive new research in the SIS field will help to improve both savings estimates and optimize program effectiveness.

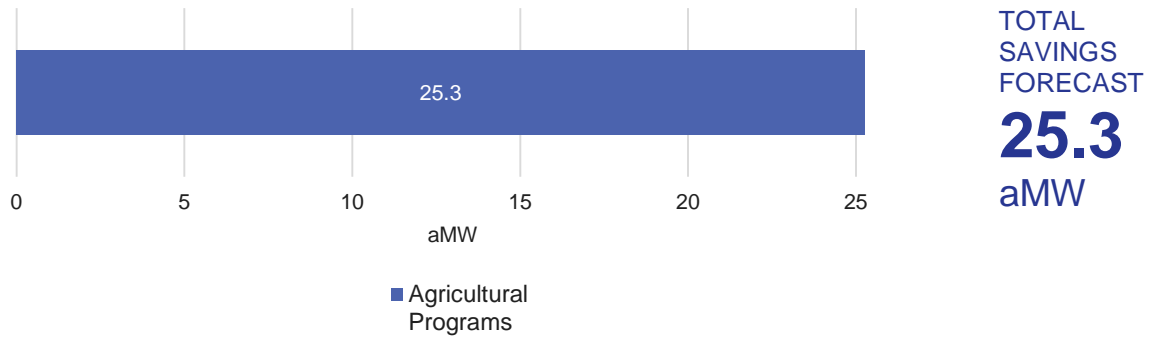
Savings, Costs, and Performance Metrics

The Council identified 63.0 aMW of regional potential for the agricultural sector over the Seventh Plan period. BPA estimates its share (42%) of the potential at 26 aMW. Taking into account current market conditions and existing resources, BPA forecasts a programmatic savings potential of 25.3 aMW.

Agricultural Savings Estimates

Figure 35 shows the total forecasted agricultural sector savings by source from 2016 to 2021.

Figure 35: Agricultural Programmatic Savings Forecast by Source, Combined (aMW): 2016-2021



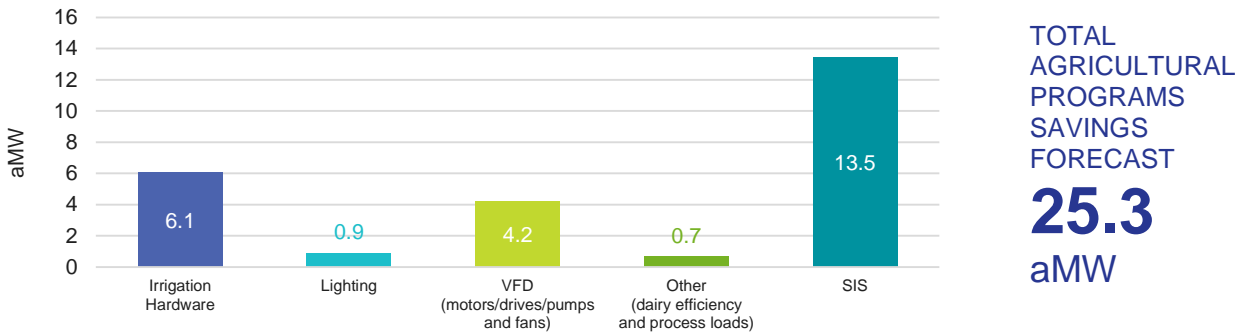
Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total

Source: BPA analysis, 2016

Figure 36 shows the total forecasted agricultural sector savings by program from 2016 to 2021.

Figure 36: Agricultural Programmatic Savings Forecast by Program, Combined (aMW): 2016-2021



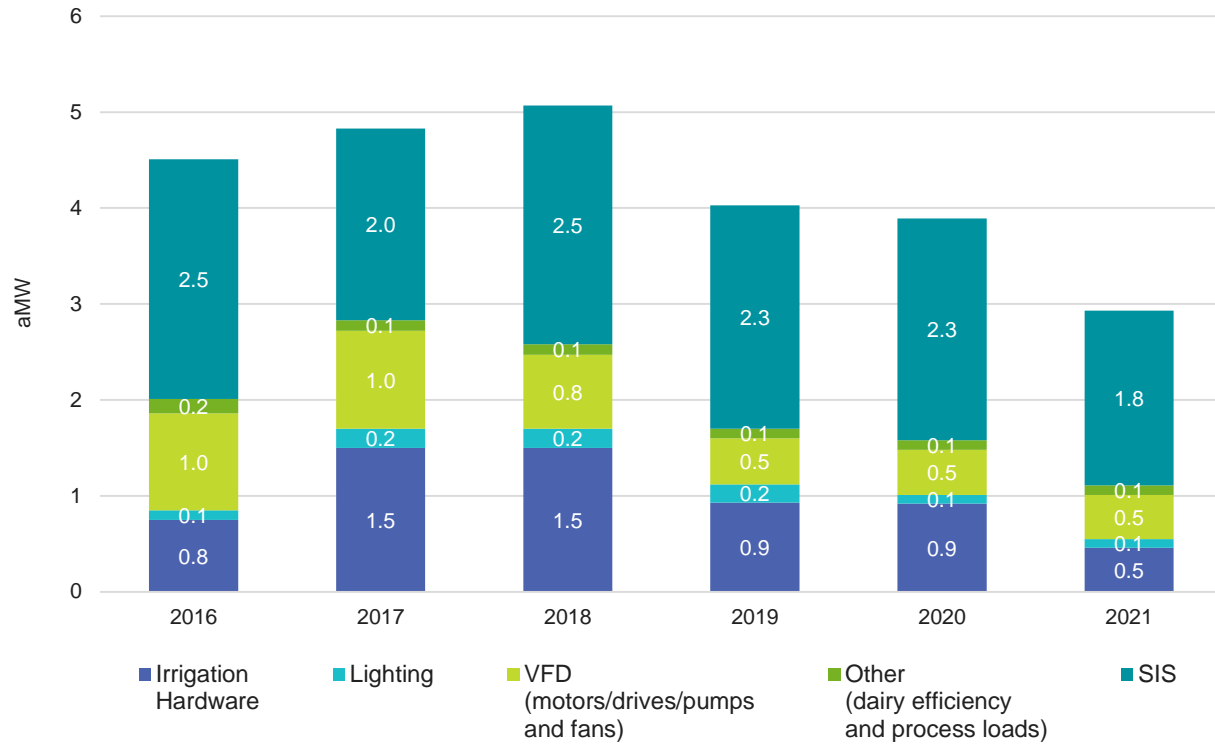
Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 37 shows the agricultural sector savings by program area and year.

Figure 37: Agricultural Programmatic Savings Forecast by Program and Year (aMW): 2016-2021



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

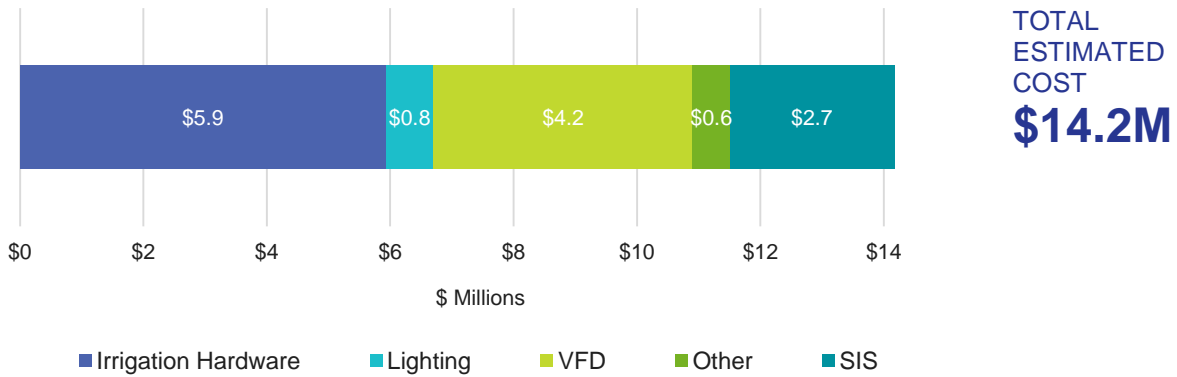
Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Agricultural Costs

Figure 38 shows the total forecasted agricultural sector costs by program for years 2016-2019.

