

B O N N E V I L L E P O W E R A D M I N I S T R A T I O N



Energy Conservation Annual Review 2021





A note from Jamae Hilliard Creecy

Vice President of Energy Efficiency

I am pleased to introduce this inaugural review of the Bonneville Power Administration's (BPA) energy efficiency program accomplishments. We are excited to highlight BPA and our customers' energy conservation achievements. These accomplishments are a direct result of the enduring commitment the Northwest has made to conserving one of the region's most important energy resources—the Federal Columbia River Power System. While BPA provided energy efficiency program infrastructure support and incentive funding, customers and regional partnerships delivered 84 average megawatts of programmatic, market transformation and momentum energy savings over the last year. These energy conservation investments reduce the need for higher cost resources to meet BPA's load obligations.

Historically there has been a relative abundance of cost-effective energy efficiency, driven by inexpensive lighting measures. With the lighting market largely transformed, developing new conservation measures at the pace and cost we have grown accustomed to is much harder now. To add to these complexities, the COVID-19 pandemic impacted every community within BPA's service territory and beyond, causing a major slowdown of energy efficiency efforts across the region and placing even more energy burden on those most in need.

These challenges brought to the forefront important conversations about enhancing program accessibility. We thought more critically about how to capture the true value of conservation, including energy, non-energy and capacity benefits, and how to identify the type, timing and geographical location of energy savings to best achieve the conservation called for in the Northwest Power and Conservation Council's 2021 Northwest Power Plan and BPA's 2022 Resource Program.

It is no secret the energy landscape is rapidly changing as electrification, renewable resource integration and decarbonization efforts shape modern power systems. The Northwest is a leader in this arena. We understand using energy more efficiently is one of the most cost-effective ways to save money, reduce greenhouse gas emissions, create jobs and meet growing energy demand.

I am proud to see this legacy continue. Dedicated customers and staff from across the Northwest remain committed to working closely with residents, schools, farmers, businesses, state and federal agencies, tribal nations, utilities and industries to conserve energy. I hope you enjoy the Annual Review. The achievements highlighted represent the collaboration and innovation needed to meet the region's future energy needs.

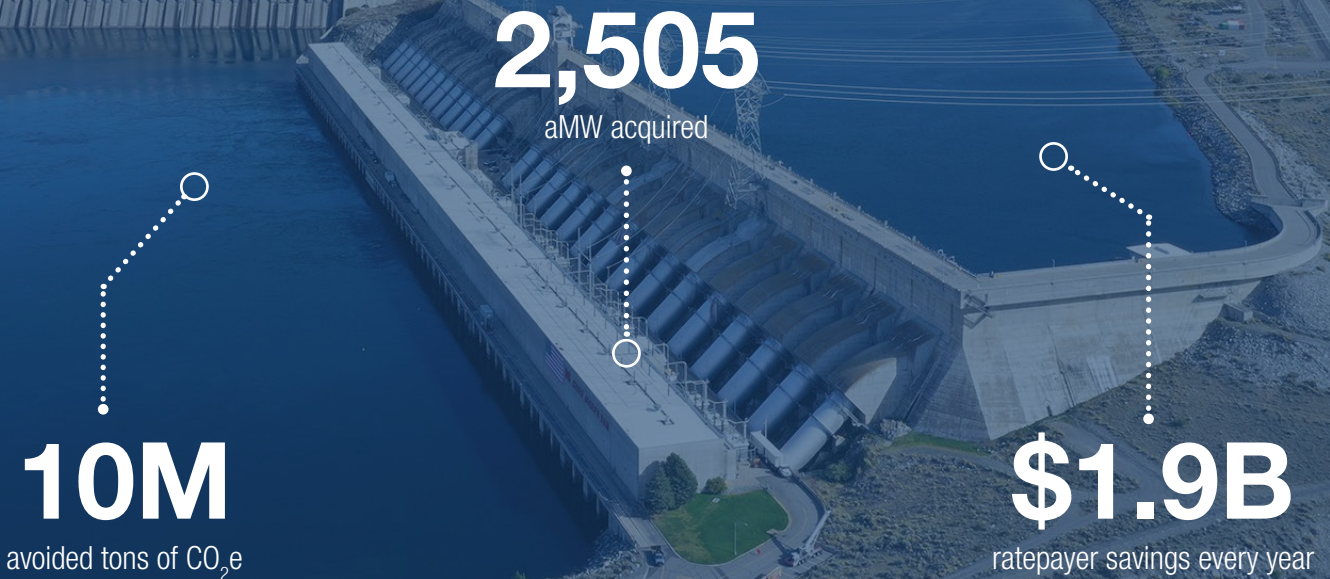
Sincerely,

A handwritten signature in cursive script that reads "Jamae Hilliard Creecy". The signature is written in black ink and is positioned below the word "Sincerely,".

Jamae Hilliard Creecy

A history of resource acquisition.

Since 1982, BPA and its customers have achieved a lasting resource that includes...



Accomplishments in 2021

84.1

aMW acquired (providing 190 MW of winter morning capacity)

335,000

avoided tons of CO₂e (equivalent to 73K cars' annual emissions)

\$63M

bill savings for ratepayers (enough to fund 919 average wage jobs)

3 million

ft² serviced by weatherization measures

834

custom projects completed (providing 16.1 aMW of energy savings)

61,000

average Northwest homes powered annually by the energy saved

About this document

This inaugural Energy Conservation Annual Review assesses, compiles and communicates BPA's cumulative conservation achievements since 1982 and highlights BPA's energy efficiency accomplishments from fiscal year (FY) 2021 (Oct. 1, 2020 to Sept. 30, 2021). It also reports achievements over the Council's Seventh Power Plan (Seventh Plan) Action Plan period, 2016 through 2021. Moving forward, BPA plans to publish the Annual Review yearly to provide an accessible "look back" at the prior year's energy conservation achievements.

