

2016-2021

Energy Efficiency Action Plan Update



Table of Contents

1	Introduction	3
1.1	Evolution of the Savings Forecast	3
1.2	Expected Seventh Plan Period Achievements.....	5
1.3	Action Plan Development Process	6
2	Energy-Efficiency Savings and Budget.....	6
2.1	BPA’s Savings Accomplishments and Forecasts.....	7
2.2	BPA’s Energy-Efficiency Budget	8
3	Programmatic Savings	10
3.1	Residential Sector	12
	Accomplishments Since Plan Publication	12
	Areas of Focus 2020-2021	13
3.2	Commercial Sector.....	15
	Accomplishments Since Plan Publication	15
	Areas of Focus 2020-2021	16
3.3	Industrial Sector	17
	Accomplishments Since Plan Publication	17
	Areas of Focus 2020-2021	18
3.4	Agricultural Sector	19
	Accomplishments Since Plan Publication	20
	Areas of Focus 2020-2021	20
3.5	Federal Sector.....	21
	Accomplishments Since Plan Publication	21
	Areas of Focus 2020-2021	22
3.6	Utility Distribution SECTOR.....	23
4	Non-programmatic Savings	25
4.1	Momentum Savings	25
	Accomplishments Since Plan Publication	25
	Areas of Focus 2020-2021	27
4.2	Market Transformation	28
5	Looking to the Future	29

FIGURES

Figure 1. Savings Forecast Development Efforts	3
Figure 2. BPA Savings by Source, Combined (aMW): 2016-2021	7
Figure 3. BPA Savings by Source and Year (aMW): 2016-2021	8
Figure 4. BPA Budget by Category, Combined (\$ Millions): 2016-2021	9
Figure 5. Budget by Source and Year (\$ Millions): 2016-2019 Actuals, 2020-2021 Forecast	10
Figure 6: BPA Programmatic Savings by Sector, Combined (aMW): 2016-2019 Actuals, 2020-2021 Forecast	11
Figure 7: BPA Programmatic Savings by Sector and Year (aMW): 2016-2019 Actuals, 2020-2021 Forecast	12
Figure 8: BPA Residential Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals	13
Figure 9: BPA Residential Sector Savings Forecast by End-Use and Year (aMW): 2020-2021	14
Figure 10: BPA Commercial Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals	15
Figure 11: BPA Commercial Sector Savings Forecast by End-Use and Year (aMW): 2020-2021	16
Figure 12: BPA Industrial Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals	18
Figure 13: BPA Industrial Sector Savings Forecast by End-Use and Year (aMW): 2020-2021	19
Figure 14: BPA Agricultural Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals.....	20
Figure 15: BPA Agricultural Sector Savings Forecast by End-Use and Year (aMW): 2020-2021	21
Figure 16: BPA Federal Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals	22
Figure 17: BPA Agricultural Sector Savings Forecast by End-Use and Year (aMW): 2020-2021	23
Figure 18: BPA Utility Distribution Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals.....	24
Figure 19: BPA Momentum Savings Estimate by Source by and Year (aMW): 2016-2021	27
Figure 20: BPA’s NEEA Net Market Effects Estimated Savings by Year (aMW): 2016-2021	29

1 Introduction

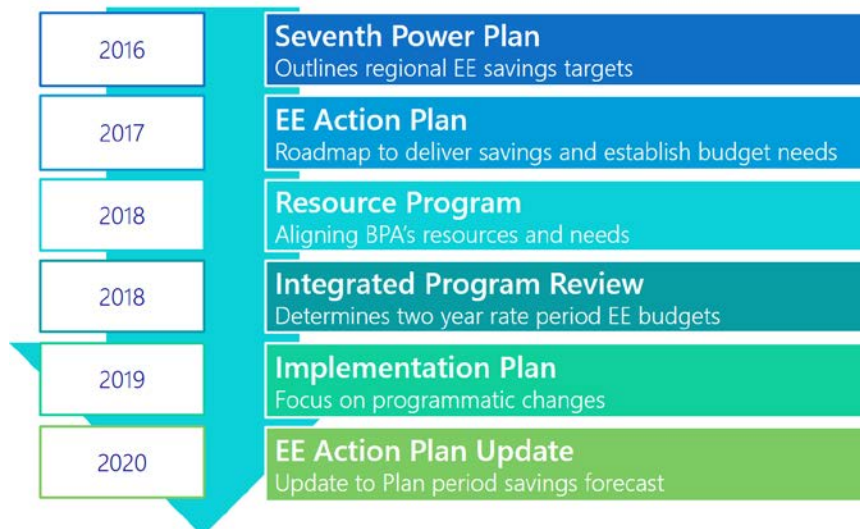
The Bonneville Power Administration, or BPA, and its public power utility customers are leaders in promoting energy efficiency, or EE, in the Pacific Northwest. Since the early 1980s, BPA and its customers have acquired more than 2,159 average megawatts (aMW)¹ in electricity savings through EE efforts.

In March 2017, BPA released its 2016-2021 Energy Efficiency Action Plan, which outlined BPA’s approach to achieving a portion of the Northwest Power and Conservation Council’s, or the Council, Seventh Northwest Conservation and Electric Power Plan, or Seventh Plan, Action Plan period goal of 1,400 aMW of EE by 2021.² Energy efficiency is the Seventh Plan’s preferred resource and BPA’s EE Action Plan was developed with the goal of contributing 581 aMW to the regional target.

1.1 EVOLUTION OF THE SAVINGS FORECAST

BPA is committed to regularly re-evaluating the assumptions and approaches established for obtaining EE savings enabling BPA to reflect on achievements and make adjustments to EE savings tactics as policy, technology and market conditions evolve. Throughout the duration of the Seventh Plan Action Plan period, BPA has engaged in numerous planning efforts focused on its contribution to the regional EE target and aligning BPA’s EE portfolio with its resource needs. Figure 1 shows the major efforts BPA has undertaken to date.

Figure 1. Savings Forecast Development Efforts



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

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

Since the development of the original 2016 EE Action Plan, several planning initiatives have shaped BPA's EE spending levels and programmatic implementation strategy. BPA's 2018 Resource Program included energy efficiency as a modeled resource to be optimized with other available resources including market purchases, gas, solar and wind for the first time. Energy efficiency was selected as a significant component of a least-cost acquisition portfolio. BPA leveraged the results of the Resource Program to assist in determining the level of energy efficiency BPA should acquire to meet its power obligations. The second initiative was the 2018 Integrated Program Review, or IPR, which included the results of the Resource Program and set budgets for the 2020-21 rate period.³ During the 2018 IPR BPA accounted for programmatic savings overachievements in 2016 and 2017 by reducing the overall amount of programmatic savings needed to be acquired in 2020 and 2021 to meet its share of the regional goal. Budgets were set with the intent of acquiring the reduced level of programmatic savings in 2020-2021.

Stemming from the IPR process was the Implementation Plan⁴, which was shared with the region in January 2019. The Implementation Plan sought to better align BPA's EE portfolio for the 2020 and 2021 rate period with its Resource Program findings.⁵ The main takeaway from this analysis showed a higher preference for HVAC and lower preference for lighting than what was achieved programmatically in 2016 and 2017. This prompted BPA to modify its implementation strategy, including, for example, shifting programmatic focus to developing a program portfolio with HVAC and weatherization at its core. Recognizing the challenge of developing point estimates and given uncertainty in utility acquisitions, the Implementation Plan also established ranges of anticipated savings for the 2020 and 2021 rate period, and overall Seventh Plan Action Plan period goals.

The EE Action Plan Update is the final step in the evolution of BPA's savings forecast during the Seventh Plan Action Plan period. This document reports BPA's actual EE programmatic achievements for fiscal year, or FY, 2016-2019⁶, and shows BPA's projected achievements for 2020 and 2021. This is an important step in BPA's progression towards the Seventh Plan goals for several reasons. First, achieved 2018 and 2019 programmatic savings values were not known at the time of the Implementation Plan. Second, the programmatic changes from the Implementation Plan are beginning to take place. Finally, new research and updated data on non-programmatic efforts, including the Northwest Energy Efficiency Alliance's, or NEEA's, Net Market Effects and Momentum Savings can be factored into BPA's expected savings. With this information in hand, BPA is now reporting the low end of the savings range as developed in the Implementation Plan for all sources of savings. This is a conservative approach and aligns with BPA's sense of the current market conditions.

³ <https://www.bpa.gov/Finance/FinancialPublicProcesses/IPR/Pages/IPR-2018.aspx>.

⁴ <https://www.bpa.gov/EE/NewsEvents/presentations/Documents/EE-Implementation-workshop.pdf>.

⁵ BPA system needs vary by season and time of day and are dependent on numerous factors such as hydro conditions and market prices. The Resource Program analyzes EE from the perspective of the value the types of EE bring to BPA, meaning aMW of lighting savings may provide a different value to BPA than an aMW of water heating savings.

⁶ 2019 programmatic changes are subject to change as customer utilities continue to report savings. 2016-2019 savings also include achieved Momentum Savings, though these savings are anticipated to change as additional market data is incorporated.

1.2 EXPECTED SEVENTH PLAN PERIOD ACHIEVEMENTS

During the course of the Seventh Plan period, BPA is on track invest \$634 million on energy-efficiency acquisitions. This level of spending corresponds to a low-end estimate of 532 aMW of savings throughout the six-year period. When accounting for the uncertainty in the forecast, these savings increase to a high-range estimate of 567 aMW. With the current conservative forecast, BPA anticipates coming in 49 aMW, or 8% short of the 581 aMW goal laid out in the original EE Action Plan. If the high-range estimate of savings are accomplished, they will fall within 14 aMW, or 2% of the target.

Several factors led to the reductions in savings. The primary driver is Momentum Savings from federal energy-efficiency standards. In the original EE Action Plan, BPA anticipated quantifying up to 40 aMW of Momentum Savings from federal energy efficiency standards. However, due to changes in the federal administration, there has been limited rulemaking activity limiting the amount of Momentum Savings attributable to these standards.

With the implementation of a range, programmatic savings achievements are now forecasted to be within 338 to 359 aMW of savings. At the low end, programmatic savings are falling 13 aMW short of the 352 aMW goal in the original EE Action Plan⁷, and at the high end, savings exceed the Action Plan by 7 aMW. This downward shift is spread across several sectors and is not being driven by a single sector, market or programmatic barrier. Overall, during the course of the Seventh Power Plan, cheaper EE savings — such as residential lighting — are decreasing, while program focus shifts to markets with greater barriers and more costly savings, making acquisition more difficult. Cost effectiveness is another challenge permeating all aspects of programmatic offerings, narrowing the scope of what can be offered and how many end-users a single measure offering can touch.