Figure 38: Agricultural BPA Cost Estimate by Program, Combined (\$ Millions): 2016-2019



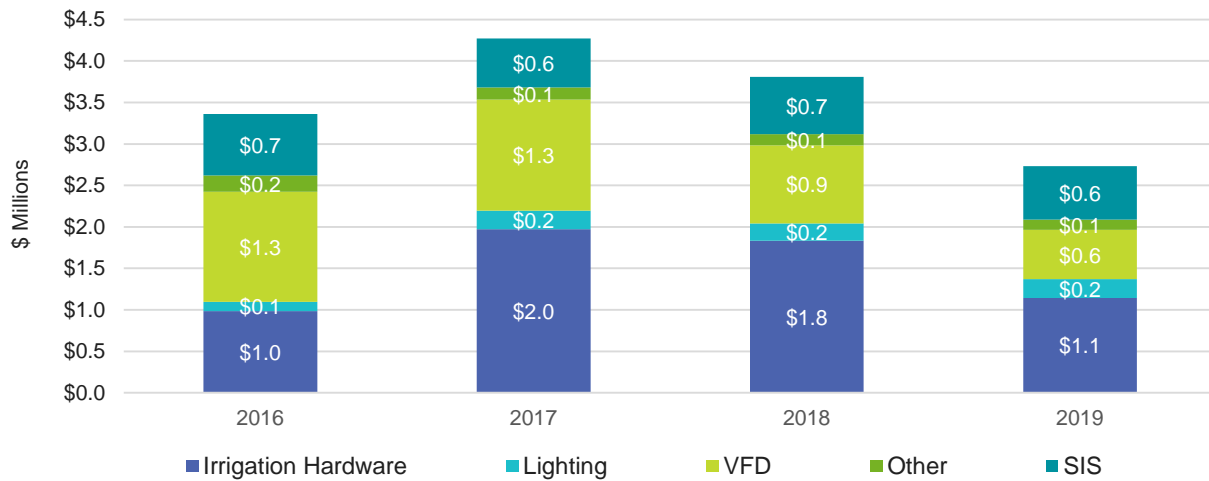
Note: Costs include only BPA EEI-Funded programs.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 39 shows the total forecasted agricultural sector costs by program and year.

Figure 39: Agricultural BPA Cost Estimate by Program and Year (\$ Millions): 2016-2019

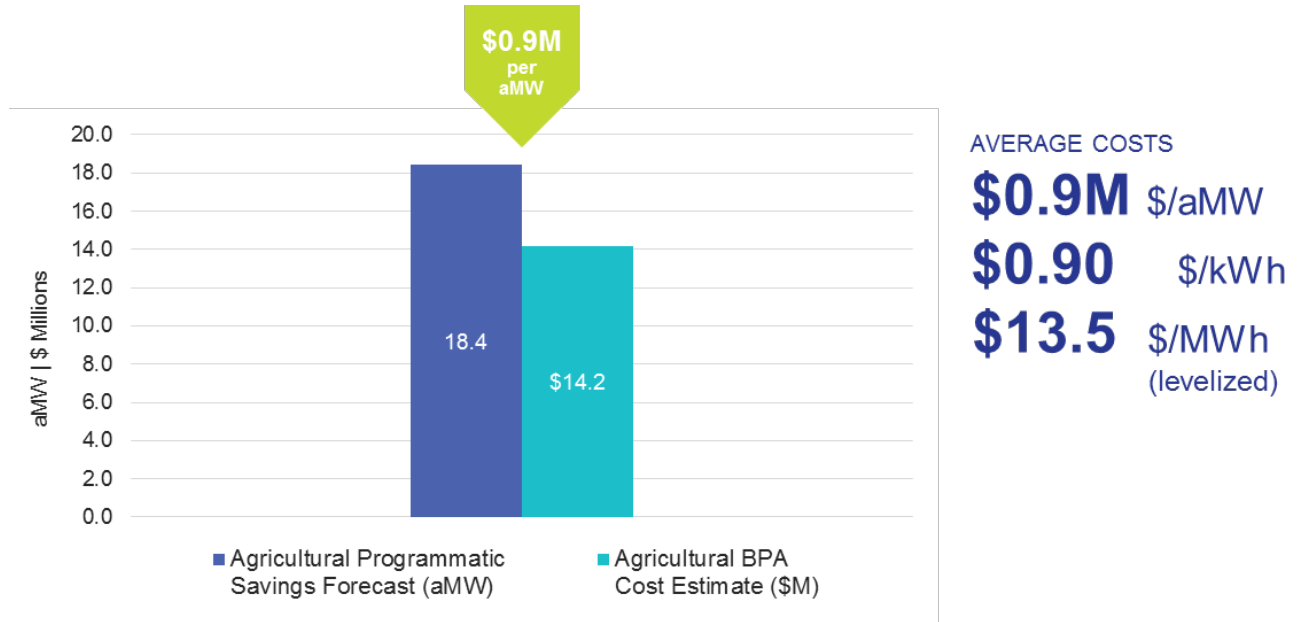


Note: Costs include only BPA EEI-Funded programs.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 40: Agricultural Programmatic Savings and BPA Cost Metrics, Combined: 2016-2019

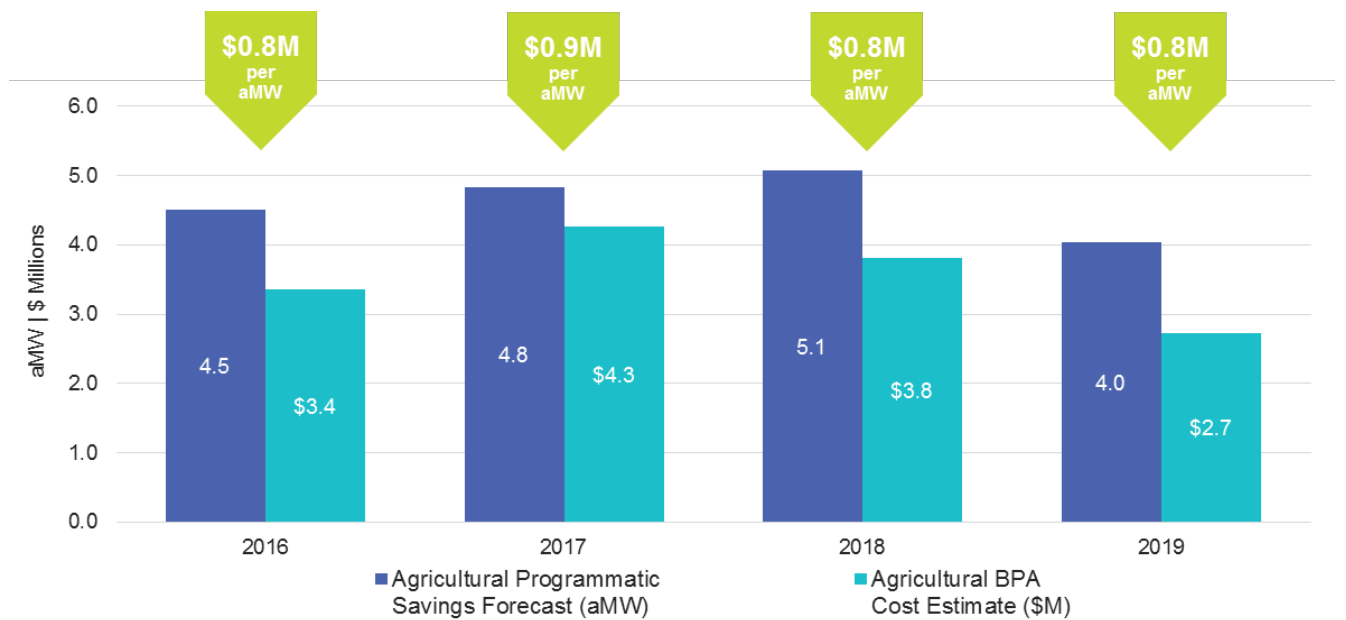


Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Figure 41: Agricultural Programmatic Savings and BPA Cost Metrics by Year: 2016-2019



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Agricultural Performance Metrics

BPA's two main goals of the agricultural program are to achieve regional energy savings goals and to support utilities in enabling their agricultural customers to save energy. BPA will track these goals by evaluating energy savings in aMW and tracking the number of participating utilities in the program.

3.5 FEDERAL SECTOR STRATEGY

This section presents the strategies the federal sector will employ over the Seventh Plan period to meet its savings forecast (14.1 aMW). It provides an overview of the federal program landscape, discusses the strategic opportunities existing in the market, and outlines the planned approach to meeting the savings forecast. Finally, it presents the savings estimates, budgets, and metrics to gauge performance over the plan period.

Federal Sector Landscape and Context

About 5% of BPA's total electric supply goes to power facilities around the Pacific Northwest that are owned or occupied by federal agencies. These federal facilities range from large military bases to small rural post offices, federal courthouses, office buildings, and other facilities in between. BPA's federal sector team manages the ESFP and the ESRP program with the goal of encouraging EE in these federal facilities. ESFP and ESRP provide a wide range of EE assistance including full comprehensive energy and water assistance, help with obtaining third-party financing, utility energy service contracts (UESCs), and long-term project planning.

Accomplishments Since 2010 Plan Publication

Through ESFP, BPA connects federal agencies with their local utility, contractors, financing institutions, and other resources. Since its inception, this partnership has saved federal agencies 33 aMW, reducing federal agencies' utility bills and saving taxpayers an estimated \$14.5 million per year. From 2010 to 2015, federal sector programming saved 8.6 aMW. Since beginning the program in 2013, participation has increased in each of the four years the program has been operating.

Current Landscape Assessment

The federal Energy Policy Act of 2005 established several goals and standards to reduce energy use in existing and new federal buildings. Executive Order 13423, signed in January 2007, expanded on those goals and standards and was later reaffirmed by Congress with EISA 2007.⁴³ EISA 2007 extended an

⁴³ Federal Register, "Executive Order 13423," January 24, 2007. www.gpo.gov/fdsys/pkg/FR-2007-01-26/pdf/07-374.pdf

existing federal energy reduction goal to 30% by FY 2015, directed federal agencies to purchase ENERGY STAR and Federal Energy Management Program-designated products, and required new federal buildings to be built above American Society of Heating, Refrigerating and Air-Conditioning Engineers standards or the International Energy Conservation Code.

New Executive Order 13693 spreads new energy use reduction targets for the next 10 years, using FY 2015 as a baseline. It requires federal buildings to achieve an annual 2.5% reduction in energy use through 2025. All federal agencies are actively engaged in reporting their progress toward this mandate, in addition to identifying and implementing energy savings projects to support and meet the federal mandate.

Existing Efforts

ESFP. BPA currently has multimillion-dollar UESCs with the Navy, Joint Based Lewis-McChord, and several US Veterans Affairs facilities, which have and will continue to result in substantial reported kilowatt-hour savings in the next one to three years. Two types of federal agencies participate in the ESFP: direct-served federal sites and utility-served federal sites. BPA defines these sites as the following:

- **Direct-served federal (DSF) sites.** A limited number of Pacific Northwest federal sites take power directly from BPA. Each DSF site has its own EEI and an energy conservation agreement with BPA to manage the site's EEI budget. DSF sites include Naval Base Kitsap (Bangor and Bremerton), Jim Creek Naval Radio Station, Fairchild Airforce Base, US DOE Richland, and the US DOE National Energy Technology Lab in Albany.
- **Utility-served federal sites.** The great majority of federal sites in the Pacific Northwest obtain power from a local utility. Serving utilities include both consumer-owned utilities (COUs) and investor-owned utilities (IOUs). BPA targets its efforts toward federal facilities served by COUs, but also provides general assistance for agencies with IOU-served sites.

ESRP. One type of federal agency participates in ESRP: no serving utility sites. No serving utility sites receive power directly from the Federal Columbia River System hydroelectric dam. These sites include 28 irrigation districts, US Army Corps of Engineers and US Bureau of Reclamation hydroelectric facilities, and BPA's own station service loads. The ESRP program serves these sites exclusively.

Market Research

BPA conducted a research study in 2011 to identify all federal agencies that operate in BPA territory. BPA used the results to create a contact database that enabled routine program communications to all federal sites. BPA will update the contact database during the 2016 to 2021 Action Plan period.

Strategic Opportunities and Planned Approach

This section outlines BPA's approach to meeting federal EE program goals. The section identifies new and planned efforts including how ETs, R&D, and Momentum Savings contribute to savings forecasts.

New and Planned Efforts

Approximately 20 smaller no serving utility irrigation district sites out of the 28 total have not participated in the ESRP program. BPA will develop structured communication plans to provide better program outreach to all 20 eligible sites. BPA staff are performing a strengths, weaknesses, opportunities, and threats analysis to determine the successful program areas and what program areas to strengthen to ensure the continued success of the ESRP program.

Only a few large agencies (Navy, Joint Based Lewis-McChord, and Veterans Affairs) take advantage of the ESFP financing available through the UESC. The UESC with the Veterans Affairs will conclude in 2017. There is an opportunity to continue UESC work with Navy and Joint Based Lewis-McChord as well as engage other federal agency sites such as Fairchild Air Force Base, Pacific Northwest National Laboratory, the US Forest Service, the US National Park Service, and US Army Reserve Centers.

There has also been discussion about creating an SEM program cohort inclusive of eligible federal agencies to provide ongoing support of their Executive Order-defined goals as well as participation in BPA federal EE programs. BPA will examine the potential in 2017 and take action accordingly.

Emerging Technologies and Research and Development

BPA will review federal sector ETs over the course of the Seventh Plan period and determine how ETs will play a role in new and planned efforts to meet the savings forecast.

Momentum Savings

BPA will not capture Momentum Savings in the federal sector.

Challenges and Opportunities

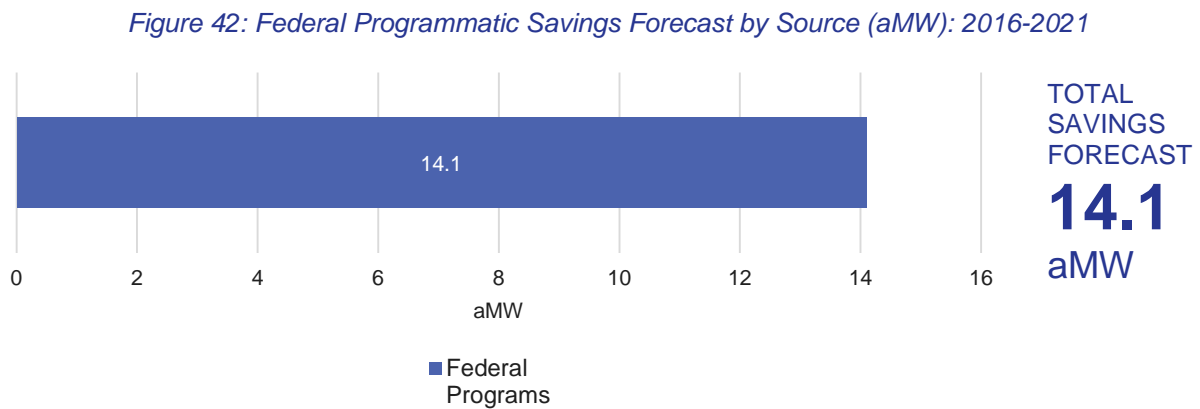
Challenge or Risk	Opportunity
Federal buildings have a mandate to reduce energy use, however many are lacking the funding to do so.	BPA will continue to work with federal agencies to utilize BPA funds and offer assistance in working with stakeholders in obtaining needed loans.
Accurately predicting annual aMW savings for the federal sector can be a challenge. Project implementation can take several years to complete and can be delayed by the contracting process.	With each project, BPA continues to learn about the contract complexities and timeline for implementation, improving our forecasts of project duration and expected savings.

Savings, Costs, and Performance Metrics

The Seventh Plan does not include a federal sector efficiency goal. BPA distributes some of the savings achieved from federal sector programs to the commercial and industrial sectors.

Federal Savings Estimates

Figure 42 shows the federal sector savings forecast.



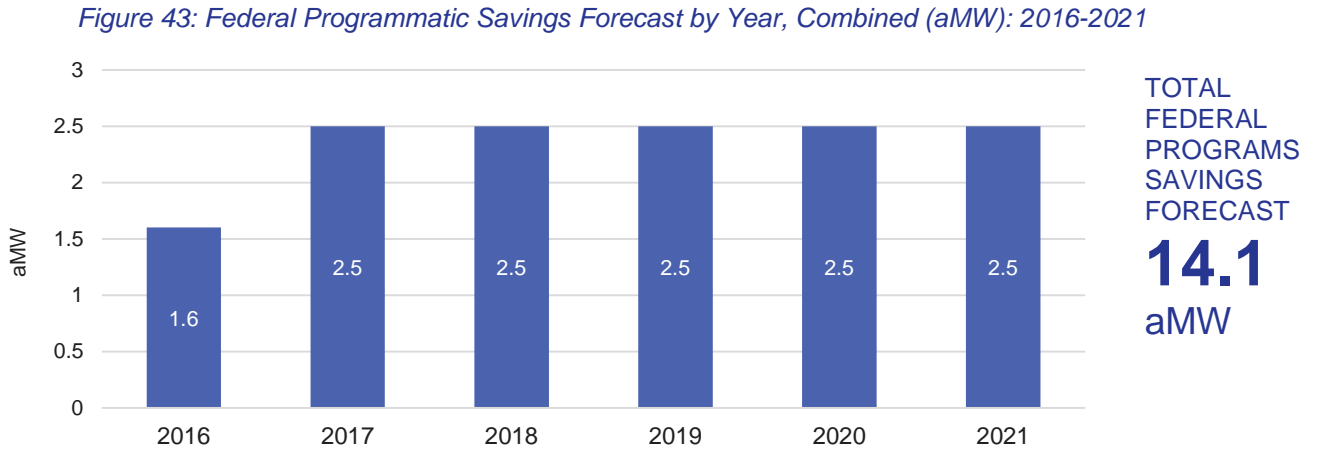
Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Federal Costs