While savings forecasts are lower than originally anticipated, there have been many accomplishments over the Seventh Plan Action Plan period to date. One of the most important endeavors BPA undertook was aligning program implementation strategy to the Resource Program and BPA's needs. This strategic transition resulted in a reprioritization of efficiency measures such as HVAC and weatherization that have not been a high priority in the past. This realignment will allow BPA to build the program infrastructure needed to continue offering robust and effective programs into the next Power Plan period. Much of the 2020-2021 rate period remains, and BPA will strive to make this remaining time in the Seventh Plan Action Plan period as impactful as possible through savings achieved and strategic programmatic focus.

⁷ It is important to note that in this document the programmatic savings target of 351.6 is inclusive of 10 aMW of savings categorized as "unallocated" in the original EE Action Plan.

1.3 ACTION PLAN DEVELOPMENT PROCESS

The Action Plan Update was developed using inputs across BPA's EE organization. Actual savings for the 2016-2019 period include savings from Energy Efficiency Incentives, or EEI, and utility self-fund sources, with BPA utilizing reported savings from its customer utilities to account for these accomplishments. Actual expenditures coincide with these savings.

The forecast for the 2020-2021 programmatic savings was developed for the 2019 Implementation Plan using several inputs, including the level of savings achieved pre-2019, the overall Seventh Power Plan targets, the Resource Program findings, the existing program infrastructure and the expected market dynamics. Programmatic saving forecasts have been refined since then and reflect the low end of the savings range reported in the Implementation Plan. Budgets are based on the expected level of savings for the 2020-2021 period.

Non-programmatic savings, including NEEA's Net Market Effects and BPA and NEEA's Momentum Savings, were developed using a different approach. NEEA's Net Market Effects and Momentum Savings are derived from NEEA's annual savings report showing estimated achieved savings through Q4 2019. The remaining years' savings are forecasted by NEEA and based on the best-available data about market trends. It is important to note that as NEEA researches new initiatives and obtains new market data savings, including years prior to 2020, Net Market Effects savings will change. BPA's Momentum Savings achievements for 2016-2021 are based on a portfolio of three full market-consumption models developed by BPA. BPA's work is ongoing, and as other markets are modeled and additional data is incorporated, the savings for the entire the Seventh Plan Action Plan period are subject to change. While these three Momentum Savings market consumption models provide a point estimate, a range of savings is also provided to account for changes in data and new research.

The following sections provide BPA's actual EE achievements⁸ for FY 2016-2019, and show BPA's projected achievements for 2020 and 2021, along with corresponding actual spend and approved budget. This data is shown at the portfolio level, and then by savings source and sector. Additionally, each section examines how market and external factors impact the BPA portfolio, and how BPA has adapted programs and non-programmatic initiatives in response to these forces.

2 Energy-Efficiency Savings and Budget

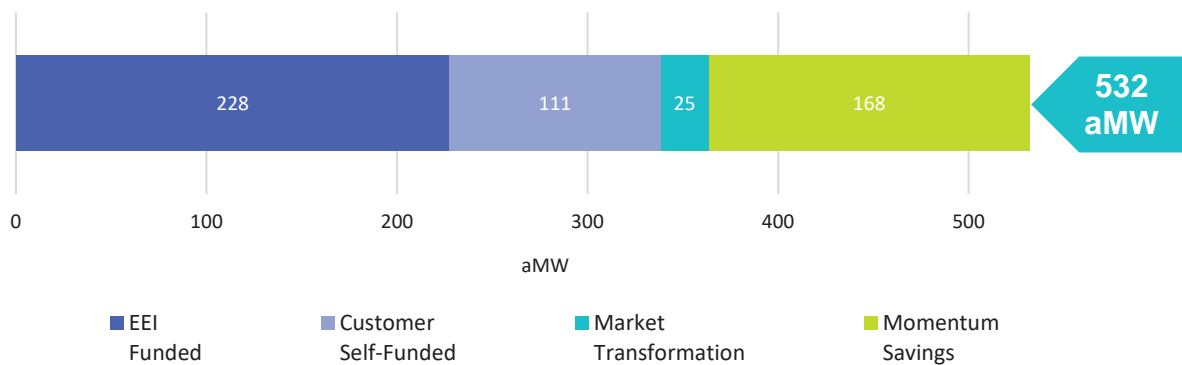
During the Seventh Plan Action Plan period, BPA anticipates investing \$634 million in energy-efficiency. This level of spending corresponds to at least 532 aMW and up to 567 aMW of savings over the six-year period. The following sections provide more detail on expected accomplishments and expenditures. To be conservative, expected savings are reported on the low end of the estimated range, unless otherwise noted.

⁸ Distributed Energy Resources, which were included in the original EE Action Plan have been omitted here.
2016-2021 Energy Efficiency Action Plan

2.1 BPA'S SAVINGS ACCOMPLISHMENTS AND FORECASTS

BPA anticipates achieving a low-end estimate of 532 aMW over the course of the Seventh Plan Action Plan period (Figure 2). Programmatic activities offer the largest contribution to BPA's energy savings. BPA estimates programmatic savings will account for 339 aMW, or 64% of BPA's total savings from 2016-2021. BPA divides programmatic savings into two categories based on 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 savings are savings for which customers do not seek reimbursement from BPA. Customers report these savings to BPA and BPA claims these savings in their reporting to the Council. From 2016-2021 it is anticipated there will be 228 aMW of EEI-funded savings and 111 aMW of self-funded savings, resulting in a 67%-33% split.

Figure 2. BPA Savings by Source, Combined (aMW): 2016-2021



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

Note: Momentum and Net Market Effects savings are subject to change.

Note: Programmatic savings represent actuals for 2016-2019 and a low-end forecast for 2020-2021.

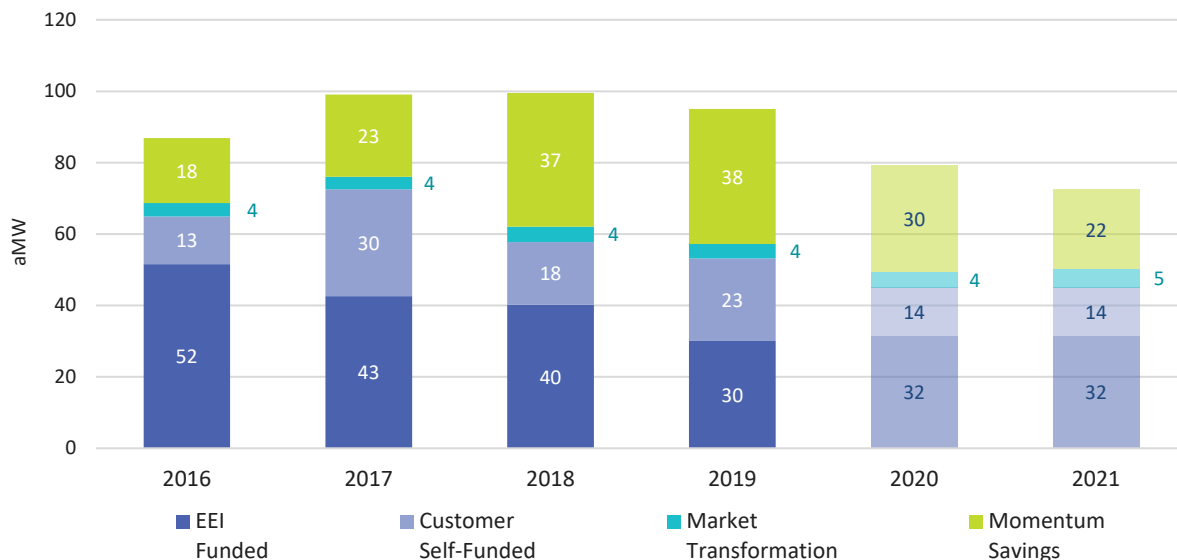
Note: It is assumed there will be a 70/30 split between EEI and self-funded savings for 2020 and 2021.

Source: BPA analysis, 2019.

BPA also tracks and accounts for savings related to Momentum Savings and market transformation through its investment in NEEA. BPA expects that Momentum Savings and NEEA's Net Market Effects will account for approximately 194 aMW, or 36% of BPA's overall Seventh Plan Action Plan period goal. BPA estimates Momentum Savings achievements of 168 aMW and Net Market Effects savings of 25 aMW.

Figure 3 outlines BPA's savings achievements for 2016-2019 and the low-end estimated savings for 2020 and 2021 for all savings types. BPA achieved 99 aMW in both 2017 and 2018, the highest levels of annual savings in the Seventh Plan period. Programmatic savings of 73 aMW were a primary driver of this high level of accomplishment in 2017. It is anticipated that Momentum Savings will peak in 2018 and 2019, and begin tapering in 2020 and 2021 as the rapid rate of change in the nonresidential lighting market — the primary driver of savings — slows.

Figure 3. BPA Savings by Source and Year (aMW): 2016-2021



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

Note: Momentum and Net Market Effects savings are subject to change.

Note: Programmatic savings represent actuals for 2016-2019 and a low-end forecast for 2020-2021.

Note: It is assumed there will be a 70/30 split between EEI and self-fund savings for 2020 and 2021.

Source: BPA analysis, 2019.

2.2 BPA’S ENERGY-EFFICIENCY BUDGET

To meet savings goals, BPA budgets for EE program reimbursements, performance payments, program implementation, research, evaluation, contract support, NEEA support and emerging technology development. BPA groups the budgets into three categories:

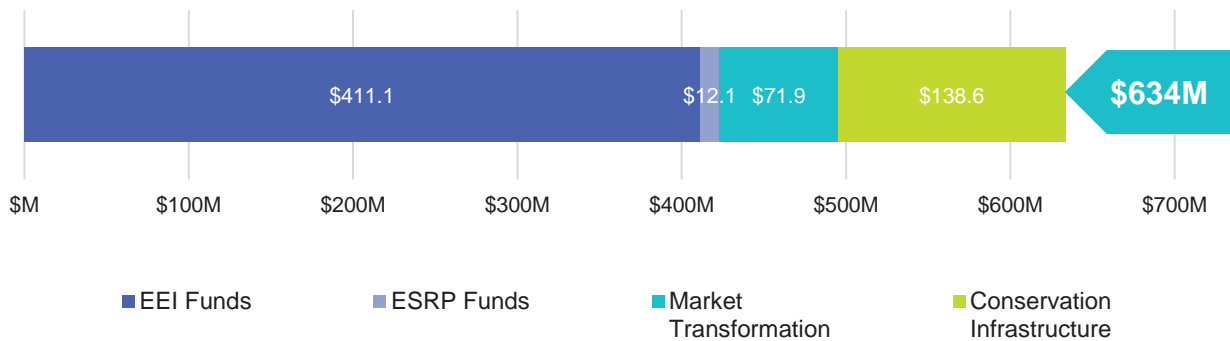
- **Conservation purchases** are BPA programmatic savings reimbursements and EEI funds. Includes performance payments and Energy Smart Reserved Power, or ESRP.⁹
- **Market transformation** is support for NEEA’s market transformation initiatives. Market transformation is the strategic process of intervening 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.

⁹ 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.

- Conservation infrastructure** includes all support for programs and operations, including third-party program implementation, contract support, contract personnel costs, market and Momentum Savings research, evaluation and emerging technology research.

Throughout the course of the Seventh Plan Action Plan period, BPA anticipates dedicating \$634 million to energy efficiency, as shown in Figure 4. More than \$70 million of this budget is dedicated to directly NEEA.

Figure 4. BPA Budget by Category, Combined (\$ Millions): 2016-2021



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

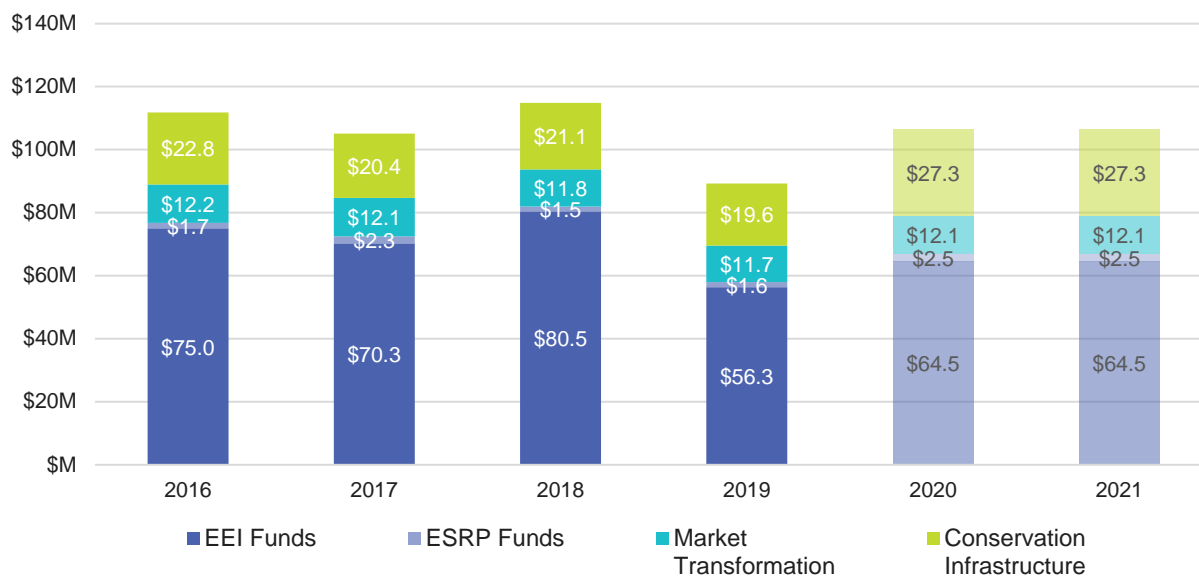
Note: Actual expenditures are included for 2016-2019 and allocated budgets are included for 2020 and 2021. These values are total program costs and tie to BPA's audited financial statements.

Source: BPA analysis, 2019.

Over the six-year period BPA anticipates spending a total of \$423 million on direct conservation purchases. Total expenditures vary each year, as do expenditures by category. EEI expenditures were the highest in 2016-2018, averaging more than \$70 million each year. After surpassing programmatic savings goals in 2016 and 2017, BPA estimated the budget needed to achieve the remaining programmatic savings outlined in the EE Action Plan, and established budgets for 2020 and 2021 during the 2018 IPR process. One other driver of the annual fluctuation in EEI spend is when BPA's customer utilities choose to utilize their EEI since utilities are given rate-period EEI budgets.

Conservation infrastructure spending ranged from approximately from \$20-\$27 million per year. Annual budgets are shown below in Figure 5, and do not include dollars associated with self-funded savings, which shifted from funding 25% to 30% of total savings goals beginning in 2018. The 2020-2021 conservation infrastructure are budgets, whereas the 2016-2019 are actual spend, which include underspend in those years due to contract staffing vacancies.

Figure 5. Budget by Source and Year (\$ Millions): 2016-2019 Actuals, 2020-2021 Forecast



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

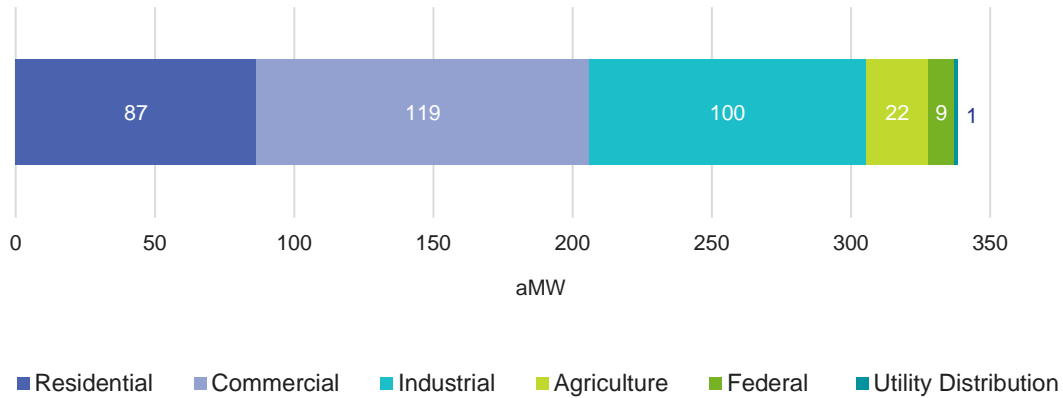
Note: Actual expenditures are included for 2016-2019, and allocated budgets are included for 2020 and 2021. These values are total program costs and tie to BPA's audited financial statements.

Source: BPA analysis, 2019.

3 Programmatic Savings

Programmatic savings contribute to the bulk of BPA's energy-efficiency savings, accounting for 338 aMW over the six-year period, as shown in Figure 6. As described in section 1.1, BPA has moved to forecasting a range of programmatic and Momentum savings. The 338 aMW forecast accounts for the low end of the range, climbing to 358 aMW at the high end. The original EE Plan forecasted 352 aMW of programmatic savings. The highest proportion of total expected achieved savings, 119 aMW —representing 35% — occur in the Commercial sector. The Industrial and Residential sectors contribute another 29% and 26% respectively, to total expected savings.

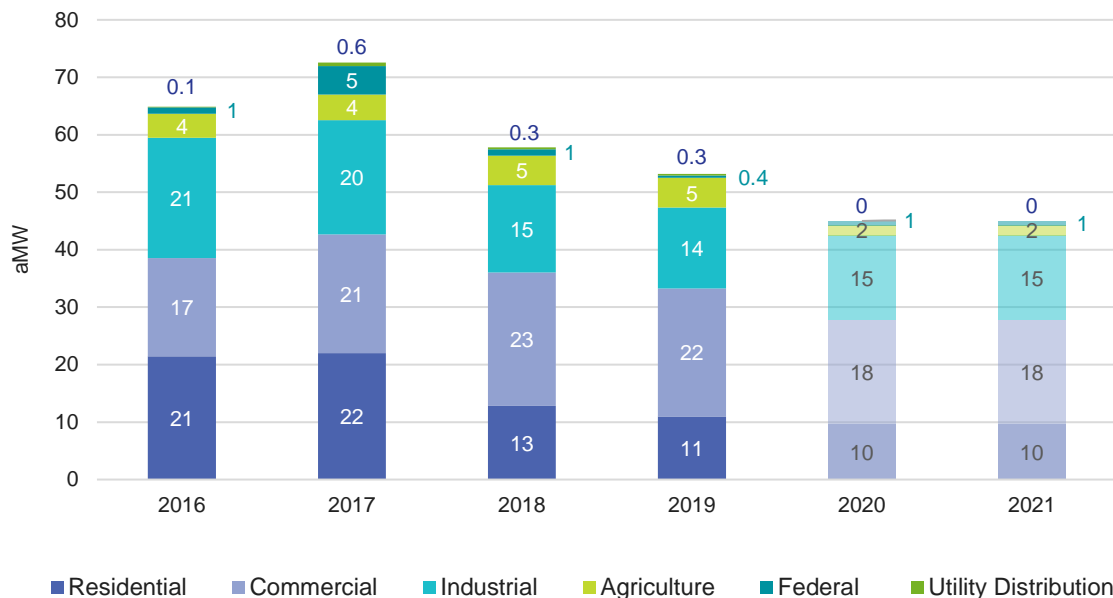
Figure 6: BPA Programmatic Savings by Sector, Combined (aMW): 2016-2019 Actuals, 2020-2021 Forecast



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent actuals for 2016-2019, and a low-end forecast for 2020-2021.
 Source: BPA analysis, 2019.

Figure 7 shows the annual achieved and remaining low-end forecasted programmatic accomplishments for the Seventh Plan Action Plan period. The Residential sector achieved more than 20 aMW in 2016 and 2017; savings have tapered off from 2018-2021, as baselines become more efficient and the portfolio transitions from lighting to a focus on HVAC. Commercial savings were strongest in 2018 and 2019. All sectors are expected to have lower levels of savings in 2020 and 2021 corresponding to the strong performance in 2016 and 2017. Since the savings for 2020 and 2021 are a forecast, assumptions regarding total accomplishment and sector distribution were kept constant between the two years. The following sections discuss each sector’s accomplishments in more detail.

Figure 7: BPA Programmatic Savings by Sector and Year (aMW): 2016-2019 Actuals, 2020-2021 Forecast



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

Note: Programmatic savings represent actuals for 2016-2019 and a low-end forecast for 2020-2021.

Source: BPA analysis, 2019.