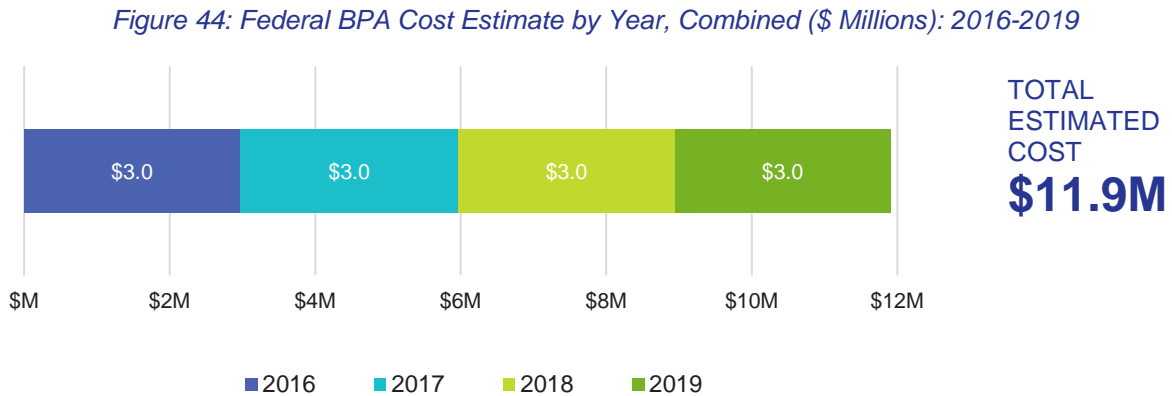
Figure 43 shows the federal sector cost forecast by year for 2016-2019.



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

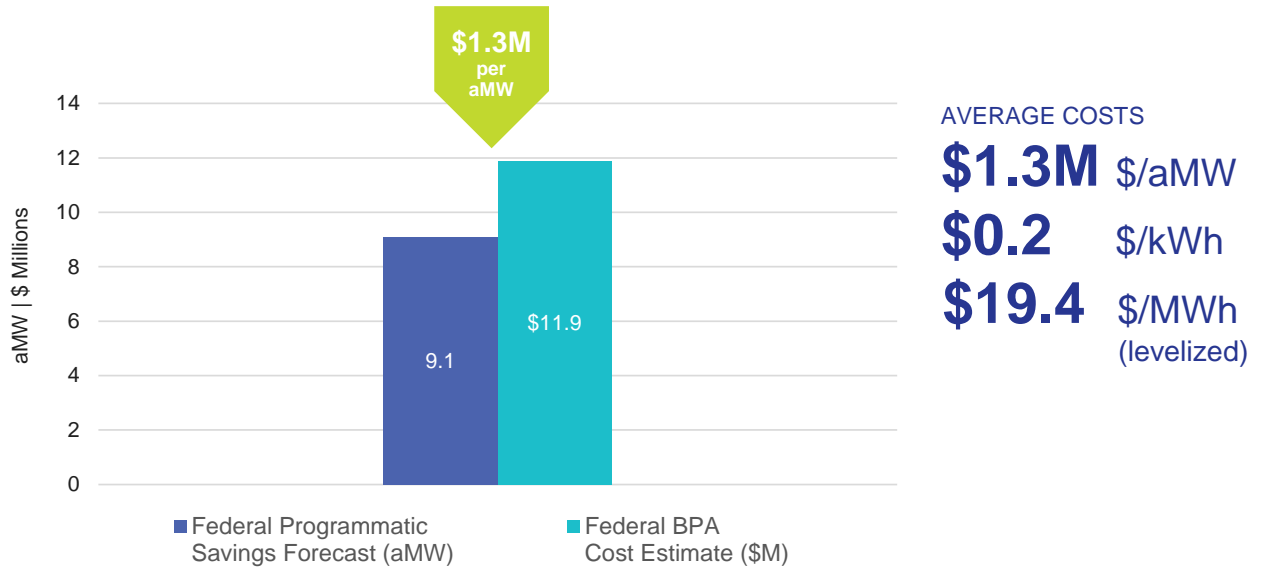


Note: Costs include only BPA EEI-Funded programs.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 45: Federal Programmatic Savings and BPA Cost Metrics, Combined: 2016-2019

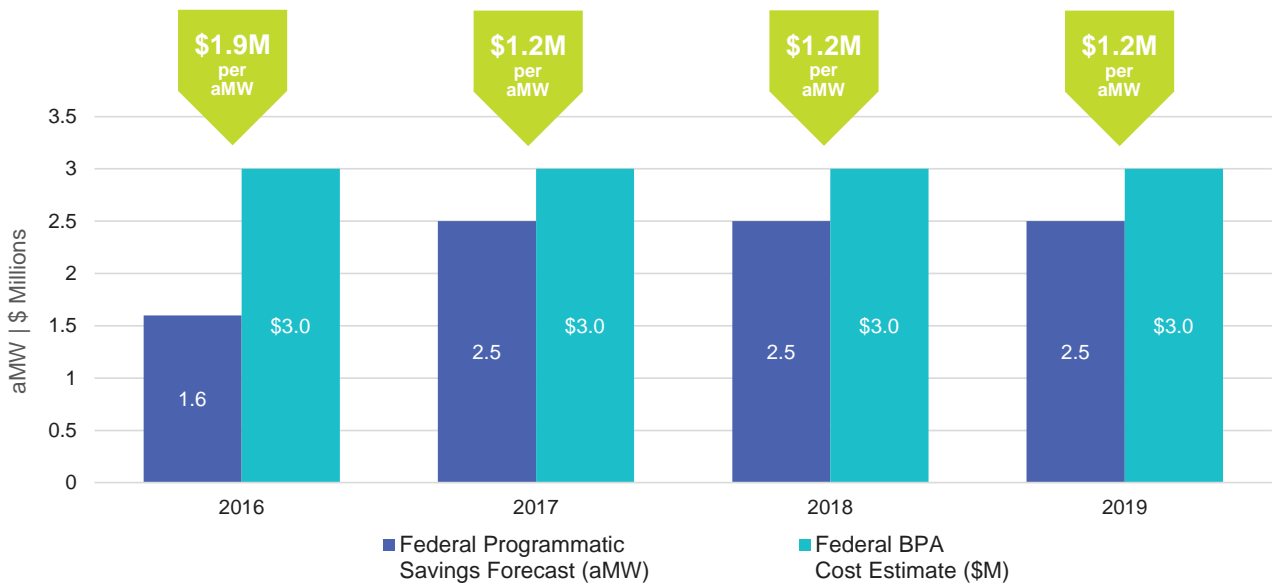


Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Figure 46: BPA Federal Sector Programmatic Savings and Cost Metrics by Year: 2016-2019



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Federal Performance Metrics

There are two key performance indicators for both programs:

- **Percentage of program budget distributed.** The amount of the total federal program budget that BPA reimbursed for project costs relative to the total budget
- **Cost-effectiveness of aMW savings (\$/aMW).** The dollar per kilowatt-hour savings achieved

BPA may also assess the quality of the program by using formal customer satisfaction survey results.

3.6 DISTRIBUTION SYSTEM EFFICIENCY SECTOR STRATEGY

This section presents the strategies the distribution system efficiency sector will employ over the six -year period to meet its savings forecast (4.3 aMW). It provides an overview of the distribution system efficiency program landscape, discusses the strategic opportunities existing in the market, and outlines the planned approach to meeting the savings forecast. Finally, it presents the savings estimates, budgets, and metrics to gauge performance over the plan period.

Distribution System Efficiency Sector Landscape and Context

Electricity distribution companies are under pressure to improve distribution system reliability and performance while dealing with the ongoing challenges of aging infrastructure and increasing customer demands for higher reliability and power quality. BPA offers several distribution-level efficiency improvement measures through the BPA Energy Smart Utility Efficiency (ESUE) program, including reimbursements for high-efficiency transformer replacement, load balancing, reconductoring, and voltage optimization (VO).