3.1 RESIDENTIAL SECTOR

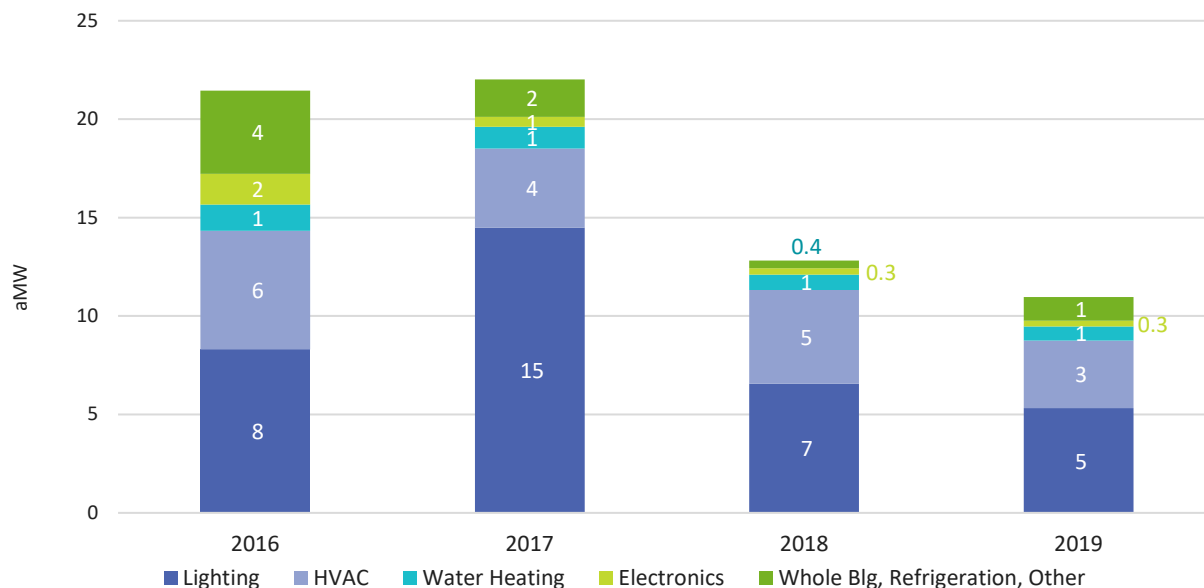
As a result of significant achievements during the first two years the Residential sector is on track to surpass the original goals laid out in the EE Action Plan of 78 aMW, with a low-end estimate of 87 aMW of savings. A strong performance in 2016 and 2017 set the stage for this overachievement with large contributions from lighting. In the last two years of the Seventh Plan Action Plan period, UES for nearly all measures and cost-effectiveness concerns for several measures have shifted the focus to future stability and new measure development.

Accomplishments Since Plan Publication

During 2016 and 2017, Residential sector achievements significantly exceeded targets primarily as a result of the rapid adoption of LED lighting, with annual savings peaking at 21 aMW and 22 aMW, respectively. During that time period, however, the residential lighting market largely transformed resulting in significantly lower reportable energy savings in 2018 and 2019. HVAC and weatherization savings peaked at 6 aMW in 2016 and have declined since then, partly as a result of post-2015 Regional Technical Forum reductions in measure-level UES. Energy savings from water heating, electronics and appliances have remained fairly consistent, though water heating savings have not been as strong as expected due to slower market

adoption of heat pump water heaters. Figure 8 shows the savings achieved in each end use from 2016-2019.

Figure 8: BPA Residential Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent actuals for 2016-2019
 Source: BPA analysis, 2019.

In 2018 and 2019, BPA’s residential implementation support prioritized two channels: retail through the Simple Steps program, and performance installations of HVAC equipment and duct sealing through the Performance Tested Comfort Systems, or PTCS, program. The success of the Simple Steps program led to significant residential lighting achievements and more than 50% of residential energy savings each year. For PTCS, 2019 marked a period of deep investigation into program specifications, reporting processes, and quality assurance processes with an eye to simplifying and streamlining the program in 2020 and 2021.

During the same time period, BPA revitalized its New Construction portfolio by rolling out measures that are better able to adapt to changes in new construction codes. This resulted in new measures for single-family and manufactured homes in partnership with NEEA, and new energy-use-intensity-based measures for multifamily homes. BPA also began offering incentives for replacement of older, inefficient manufactured homes with new high-efficiency models.

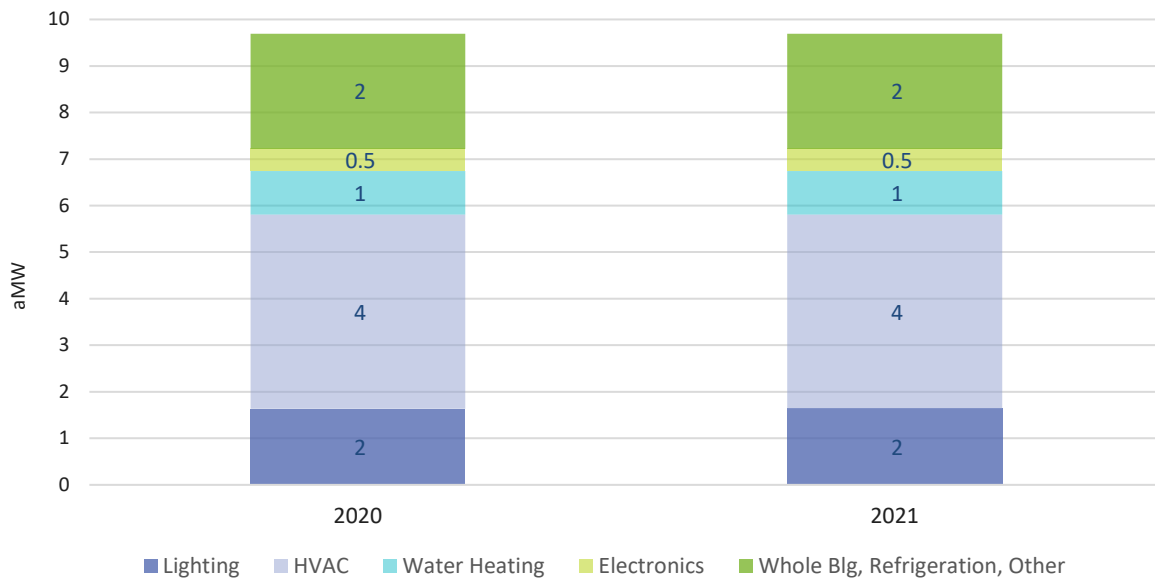
BPA also provided significant support to installations of ductless heat pumps, which resulted in the measure achieving nearly 25% of total residential savings in the first four years of the Seventh Plan Action Plan period.

Areas of Focus 2020-2021

During 2020 and 2021, the Residential sector is expected to achieve a low-end estimate of 19 aMW as

shown in Figure 9. Savings are lower in 2020 and 2021 — compared to earlier years of the Plan period — because of the overachievement in 2016 and 2017, and the transition from lighting to HVAC. BPA is working to develop a suite of new residential measures over the next two years with the goal establishing a strong portfolio for 2022 and beyond.

Figure 9: BPA Residential Sector Savings Forecast by End-Use and Year (aMW): 2020-2021



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent a low-end forecast for 2020-2021.
 Source: BPA analysis, 2019.

Beginning in 2020, BPA plans to focus on contractor installed technologies including weatherization, HVAC measures and heat pump water heaters to better align energy savings with BPA’s resource needs and reinvigorate markets that have been lagging. This shift results in a low-end estimate of 4 aMW of annual savings from HVAC. BPA will also be investigating and implementing a new direction for achieving energy savings through retail offerings.

Cost effectiveness will remain a significant challenge for residential measures for the next two years. Rapid market adoption of technologies, improved building codes, and lower than expected evaluated energy savings — combined with increased measure costs due to labor, tariff and technology costs — are creating this challenge. Without significant lighting savings, BPA will need to develop a new approach to achieve energy savings from measures sold at retail, which could result in a reduction in energy savings acquired from those measures.

BPA sees opportunities to increase the achieved energy savings from contractor installed measures through additional training and support and are hopeful that a suite of new residential energy-efficiency measures will help bolster activities.

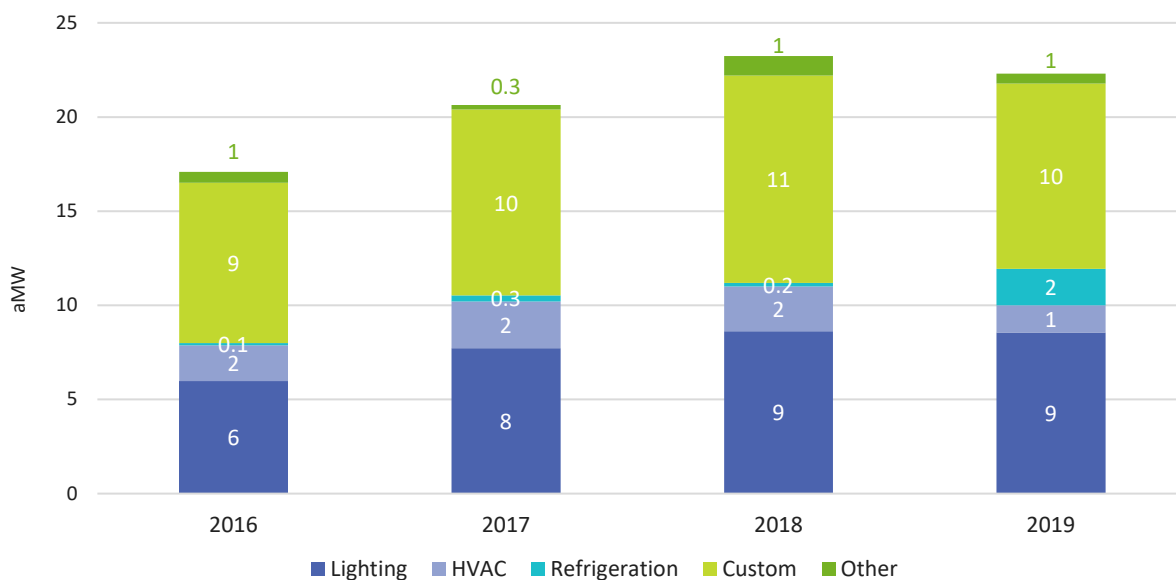
3.2 COMMERCIAL SECTOR

The Commercial sector is on track to exceed the goal of 115 aMW laid out in the EE Action Plan with estimated low-end savings accomplishments of 119 aMW. Significant savings have been achieved in lighting, while savings have lagged in all other end-uses and measure types. In the remainder of the Plan period, BPA will continue its focus on responding to the evolving lighting market by reducing incentives for lighting. BPA will additionally focus its commercial outreach efforts to trade allies to bolster HVAC and custom project savings.

Accomplishments Since Plan Publication

Commercial sector savings have exceeded EE Action Plan levels for all years. The largest contributor to savings achievement is lighting, which represents about 80% of the current portfolio, driven by the largescale market adoption of LED technology. Lighting savings are attributed to two primary factors: a well-established trade ally network focused on training and promoting lighting technologies with the region’s trade allies and utilities, and robust incentive offerings per the BPA Lighting Calculator. Figure 10 shows the breakdown of annual achieved savings by end-use for the Commercial sector from 2016-2019. Savings peaked in 2018 with 23 aMW, but 2017 and 2019 exceeded 20 aMW each. The three primary end-uses: lighting, HVAC and refrigeration are shown explicitly; custom projects are reported separately, but may encompass these end uses. Loads such as motors and drives and process loads are captured in the “other” category.

Figure 10: BPA Commercial Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent actuals for 2016-2019.
 Source: BPA analysis, 2019.

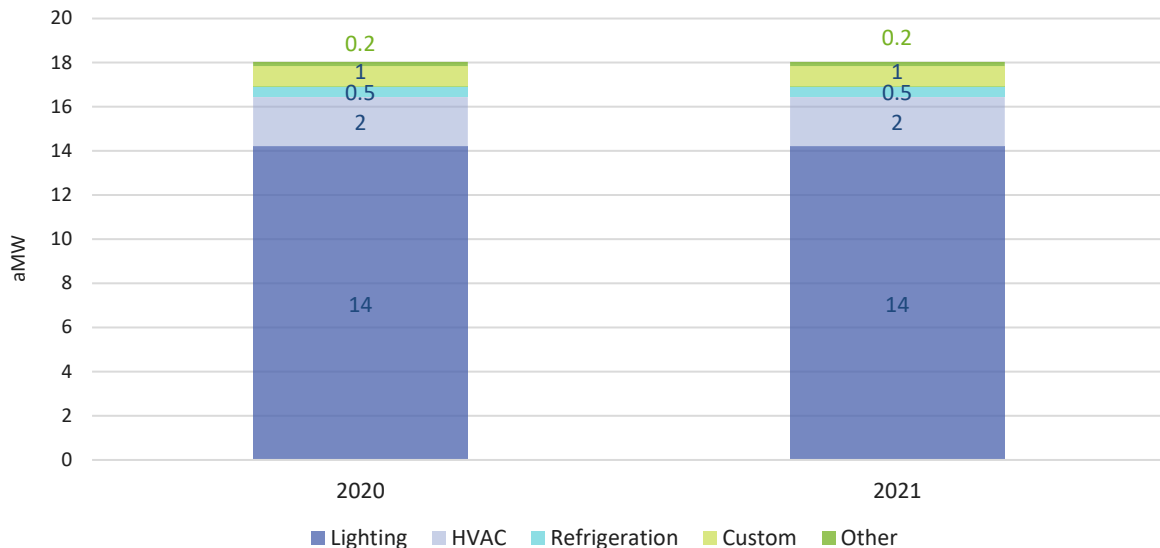
Relative to lighting savings, custom project savings and deemed savings have fallen short of EE Action Plan estimates. This is attributed largely to the shift in program design focus. At the time the EE Action Plan was written, BPA had developed a program design with the intent to implement a comprehensive turnkey field program that included scaled-up custom project services and Strategic Energy Management, or SEM. In mid-2017, the design was revised to align with BPA strategic objectives and focus on implementing a more cost-effective approach to serving the lighting and HVAC market. From this, the Trade Ally Network NW was born.

The Trade Ally Network NW launched in June 2018. This program offers critical regional infrastructure to enable BPA customer local program success, and focuses on strategic market intervention with HVAC and lighting manufacturers’ representatives, distributors and equipment installation contractors — collectively referred to as “trade allies.”

Areas of Focus 2020-2021

BPA anticipates achieving a low-end estimate of 36 aMW in the Commercial sector from 2020-2021 as shown in Figure 11. Savings forecasts assume that revised payment levels for lighting will drive down programmatic savings in this end use, while increased outreach focused on HVAC will drive uptake of deemed measures. It is unknown how quickly the lighting market will respond to adjusted incentive levels. At the same time, BPA recognizes it is just in the beginning of the multiyear HVAC strategy, inclusive of the Trade Ally Network NW, that seeks to influence trade allies to install high-efficiency equipment. It will take continued perseverance and coordination with the Residential sector to bring HVAC savings to bear.

Figure 11: BPA Commercial Sector Savings Forecast by End-Use and Year (aMW): 2020-2021



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent a low-end forecast for 2020-2021.
 Source: BPA analysis, 2019.

BPA will continue to focus on building out the Trade Ally Network NW, and align its efforts with BPA's increasing its strategic focus on HVAC technologies and lighting controls. This strategy is maintained from the 2018-2019 rate period. BPA custom project services, delivered by BPA's in-house customer service engineers, will continue to serve BPA customers equitably and in response to local customer need.

BPA adopted a new incentive strategy for lighting starting in the 2020 rate period, which releases incentive updates via the BPA Lighting Calculator on a rate-period basis. The lighting market has proven to be tremendously difficult to forecast in terms of technology and savings. BPA will continue to partner with other regional utilities and national organizations to track trends, and seek to set appropriate payment levels.

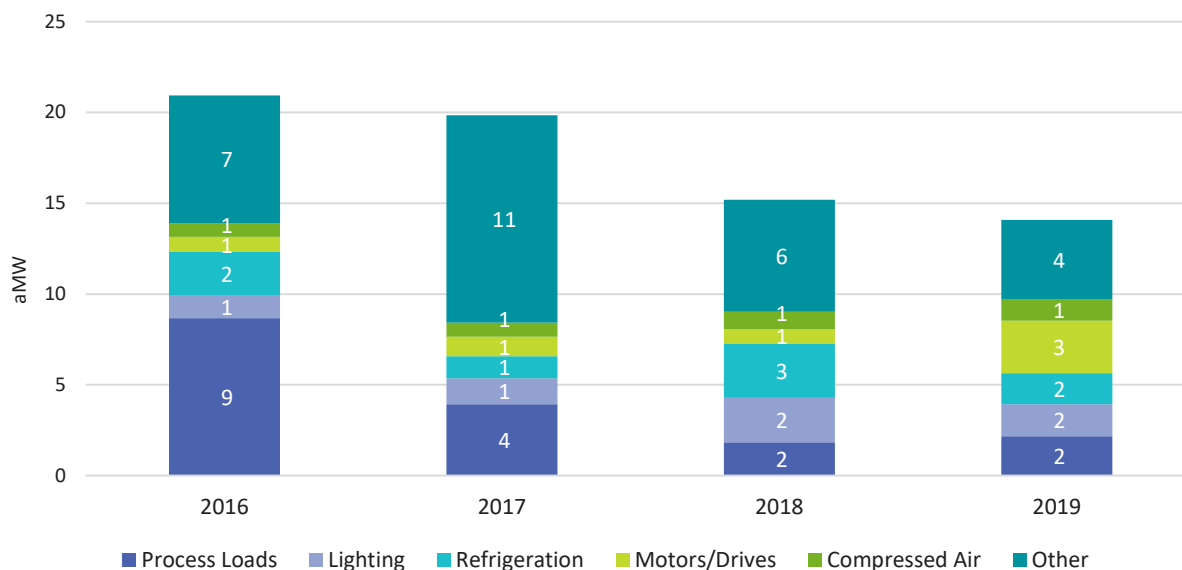
3.3 INDUSTRIAL SECTOR

Since 2009, BPA has offered the Energy Smart Industrial, or ESI, program to assist BPA customers and their end-users with acquiring Industrial sector savings. ESI is a turnkey program that provides tools, resources and technical expertise to industrial users of different types and sizes. Savings from the Industrial sector are anticipated to come in at the low-end estimate of 100 aMW, just 4 aMW under the original goal laid out in the EE Action Plan.

Accomplishments Since Plan Publication

In the first four years of the Seventh Plan period, the ESI achieved 70 aMW of savings, 1 aMW over the four-year goal in the EE Action Plan. These savings were concentrated in process loads, refrigeration and lighting (Figure 12). More than 40% of the savings achieved are categorized as other, which includes HVAC, whole building and other categories not easily categorized in BPA's reporting system.

Figure 12: BPA Industrial Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals



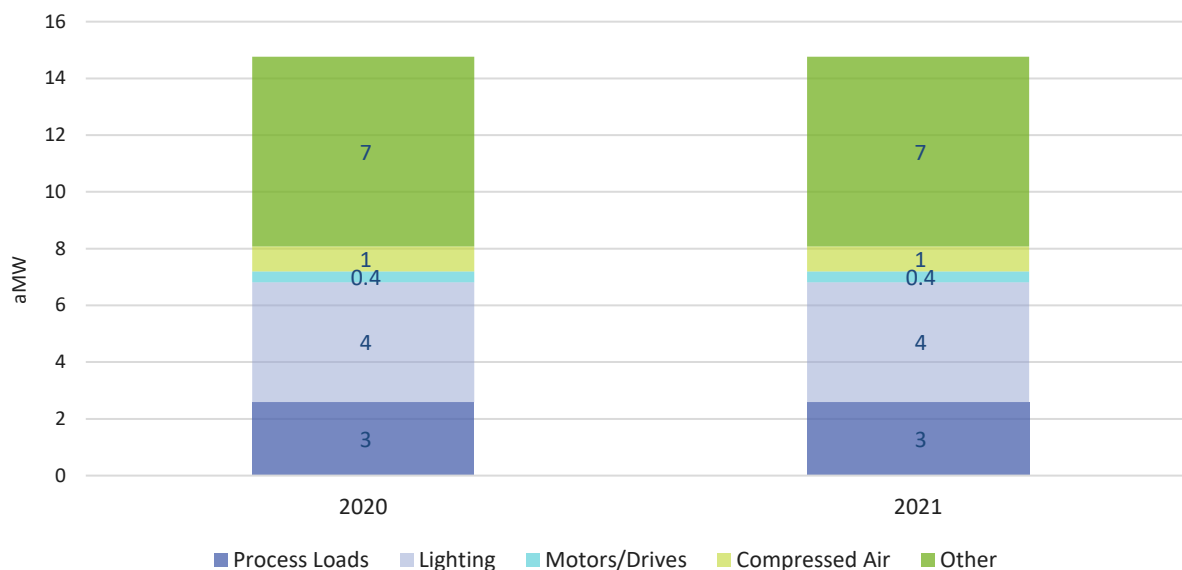
Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent actuals for 2016-2019.
 Source: BPA analysis, 2019.

In addition to the savings achieved through the program, the ESI program has accomplished a significant amount in the Seventh Plan Action Plan period. Since the ESI program launch, 117 utilities — representing 99.8% of BPA-served industrial load — have enrolled. ESI continues to respond to market needs. More recently it has delivered capacity-value analysis reports for custom and SEM projects to characterize the load-shape impact of the projects.