Accomplishments Since 2010 Plan Publication

Between 2010 and 2015, the distribution system efficiency sector achieved 1.1 aMW in savings. In 2010, the RTF approved the simplified VO protocols that reduced the complexity of reporting VO savings by replacing system-specific analysis with assumptions supported by regional analysis.

To promote distribution efficiency and increase the adoption of the simplified VO protocols, BPA collaborated with the Northwest Public Power Association to deliver regional training. In addition to the training, BPA assisted 18 utilities in investigating distribution system efficiencies. From 2010 to 2014, 14 utilities implemented distribution system measures, including six utilities that implemented VO measures.

Current Landscape Assessment

The application of VO as an EE measure is limited within BPA's service territory. The Seventh Plan assumes the majority of energy savings from distribution system efficiency in the Pacific Northwest is concentrated in urban substations with residential and light commercial usage. Most customers with

significant urban, residential load have evaluated VO on their system. The VO adoption rate is limited by system designs and the speed at which utilities can implement.

Market Research

In 2015, BPA published the *Smart Grid Regional Business Case for the Pacific Northwest*.⁴⁴ The analysis leverages input data from a wide range of studies and demonstrations, including coordination with and input from the Pacific Northwest Smart Grid Demonstration Project.⁴⁵ The study found that although many new technologies that enable VO have been successfully demonstrated and have shown promising results, many of the assumptions that underlie regional projections of costs and benefits are still unproven.

Strategic Opportunities and Planned Approach

This section outlines BPA's approach to meeting distribution efficiency program goals. The section identifies new and planned efforts including how ETs, R&D, and Momentum Savings contribute to savings forecasts.

Existing Efforts

As distribution system efficiency is system- and utility-specific and dependent on system design, load distribution, and O&M plans, utilities must evaluate opportunities specific to their system.

New and Planned Efforts

The 2016 to 2021 ESUE program will focus on facilitating the reporting of VO for utilities interested in distribution efficiency.

Emerging Technologies and Research & Development

As smart grid technology matures, new ways to control and measure system performance are introduced to the market. Smart grid technologies do not typically target system efficiency but potentially improve system performance as a result of increased capabilities to monitor and control the distribution system. BPA will monitor industry trends influencing distribution system efficiency adoption, including:

- Advanced metering infrastructure (AMI)
- High-bandwidth data acquisition
- Volt/volt-ampere reactive control—regulators and capacitor technologies

⁴⁴ Navigant Consulting, Inc., *Smart Grid Regional Business Case for the Pacific Northwest, Results & Analysis*, Prepared for: Bonneville Power Administration, September 30, 2015.

www.bpa.gov/Projects/Initiatives/SmartGrid/DocumentsSmartGrid/20150930-Smart-Grid-Regional-Business-Case-for-PNW-White-Paper.pdf .

⁴⁵ BPA Smart Grid, www.bpa.gov/Projects/Initiatives/SmartGrid .

Momentum Savings

BPA does not expect significant utility distribution sector energy savings from Momentum Savings or market transformation. US DOE efficiency standards for distribution transformers became effective January 1, 2016.⁴⁶ As a result, efficient distribution transformers are assumed in the Seventh Plan baseline; thus, they are not eligible EE measures, as they are considered standard.

Challenges and Opportunities

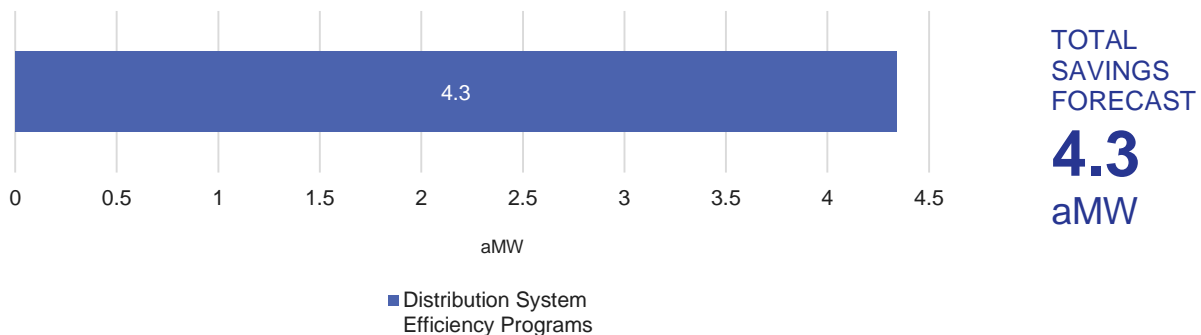
Challenge or Risk	How BPA Will Address
Stakeholders still have limited experience with the ETs and capabilities enabled by smart grid investments	BPA will approach grid modernization investments with caution until the technologies, investment risks, and business case are more clearly understood
Demand voltage reduction (DVR) presents a significant challenge to VO as some customers have preferentially implemented DVR over VO. DVR and VO are incompatible—both cannot be implemented on the same circuit—and VO provides greater rate-payer value.	The DEI program will continue to communicate the value of DVR and educate utilities on the benefits. BPA will also continue to provide engineering support to help utilities find cost effective potential.

Savings, Costs, and Performance Metrics

The Council identified 28 aMW energy savings potential for the distribution system efficiency sector over six years. BPA estimates its share (42%) at 11.8 aMW. However, taking into account current market conditions and existing resources, BPA estimates a savings potential of 4.3 aMW within its territory.

⁴⁶ US Department of Energy, Appliance and Equipment Standards Rulemakings and Notices, www.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=55&action=viewcurrent

Figure 47: Distribution System Efficiency Programmatic Savings Forecast by Program (aMW): 2016-2021



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

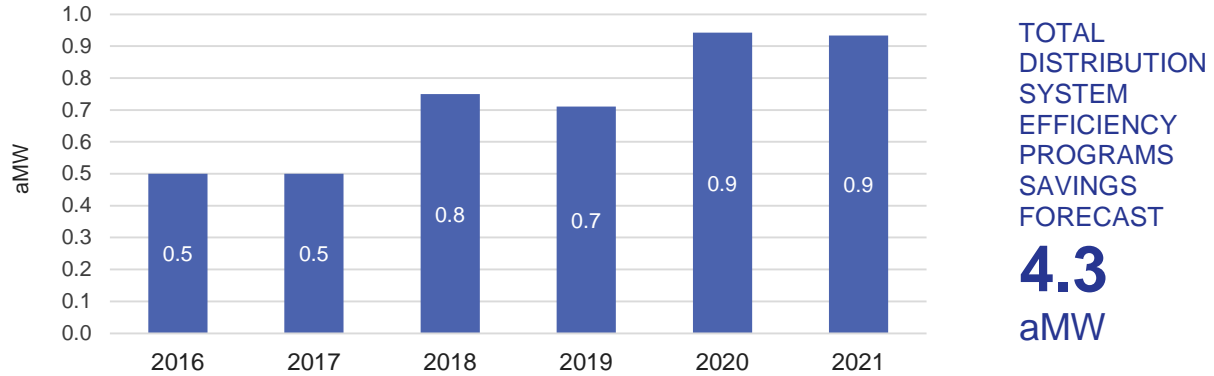
There are several reasons for the difference in the BPA estimate versus the Council estimate. Distribution system efficiency is concentrated in dense, residential substations. Residential loads are most affected by changes in supplied voltage, and customer density affects cost-effectiveness. Although the Council model is based primarily on residential load and accounts for customer density, the model does not allocate the potential proportionately. BPA’s dense residential load as compared with the region is underrepresented.

BPA also anticipates an even slower ramp rate of distribution efficiency than what is used in the Seventh Plan. The Seventh Plan assumes a slow industrial ramp rate. BPA applies a slower ramp rate to distribution efficiency, as an industrial facility commonly has a 10- to 20-year lifecycle and distribution equipment has a lifecycle of 40 to 60 years.

Distribution System Efficiency Savings Estimates

Figure 48 shows the total forecasted distribution system efficiency sector savings from 2016 to 2021.

Figure 48: Distribution System Efficiency Programmatic Savings Forecast by Year, Combined (aMW): 2016-2021



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

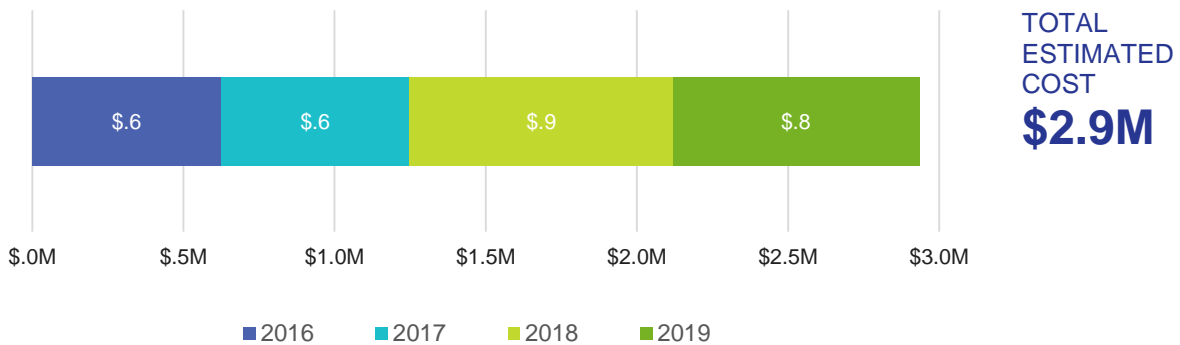
Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Distribution System Efficiency Costs

Figure 49 shows the total forecasted distribution system efficiency sector costs for 2016-2019.

Figure 49: Distribution Efficiency BPA Cost Estimate by Year, Combined (\$ Millions): 2016-2019

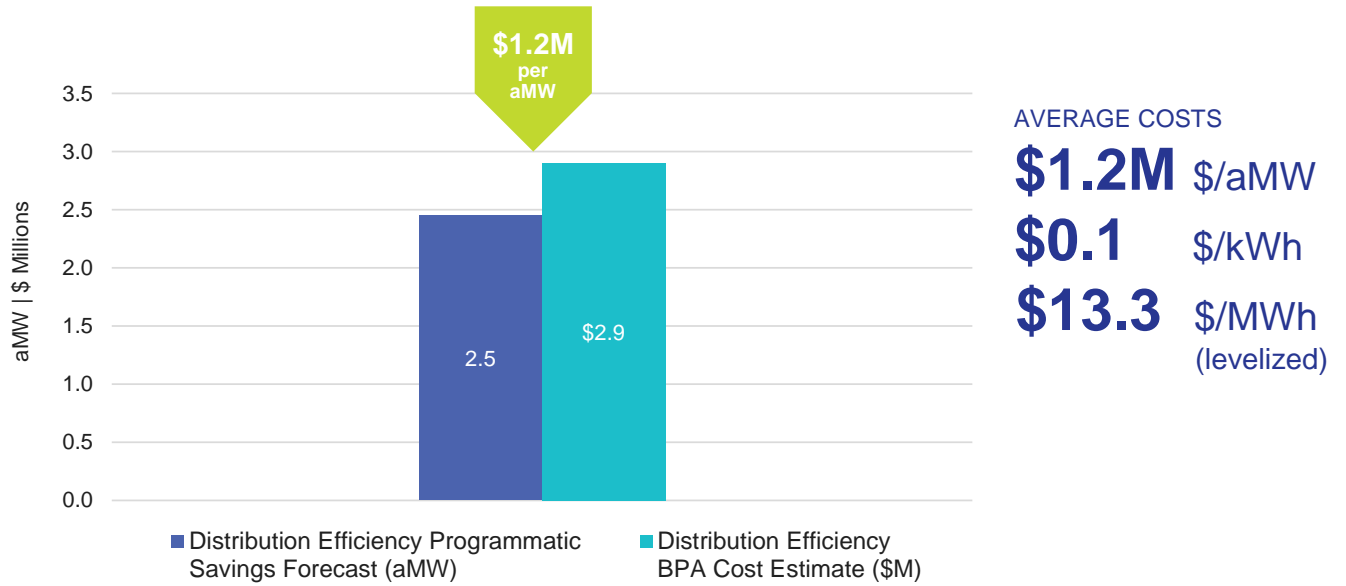


Note: Costs include only BPA EEI-Funded programs.

Note: Due to rounding, numbers may not add to the total.

Source: BPA analysis, 2016

Figure 50: Distribution Efficiency Sector Programmatic Savings and Cost Metrics, Combined: 2016-2019

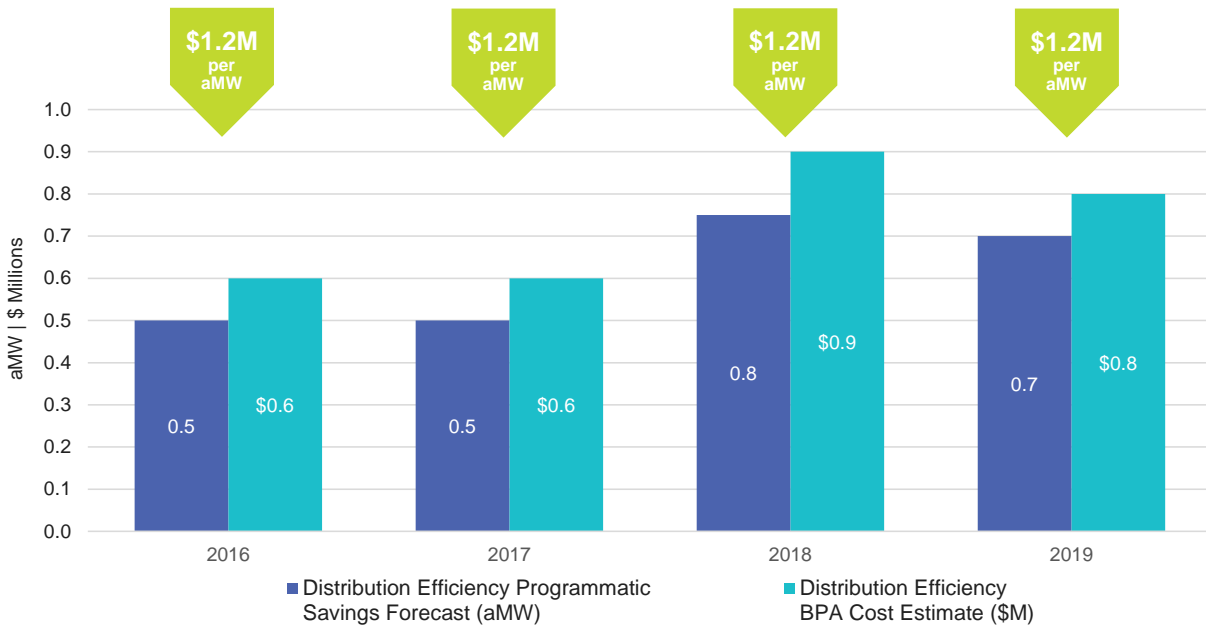


Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Figure 51: Distribution Efficiency Programmatic Savings and BPA Cost Metrics by Year: 2016-2019



Note: Savings include BPA EEI-Funded and Customer Self-Funded.

Note: Costs include only BPA EEI-Funded programs.

Source: BPA analysis, 2016

Distribution System Efficiency Performance Metrics

BPA will evaluate distribution system efficiency primarily on the aMW savings associated with the sector. Additional metrics that are helpful in evaluating this sector include the number of optimized substations and the depth of implementation relative to the magnitude of savings.



4 Emerging Technologies

BPA's ETs team develops new business opportunities for regional conservation programs by maintaining a research pipeline of near-term and longer-term potential technologies. This section discusses the current market conditions as they relate to ET and shows the strategic opportunities for these technologies as they relate to BPA EE programs.

BPA has a long and successful commitment to R&D through its Technology Innovation (TI) office. Each year, the TI office solicits new cutting-edge technology R&D opportunities. The TI office uses a proven, disciplined approach to manage projects that deliver cost-effective results. Through these R&D projects, BPA can work with manufacturers and shape technology to meet the Northwest's EE needs. These technologies will take several years to mature before BPA includes them in EE programs.

ET research consists of technical and market assessments of products, services, and technologies that are commercially available but have low adoption rates. This research evaluates the electricity use or DSM opportunities for BPA customers. Combined, the two efforts feed BPA's pipeline of conservation measures so that BPA programs have cost-effective offerings to help utility customers meet EE goals.

4.1 MARKET CONDITIONS

The Internet of Things is transforming EE. Two specific areas are advanced integrated controls and data. BPA is now conducting research on how these disruptive technologies can result in better, faster, and more cost-effective EE program offerings. For example, real-time energy usage data can alter the way teams estimate savings for measures and result in pay for performance.