Areas of Focus 2020-2021

The ESI program anticipates acquiring a low-end estimate of 30 aMW in 2020 and 2021, bringing the sector 4 aMW under the original goals in the EE Action Plan. Lighting and process loads are the primary contributors to the portfolio (Figure 13). The ESI program will continue to support a comprehensive and flexible program approach. Furthermore, the program will continue engagement in the eastern part of BPA’s service territory. Key activities include development of account plans and dedication of additional outreach to drive pipeline development. BPA is also focusing on the development of deemed measures. Three new BPA-qualified, or BPAQ, measures were launched at beginning of FY2020. These include the High Frequency Battery Charger Upgrade, Welder Upgrade, and Water System Leak Abatement. Previously, these were required to run through the custom project process. With the new BPAQ tools and calculators, an uptake of implementation is expected across the BPA service territory compared to the past custom project process.

Figure 13: BPA Industrial Sector Savings Forecast by End-Use and Year (aMW): 2020-2021



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent a low-end forecast for 2020-2021.
 Source: BPA analysis, 2019.

The ESI program will focus on consolidating quality control assessments, automating routine processes, streamlining cost documentation procedures, and implementing a top-down approach to evaluation, measurement and verification protocols.

Many industrial facilities in the Pacific Northwest are aging. This reality represents an opportunity for the ESI program, as it indicates industrial facilities need energy-efficiency improvements. Food processing and pulp-and-paper facilities make up a large portion of the aging infrastructure. Interest in the ESI program has been and remains high for this segment of the market.

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.

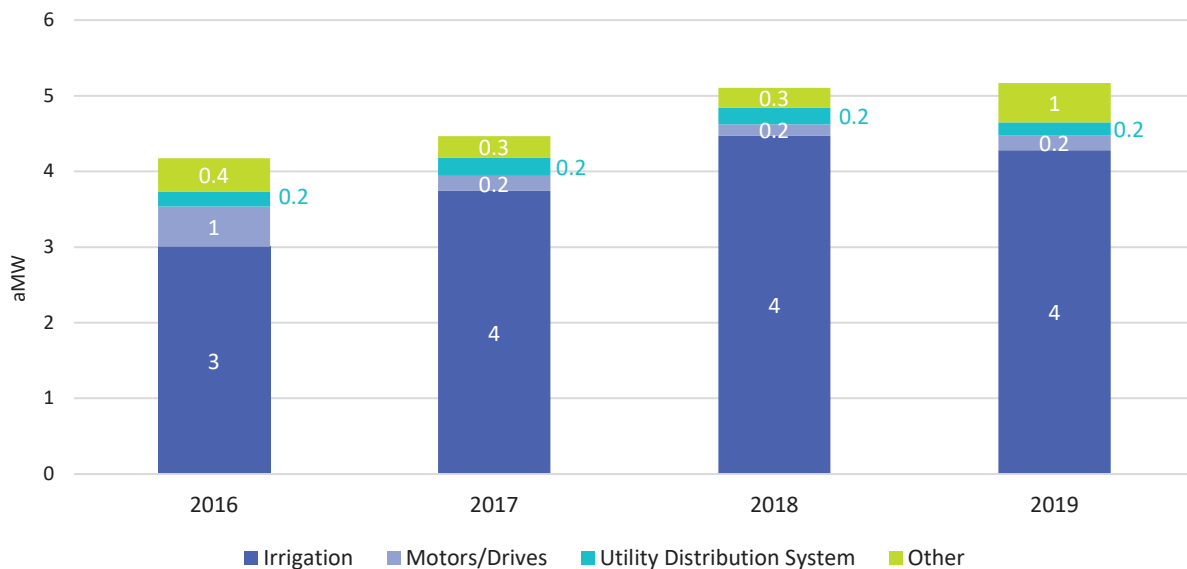
3.4 AGRICULTURAL SECTOR

BPA’s Agricultural sector offers a full range of programs and measure opportunities to enable and empower customers to serve their agricultural end-users and meet their energy-efficiency goals. The sector is anticipated to achieve a low-end savings of 22 aMW, which is 3 aMW or 11% under the original goal of 25 aMW stated in the EE Action Plan.

Accomplishments Since Plan Publication

During 2016-2019, the Agricultural sector achieved 19 aMW of savings, surpassing the EE Action Plan goals of 18 aMW for the same timeframe. Savings from the irrigation end-use are the primary contributor to the sector’s offerings making up 82% or 15 aMW of the total savings (Figure 14). Savings levels stayed relatively flat over the first four years of the Plan period, ranging between 4 aMW in 2016 and 2017, and 5 aMW in 2018 and 2019.

Figure 14: BPA Agricultural Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals



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

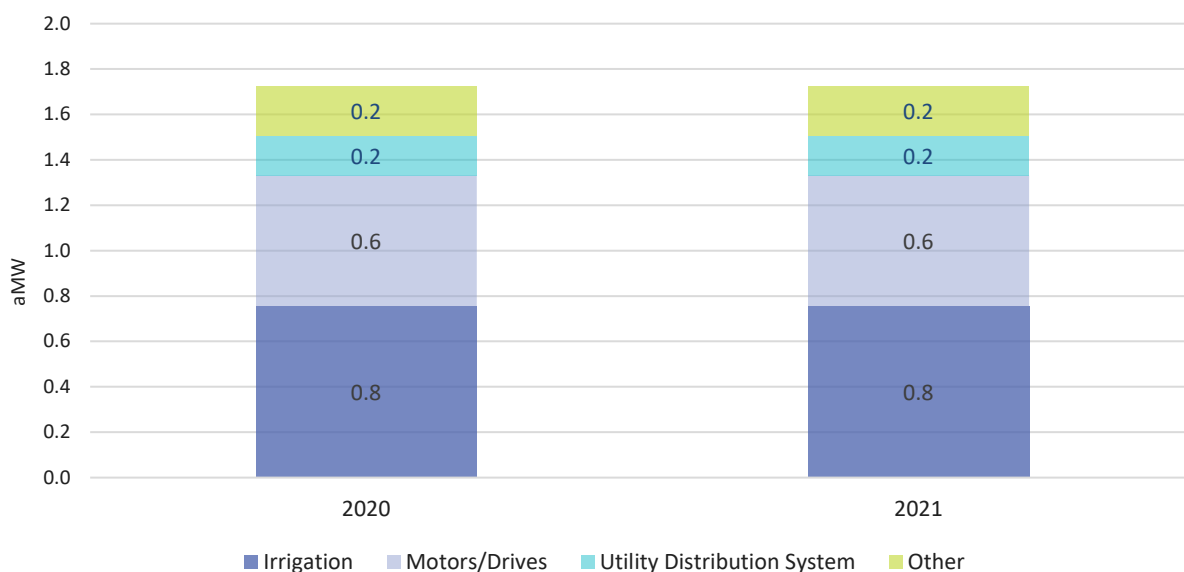
Note: Programmatic savings represent actuals for 2016-2019.

Source: BPA analysis, 2019.

Areas of Focus 2020-2021

In 2020 and 2021, BPA anticipates achieving another 3 aMW, which is on the low-end of the expected range. The decrease in 2020 and 2021 reflect the overachievement at the overall portfolio level for all sectors for 2016 and 2017, and a subsequent lower level of conservation purchase spending in 2020 and 2021. The loss of the Scientific Irrigation Scheduling, or SIS, program has also impacted the Agricultural sector, removing a significant contributor to the portfolio. Although SIS is no longer available as a measure, the Agricultural program continues to offer a robust portfolio of measures: Variable Frequency Drives, or VFDs, irrigation pumps, irrigation pump testing and system analysis, sprinkler hardware upgrades, lighting and seasonal transformer de-energization, thermostat control and other custom opportunities for a variety of agricultural industry applications. In addition, to streamline the incentive process, measures such as VFDs and pump upgrades have been converted to UES measures. Forecasted savings for 2020 and 2021 are shown in Figure 15 below.

Figure 15: BPA Agricultural Sector Savings Forecast by End-Use and Year (aMW): 2020-2021



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent a low-end forecast for 2020-2021.
 Source: BPA analysis, 2019.

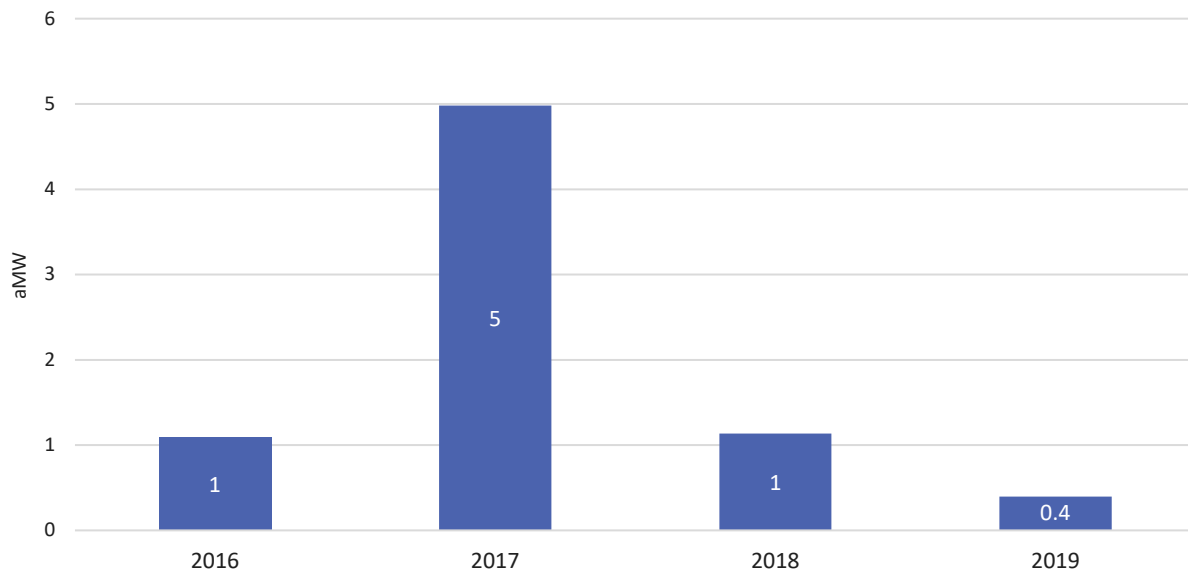
3.5 FEDERAL SECTOR

BPA’s Federal sector team manages the Energy Smart Federal Partnership, or ESFP, and the ESRP program with the goal of encouraging EE in 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 and long-term project planning. It is expected that the Federal sector will acquire 9 aMW of savings (on the low end) over the Plan period. This is 5 aMW or 35% less than the original target of 14 aMW included in the EE Action Plan.