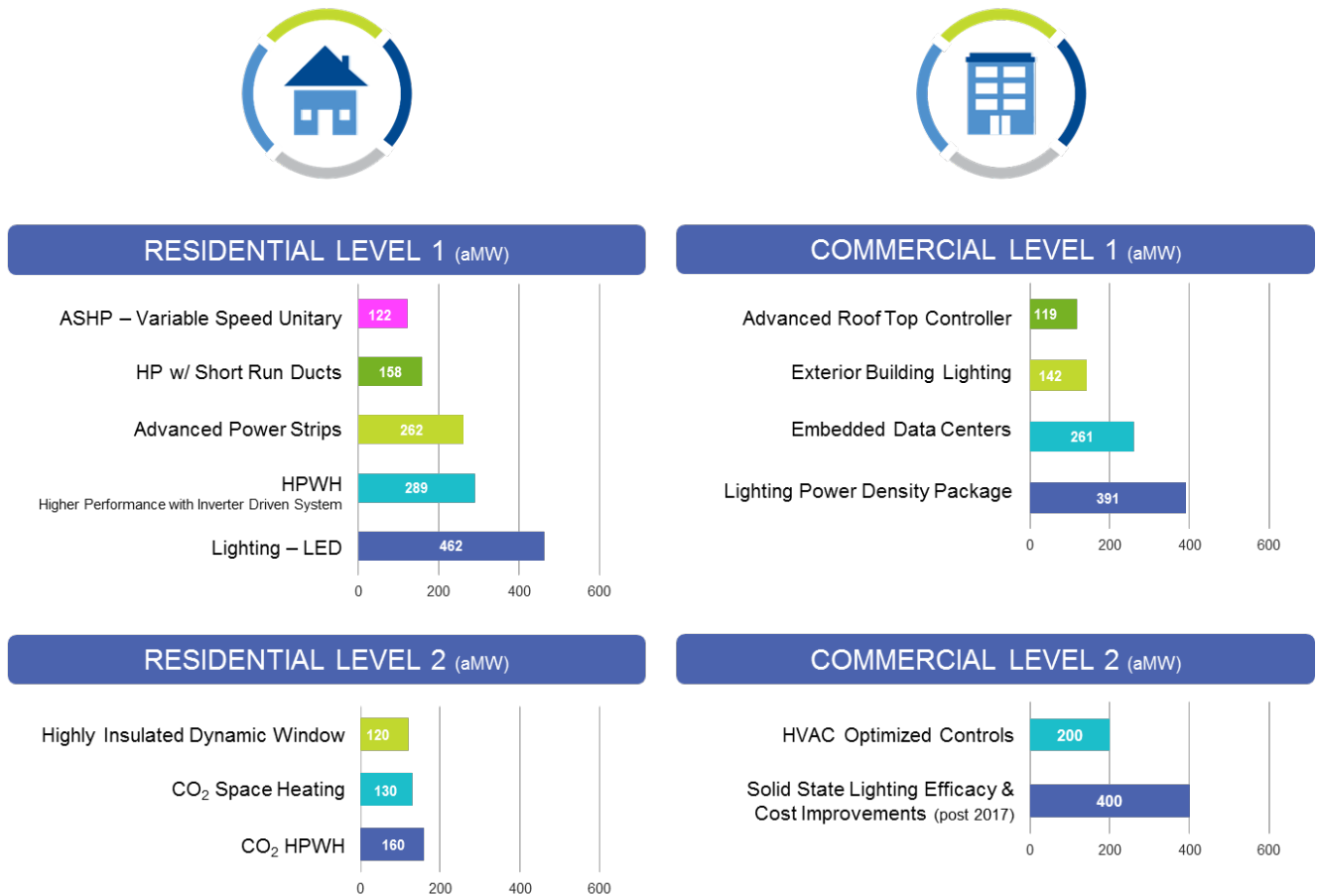
Advanced integrated controls and sensors hold large savings potential. Advanced controls can respond to price or reliability signals and potentially provide cost-effective grid support. Controls and sensors also increase technology efficiency for heating and cooling, lighting, and window coverings. For example, sensors can monitor indoor/outdoor temperatures, relative humidity, and ambient lighting and controls can remotely adjust equipment to maximize comfort and energy savings.

BPA's research portfolio represents technologies that are in the Council's Seventh Plan goals. BPA maps each of the technologies to the Action Plan's sectors, and has planned research assessments for the next several years. BPA categorizes technology opportunities in three ways:

- **Level 1.** These currently exist in the market and are part of meeting the Council's Seventh Plan goal. For example, these technologies include new advances in controls.
- **Level 2.** These will enter the market in the future. For example, these technologies include the interconnectedness of controls and thermostats.
- **Innovative technologies.** These are new research opportunities brought to BPA from its annual TI solicitation. Some may become ET.

These technology areas and their 20-year technical potential for the region, as determined in the Seventh Plan, follows in Figure 52:

Figure 52: ETs Identified in the Seventh Plan



Source: BPA, 2016

4.2 STRATEGIC OPPORTUNITIES AND APPROACH

BPA uses industry best practices for scanning, screening, and assessing products, services, and technologies. BPA’s research team continuously reviews its portfolio of efficiency technologies with program sectors to plan for field assessments and program integration. Figure 53 shows the ETs within each sector.

Figure 53: Sector-Specific ETs



Source: BPA, 2016

The Seventh Plan recommends that BPA engage in the following actions to meet savings goals. BPA will be acting on these recommendations over the Seventh Plan period.

- Develop a regional work plan by mid-2016 to help ensure adoption of ETs. Update the plan every two years. This work plan will:
 - Track adoption of new measures in the Seventh Plan
 - Identify actions to advance promising technologies
 - Increase adoption of existing technologies with low market shares
 - Scan for new technologies and practices

To address this recommendation, BPA is partnering with NEEA and the Regional Emerging Technology Advisory Council on developing a software platform to coordinate and share research efforts. This partnership will help ensure that regional research efforts are not duplicated and will accelerate technology development and adoption.

BPA collaborates nationally and advocates the Northwest's interest in ETs. Specifically, BPA advises and prioritizes technology research with the US DOE, national labs, CEE, EPRI, and others to advance the Northwest's agenda for ET. This collaboration benefits utility customers because BPA can share the costs of developing ETs, leverage findings from other entities, and align efforts to advance technologies further and faster nationally. These activities directly benefit utility customers because many do not have the resources to engage in and advance research efforts.



5 Program Evaluation

BPA's program evaluation provides valuable insight that enables BPA EE programs to achieve continuous improvement and efficient, cost-effective implementation. There are two general types of EE program evaluation at BPA: process evaluations and impact evaluations. This section includes evaluation policies and procedures and the benefits of evaluation are included.

5.1 BENEFITS OF EVALUATION AT BPA

BPA's evaluations help program managers understand why effects occurred and offer constructive and strategic feedback on ways to improve current and future program offerings. Programs use this data internally to strengthen programs, and BPA shares evaluations publicly for regional learning and transparency.

BPA conducts impact and process evaluations to objectively and retrospectively document and measure how well the program met its intended outcomes. BPA's impact evaluations ensure program savings achievements are accurate and reliable and programs have transparency and accountability. They also allow BPA to assess the effectiveness of program spending. Process evaluation seeks to determine whether a program is meeting its goals and provides recommendations for how it might improve. Process evaluations can also help programs measure and track the success of customer interactions, as well as provide strategic feedback for long-term customer interactions and indicators.

5.2 STRUCTURE AND PROCESSES

Evaluations at BPA will follow the evaluation policies developed through the BPA Quality System Strategy and Implementation (QSSI) process.⁴⁷ Impact evaluation generally follows the RTF guidelines on evaluation.⁴⁸

BPA conducts evaluation in partnership with stakeholders as efficiently as possible and using best practices. BPA's evaluation strategy development includes input from internal staff and external stakeholders to provide input into scope, approaches, and unique considerations of various groups. Internal staff includes Contracting Officers Technical Representatives and planning, management, programs, engineering, and marketing teams; external stakeholders include BPA's customers, RTF staff, and the Council.

5.3 COVERAGE OF THE BPA PORTFOLIO

The BPA evaluation team will attempt to achieve 80% to 90% impact evaluation coverage of the EE portfolio in a four-year window. When selecting which programs to evaluate within a given year, evaluation will balance the objectives of portfolio coverage, strategic research needs, timely feedback, annual budgets, and the cost/effort required. Recently, BPA completed evaluations on the FY 2012-FY 2013 custom project and lighting calculator portions of the portfolio. Currently, BPA is evaluating the FY 2014-FY 2015 residential HVAC, lighting, and envelope portions. BPA expects the following activities to take place from 2017-2019:

⁴⁷ BPA will complete process evaluation policies in FY 2017.

⁴⁸ Regional Technical Forum, "RTF Operative Guidelines," <http://rtf.nwcouncil.org/subcommittees/Guidelines/Default.asp>.

- Provide remaining evaluation coverage of the UES portfolio, which likely includes savings from the residential and agricultural sectors and may include follow-up evaluation efforts on the residential HVAC and envelope
- Determine strategy for integrated EM&V for custom evaluation
- Develop QSSI policies for process evaluation
- Conduct process evaluation consistent with QSSI policies
- Develop annual evaluation reports outlining the findings and portfolio coverage

Future evaluation efforts may include components of real-time process and impact evaluation, such as leveraging AMI data and commercial SEM.



6 Demand Response

Historically, BPA has not had a consistent need for Demand Response (DR) because of its abundant hydro capacity. However, seasonal peaks, transmission constraints, and interest in variable resources have made DR a higher priority for BPA. . Technology advancements and the decreasing costs of Distributed Energy Resources (DERs) such as battery storage are increasing the opportunities of using new types of flexible assets within the BPA system. The following section reviews current DR efforts and the potential for collaboration with EE programs.

DR is used extensively throughout the United States, primarily for reliability and economic purposes, with about 55,000 MW of curtailable load under management in wholesale markets and retail utilities.⁴⁹ Although BPA has no DR under contract for commercial purposes, the value proposition for DR at BPA is shifting based on the following potential emerging needs:

- Capacity shortages during peak times in winter and summer
- Relief of transmission constraints and deferring or avoiding transmission upgrades
- Flexibility needed beyond the Federal Columbia River Power System's capability
- Integration of variable resources by providing inter-hour balancing services

BPA's Distributed Energy Resources (DER) team, in partnership with power, transmission, DER/DR providers and suppliers, and technology vendors, has been leading a series of pilots and demonstrations to build BPA's and the region's capability to acquire and successfully operate DER/DR. BPA has been monitoring the trends of the nation's utilities and the ISO/RTOs and expanded its focus from spotlighting ordinary DR to encompassing additional DER such as dispatchable DR, energy storage, and Distributed Generation in recognition of the technology breakthroughs and falling costs of solar and utility-scale storage.

6.1 OVERVIEW OF DEMAND RESPONSE EFFORTS AT BPA

In the past five years, BPA has conducted more than 20 DR pilots and three large-scale demonstrations in the region. This activity has allowed BPA and partner utilities to show that DR in MW-scale can be executed by BPA operations and that end-loads can perform reliably. In addition, BPA has begun to explore the use of demand-side resources as a non-wires alternative to traditional transmission builds (e.g., In May 2016, BPA issued its first Non-Wires Request for Offers to help address congestion on the South of Allston transmission flowgate).

BPA is now looking to transition products to a commercial state so that BPA's power and transmission services organizations will have DER products available to meet BPA system objectives. To transition DER products toward commercial use, the R&D work that the DER team has done and continues to do is important to match DER products with BPA needs. The DER team will focus attention on evaluating and preparing a suite of DER products including DR, storage, and DG that show potential for commercialization such that by 2021:

- Needed and demonstrated DER products will follow a clear migration path into BPA operations
- Demonstrated but not yet needed DER products will be at the ready for commercialization

⁴⁹ Federal Energy Regulatory Commission, *Assessment of Demand Response and Advanced Metering*, Staff Report, December 2015. <http://www.ferc.gov/legal/staff-reports/2015/demand-response.pdf>

- Evaluation of future demonstrations will be based on the cost-benefit analysis of possible commercial uses

6.2 VISION AND GOALS FOR DISTRIBUTED ENERGY RESOURCES COMMERCIALIZATION

The vision for the DER team is to provide research, development, and design and to function as a valued strategic partner in the efficient planning, process framework, and implementation of DER solutions into BPA operations. The DER team also aims to provide ongoing expertise and vendor management as DER products commercialize.

The following list outlines the DER team's goals. By meeting these goals, the DER team will enable BPA to capitalize on the benefits obtained through the commercialization of DER, allowing BPA to best meet its mission to set its rates as low as possible consistent with sound business principles:

- **Goal 1: Determine BPA needs that DER could address effectively.** Wherever applicable, the DER team will evaluate BPA needs and solutions to span multiple (stacked) value streams—for example, products that would be available for transmission and power or external parties. The DER team will work with internal customers and outside stakeholders to determine BPA's needs including those set forth in the resource program for long-term generation and short-term flexible capacity, seeking to balance transmission, utilities, and emerging needs.
- **Goal 2: Facilitate the development of an enabled DER provider base (entities that make DER available) for the future acquisition of DER products.** The DER team will identify the DER supplier and provider landscape, create a provider assessment framework, establish the acquisition model, and collaborate on cost-effective DER solutions.
- **Goal 3: Formalize a plan to commercialize DER products at BPA.** The DER team will identify the processes, policies, procedures, and products needed for DER commercialization. The team will also facilitate implementation and execute the handoff of DER products ready for operations.
- **Goal 4: Serve as the recognized subject matter experts in the field of actionable DER for BPA and other regional parties interested in participating in DER with BPA.** The DER team will work collaboratively across BPA to maintain effective communication channels and advisory services and support; it will also provide cross-share education opportunities within BPA and with customers, the region, and the industry for the express purpose of creating value.
- **Goal 5: Incorporate the DR recommendations from the Seventh Plan.** The DER team will work to support the expansion of the regional DR infrastructure, collaborate on DR data collection, continue efforts to establish DR, assess the BPA DR potential and improve access to DR data.

6.3 EXECUTION OPPORTUNITIES AND CHALLENGES

Opportunities for DR execution at BPA include the following:

- BPA will be an active participant in region-wide DR-related venues such as the Council's Pacific Northwest Demand Response Project and Demand Response Regional Advisory Committee.
- BPA sent a 2016 Request for Offers seeking non-wires measures to mitigate north to south flows on the South of Allston Substation flow gate during summer peak congestion periods. BPA reviewed responses to the RFO, is implementing a South of Allston non-wires demonstration starting in 2017, and will evaluate additional non-wire activities will occur through 2021. BPA has two non-wires teams looking at opportunities for non-wires solution offerings.
- There may be opportunity to mitigate congestion during summer peak periods using DR.
- BPA's TI department solicits annual DR project proposals. BPA will select certain proposals to invest in, taking into account the public DR roadmap.
- Outside of BPA, other entities are piloting DSM activities that could lead to opportunities for BPA.
- Evolving western energy markets could influence DR opportunities at BPA.

Challenges to execution of DR at BPA include the following:

- Low market prices and evolving energy markets create uncertainty and make it challenging to use cost-benefit analysis to justify new programs.
- The low cost of constructing natural gas combustion turbines and energy generation in general makes DR difficult to prioritize.
- The BPA resource program forecasts a capacity surplus through 2021, making DR less urgent.



Appendices

Appendix A BPA Reference Sources

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Appendix B Abbreviations and Acronyms

AMI	Advanced Metering Infrastructure
aMW	Average Megawatts
APS	Agricultural Program Specialist
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BPA	Bonneville Power Administration
BPAQ	Bonneville Power Administration-Qualified
CEE	Consortium for Energy Efficiency
CFL	Compact Fluorescent Light
COU	Consumer-Owned Utility
CVR	Conservation Voltage Reduction
DER	Distributed Energy Resources
DHP	Ductless Heat Pump
DOE	Department of Energy (United States)
DR	Demand Response
DSM	Demand-Side Management
DVR	Demand Response Voltage Reduction
EE	Energy Efficiency
EEl	Energy Efficiency Incentive
EM&V	Evaluation, Measurement and Verification
EPRI	Electric Power Research Institute
ESFP	Energy Smart Federal Partnership
ESG	Energy Smart Grocer

ESI	Energy Smart Industrial
ESIP	Energy Smart Industrial Partner
ESRP	Energy Smart Reserved Power
ESUE	Energy Smart Utility Efficiency
ET	Emerging Technology
FY	Fiscal Year
HVAC	Heating, Ventilation, and Air Conditioning
IDSM	Integrated Demand-Side Management
IFSA	Industrial Facility Stock Assessment
IM	Implementation Manual
IOU	Investor-Owned Utility
IPR	Integrated Program Review
LED	Light-Emitting Diode
LEPA	Low Energy Precision Agriculture
LESA	Low Elevation Spray Application
M&V	Measurement and Verification
MW	Megawatt
NEEA	Northwest Energy Efficiency Alliance
NEEM	Northwest Energy Efficient Manufactured
NEI	Non-Energy Impact
O&M	Operations and Maintenance
PTCS	Performance Tested Comfort Systems
QA	Quality Assurance

QC	Quality Control
QSSI	Quality System Strategy and Implementation
R&D	Research and Development
RTF	Regional Technical Forum
SEM	Strategic Energy Management
SIS	Scientific Irrigation Scheduling
TAN	Trade Ally Network
TI	Technology Innovation
TSP	Technical Service Provider
UES	Unit Energy Savings
UESC	Utility Energy Service Contracts
USB	Utility Sounding Board
USDA	United States Department of Agriculture
VFD	Variable Frequency Drive
VO	Voltage Optimization