Accomplishments Since Plan Publication

The Federal sector achieved 8 aMW of energy savings during the 2016-2019 period. Annual savings have typically been around 1 aMW; however, 2017 netted 5 aMW of total savings. Spikes in savings for this sector are expected. The Federal sector pulls from a small pool of participants and the implementation of a project by a single participant can result in large savings. Specific types of projects such as canal linings can also produce very large savings in single year.

Figure 16: BPA Federal Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals



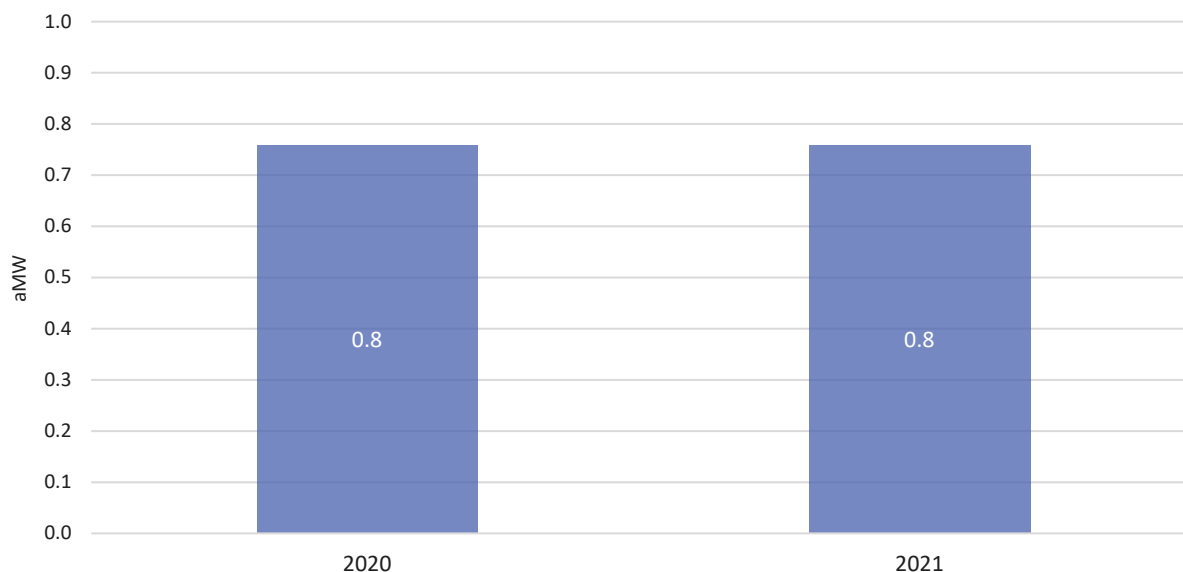
Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent actuals for 2016-2019.
 Source: BPA analysis, 2019.

Areas of Focus 2020-2021

It is anticipated the Federal sector will achieve another 2 aMW of savings in 2020 and 2021 (Figure 17). This estimate is on the low end of the range. The savings are projected to be relatively similar to what was accomplished on average, in all years except 2017.

All savings in 2020 and 2021 will be from the ESRP program, which continues to provide a robust portfolio of measures for program participants such as Irrigation Districts. The program continues to offer lighting upgrades, VFD and pump upgrades, canal lining upgrades and all of the measures — either custom or UES — available through other sectors.

The ESFP will transition away from providing financing and implementation services to BPA Territory Federal Agencies. All participation in EE programs by these agencies will be directed toward the Commercial and Industrial sector programs, as appropriate.

Figure 17: BPA Agricultural Sector Savings Forecast by End-Use and Year (aMW): 2020-2021

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

Note: Programmatic savings represent a low-end forecast for 2020-2021.

Source: BPA analysis, 2019.

3.6 UTILITY DISTRIBUTION SECTOR

The Utility Distribution sector, previously known as Distribution System Efficiency, focuses on savings gained through the efficient operation of the electric distribution process. Over the course of the Seventh Plan Action Plan period, it is estimated that BPA will accomplish a little more than 1 aMW of savings through Utility Distribution. This estimate is on the low end of the expected range and falls short of the 4 aMW goal stated in the EE Action Plan.

Accomplishments Since Plan Publication

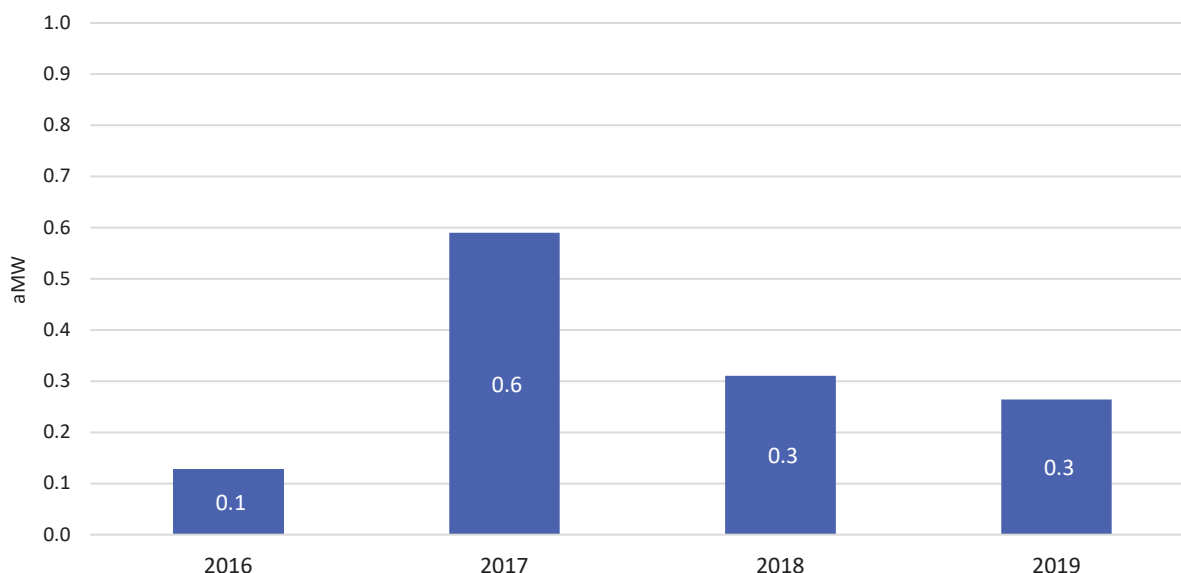
Utility Distribution sector savings fall into two general categories:

- Distribution improvement projects which are typically re-conductor or large power transformer replacement projects and include measures that are common practice for all retail utilities. These projects are relatively small ranging from roughly 10 – 80,000 kWh each.
- Conservation voltage reduction, or CVR, also called voltage optimization, are complex projects that require significant electrical engineering involvement from the distribution engineering side of the utility. CVR reduces the voltage to closer to the lower limits of the ANSI standard. While these projects can generate sizeable savings, they do mean an increased risk of customer under-voltage and a reduction of revenue, and thus have barriers to participation.

To date, BPA has been successful in implementing distribution improvement projects with roughly 20 utilities and has discussed these measures with another 10 more. Due to the size of the projects, they account for less than 25% of the overall sector savings. BPA has also worked with two utilities to implement CVR over the past 3-4 years, generally delivering one project per year. Neither participant delivered projects in 2019, due to scheduling and data collection issues.

Figure 18 shows the annual savings accomplishments for the Utility Distribution sector from 2016-2019. Savings peaked in 2016 with 0.6 aMW, and annual savings in 2018 and 2019 were both at 0.3 aMW. This sector is under-delivering compared to the goals laid out in the 2016 EE Action Plan. Those targets were based on the expectation that utilities that received a scoping and/or detailed studies, paid for by BPA, would implement those studies into actual CVR custom projects. That has not materialized and thus, savings are lower than expected.

Figure 18: BPA Utility Distribution Sector Savings by End-Use and Year (aMW): 2016-2019 Actuals



Note: Due to rounding, numbers may not add to the total.
 Note: Programmatic savings represent actuals for 2016-2019.
 Source: BPA analysis, 2019.

Areas of Focus 2020-2021

BPA is not forecasting any savings for the Utility Distribution sector in 2020 and 2021. The low levels of savings in the prior years and a generally conservative approach to forecasting for this rate period informed this estimate. The Utility Distribution sector is, however, continuing to actively pursue projects in 2020 and 2021.

BPA is actively engaged with a customer utility and is making progress toward implementing a project. BPA is also planning to reach out to a handful of utilities interested in CVR. A new offering for FY2020 is the launch of the Re-conductor/Transformer calculator, targeted for spring 2020. This is an alternative to the

custom project process for re-conductor and substation power transformer measures. The calculator will help expedite the BPA approval process and should be easier for utilities use than the existing form.

Projects in this sector require the involvement of an EE rep from the utility to handle BPA EE logistics and a distribution engineer to address the technical topics. BPA has two technical electrical engineers and a CVR expert available as resources. The team is dedicated to advancing distribution efficiency in the region.

4 Non-programmatic Savings

4.1 MOMENTUM SAVINGS

As part of its total resource portfolio, BPA quantifies Momentum Savings, which are defined as all the energy efficiency occurring above the Council's Plan baseline that are not directly reported by utilities and not part of the NEEA's Net Market Effects. The current low-end estimate for Momentum Savings achieved for the Seventh Plan Action Plan period is 168 aMW; the high-end estimate is 184 aMW. This brings Momentum Savings accomplishments within 84%-92% of the original 200 aMW goal outlined in the EE Action Plan.

Accomplishments Since Plan Publication

To date, since the Seventh Plan publication, BPA has performed research, gathered data, conducted analysis, and developed comprehensive full-market models for the nonresidential lighting, residential HVAC and residential hot water markets. These three markets comprise some of the region's largest end uses and are experiencing efficient market changes that reduce electric consumption in the region.

To quantify Momentum Savings, BPA collects rich information on how much energy efficiency is happening in the total market, which helps the region understand the total energy-efficiency resource and plan for future energy needs. BPA's market intelligence sheds light on important changes, which allows BPA to corroborate assumptions and results in its models, and help inform program strategy. Since the Seventh Plan publication, BPA has completed several market research studies and collected market data including the following:

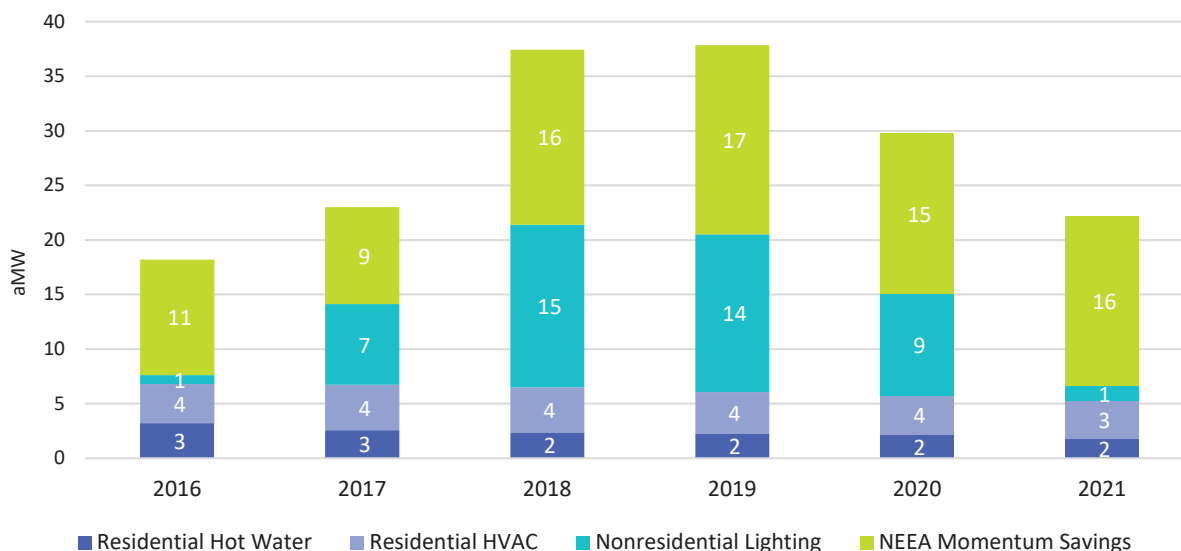
- **Nonresidential Lighting:**
 - Annual survey of nonresidential lighting distributors to gather, analyze and report on full-category sales data.
 - A lighting Market Intelligence report.
- **HVAC:**
 - Annual survey of residential and nonresidential HVAC distributors to gather, analyze and report on full-category sales data, in partnership with NEEA.
 - A regional current-practice baseline field study of residential air source heat pump commissioning controls and sizing practices.

- Annual market characterizations, including deep dives on smart thermostats, commercial HVAC and tracking general market trends.
- A comprehensive HVAC technology guide summarizing the current state of HVAC equipment installed in the Northwest
- Surveys with regional HVAC installation contractors exploring installation context for newly purchased equipment.
- **Residential Hot Water:**
 - A comprehensive market characterization study with a focus on showerheads and faucet aerators to corroborate and support market modeling, which included several research activities:
 - Assessing applicable state and federal energy-efficiency standards.
 - Interviews with 45 market actors, including manufacturers, distributors and subject matter experts.
 - A secondary literature review.
 - Attending the 2019 Kitchen and Bath Trade Show.
 - A stocking assessment of retail outlets.
 - In-depth analysis and comparison of the two Residential Building Stock Assessments' methods and results for showerheads and faucet aerators.

For the nonresidential lighting, residential HVAC, and residential hot water markets, BPA currently estimates 85 aMW of BPA-specific Momentum Savings for the years 2016-2021 (Figure 19). This estimate is subject to change, as BPA plans to update its models before the end of the Plan period. Furthermore, these accomplishments include forecasted savings for the years 2018-2021, and BPA will update those forecasts later in the Plan period when market and program data for those years become available. Specifically for the residential hot water market, there is uncertainty in the current savings estimate and BPA is still assessing the magnitude of savings. As such, the hot water savings are likely to change for the final Plan period reporting.

BPA also reports savings for NEEA initiatives that are above the Plan baseline, but are not included in NEEA's Net Market Effects. NEEA Momentum Savings contribute an additional 83 aMW to BPA's total non-programmatic savings. Figure 19 shows the estimated savings for each of the three market models and from NEEA's initiatives.

Figure 19: BPA Momentum Savings Estimate by Source by and Year (aMW): 2016-2021



Note: Due to rounding, numbers may not add to the total.
 Note: Savings for 2016-2017 are actuals based on current data, while savings for 2018-2021 are a forecast.
 Note: Momentum Savings are subject to change.
 Source: BPA analysis, 2019.

BPA’s current estimate is somewhat conservative, given that it does not incorporate savings estimates from any in progress markets including commercial HVAC. BPA may quantify savings from markets not included in this forecast, as it continues to research new markets during the remainder of the Plan period.

Federal and state efficiency standards have had a dramatic impact on energy demand in the region in the past. In BPA’s original EE Plan forecast, which was developed in 2016, BPA estimated quantifying up to 40 aMW of Momentum Savings from efficiency standards. However, due to changes in the federal administration, there has been limited activity with regard to more efficient standards. Therefore, BPA has not updated any of its standards models, and does not currently forecast any Momentum Savings from standards for the EE Plan period beyond what NEEA claims and reports to BPA. If new efficiency standards are enacted, BPA will work with NEEA to assess whether to develop Momentum Savings models for these new standards.

Areas of Focus 2020-2021

For 2020-2021, BPA plans to focus on collecting existing market data used as key model inputs (e.g., sales data), and exploring new data sources and research opportunities to fill data gaps for its existing three market models. BPA is currently researching two additional markets to explore the feasibility of market modeling: commercial HVAC and data centers. BPA may explore modeling other markets on an as-needed basis.

4.2 MARKET TRANSFORMATION

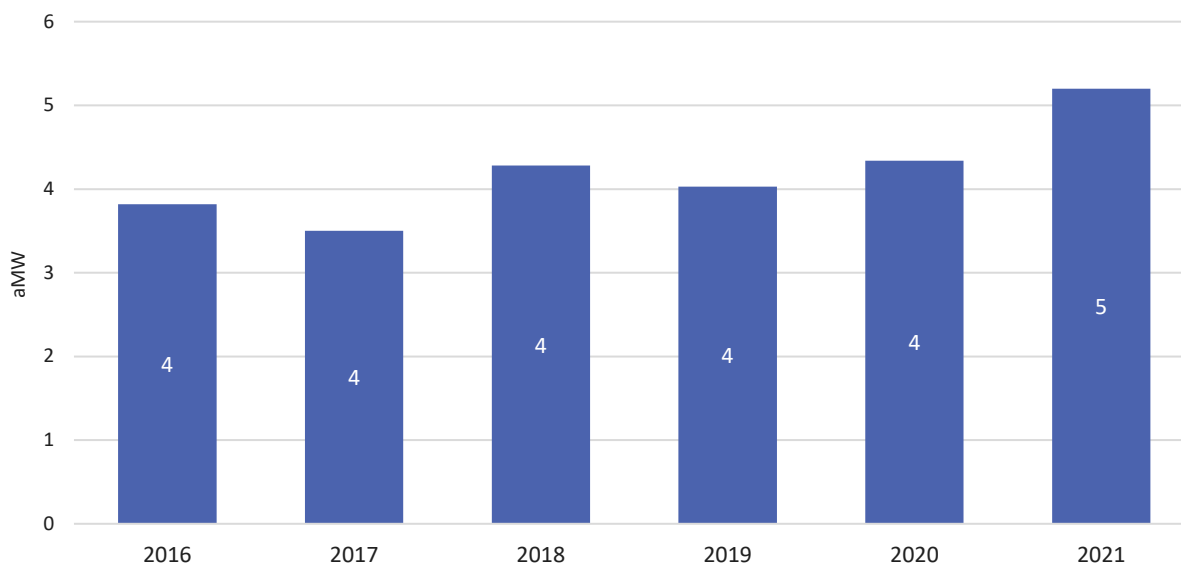
NEEA has been leading market transformation efforts since 1997, and develops and delivers programs to capture associated changes in regions served by funding-utility members. BPA provides funding to NEEA to undertake market transformation actions that push toward more efficient technologies. In addition to NEEA's market transformation efforts, NEEA also conducts numerous studies such as stock assessments and end-use load research study which provide tremendous value to the region.

During the Seventh Plan Action Plan period, NEEA predicts it will achieve 25 aMW¹⁰ of Net Market Effects savings to BPA, in addition to the 83 aMW of savings captured through NEEA's Momentum Savings. NEEA's savings fall slightly short of the estimate of 29 aMW included in the original EE Action Plan. It is important to note that the Implementation Plan published in January 2019 contained an error overstating NEEA's savings for the Plan period. This publication reflected a contribution of 50 aMW, which was the value prior to applying BPA's funding share. This error was caused by a change in the savings report format and has been corrected for the EE Action Plan Update.

NEEA's savings come from a variety of initiatives spanning retail products, codes and standards, and residential and commercial HVAC. Savings are anticipated to stay relatively flat, averaging approximately 4 aMW per year. NEEA's savings estimates will not be final until the end of the Seventh Plan Action Plan period as new data is collected and new initiatives are added over six years. Figure 20 shows the estimated Net Market Effects savings from 2016-2021.

¹⁰ The values in this report represent the share of Net Market Effects tied to energy efficiency measures above the Seventh Power Plan baseline. Benefits from Market Transformation accrues over a longer period than the Power Plan. As a result, the 25 aMW above the Seven Power Plan baseline does not encompass Net Market Effects from all of NEEA's work, which includes Heat Pump Water Heaters and Code and Standards. Using the NEEA market transformation baseline approach, NEEA forecasts that the 2016-2021 Net Market Effects for Bonneville and the public utilities will be closer to 83 aMW.

Figure 20: BPA’s NEEA Net Market Effects Estimated Savings by Year (aMW): 2016-2021



Note: Due to rounding, numbers may not add to the total.
 Note: Savings for 2016-2019 are actuals based on current data, while savings for 2018-2021 are a forecast.
 Note: Net Market Effects Savings are subject to change.
 Source: BPA analysis, 2019

5 Looking to the Future

BPA and its customer utilities have made a significant investment in energy efficiency since 2016, resulting in expected savings of more than 500 aMW for the region. These savings represent a tremendous amount of effort from public power utilities and our regional partners, and BPA is proud of the accomplishment.

There is often uncertainty around forecasting and setting budgets based on savings sources that BPA does not have direct control over, such as Momentum Savings. As the region moves to the next Power Plan, we should consider how to acknowledge this uncertainty when developing goals for 2022 and beyond. However, we must not forget the value that tracking and reporting savings outside of programs provides — not only from a savings perspective but from a research perspective, and to ensure that BPA is spending program dollars where they matter most.

BPA is working closely with Council staff to develop the 2021 Plan. We are committed to continued collaboration with the Council and other parties in the region to make strategic energy-efficiency investments that are consistent with the Council’s Power Plan and align with the long-term needs of BPA and its customers.