40 Years of Conservation

Powering the Northwest through Energy Conservation

The Pacific Northwest Electric Power Planning and Conservation Act passed in 1980 obligates BPA to acquire and encourage the development of energy conservation to maximize the value of the Federal Columbia River Power System, reducing the agency's need to acquire other resources to supply firm power to its customers. While the regional energy landscape has evolved significantly since the Act, energy conservation has proven to be a consistent and reliable resource for the agency, our customers and the region at large.

Together with our customers we have achieved an estimated 2,505 average megawatts (aMW) of energy savings over a 40-year period from FY 1982 through 2021. For perspective, that is more energy than the annual production of the Grand Coulee Dam (**Figure 1**), the largest dam within the Federal Columbia River Power System, which produces about 2,300 aMW annually.¹

Energy efficiency is a resource, which, while not as obvious as a dam, is just as real. So, too, is the \$1.9 billion in savings for ratepayers each year because

FIGURE 1: The Grand Coulee Dam



¹ <https://www.nwcouncil.org/reports/columbia-river-history/grandcouleehistory/>

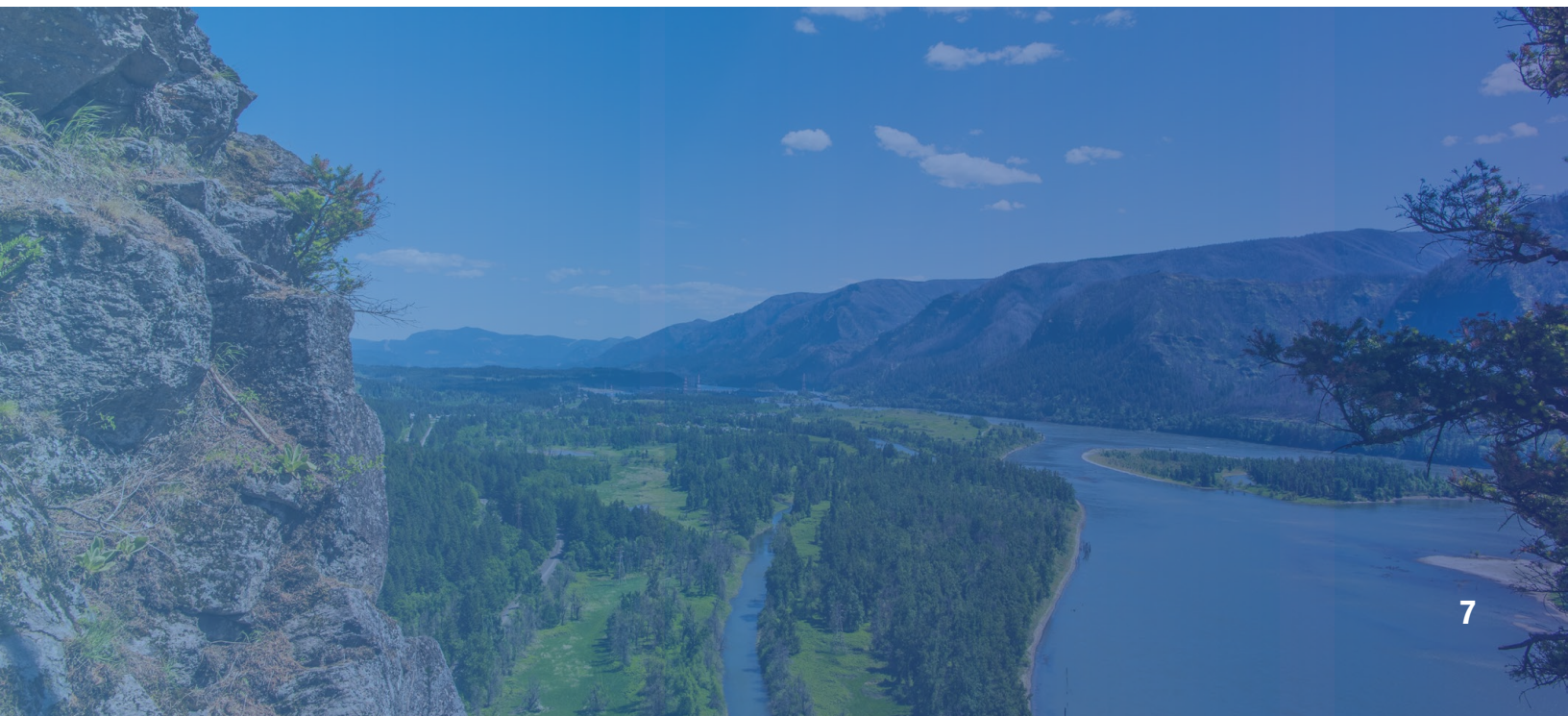
40 YEARS OF CONSERVATION

of energy conservation investments made by BPA and our customers. Seattle City Light noted in its most recent integrated resource plan that its average residential customer used 20% less energy annually in 2020 than 20 years earlier. While a myriad of factors has likely contributed to that decline, BPA and Seattle's efficiency investment is certainly a significant one and illustrates energy conservation's impact.

Even easier to overlook is the hedge energy efficiency—an invisible but critical resource that can mitigate impacts of market swings, extreme weather events and a changing utility landscape. For example, in early March 2019 a combination of prolonged low temperatures, a low water year and reduced natural gas pipeline accessibility and storage capacity across British Columbia and the Pacific Northwest caused market prices to move to \$1,000 per megawatt-hour (MWh). BPA's energy efficiency program helped BPA mitigate its risk and cost exposure for this unexpected event by reducing customer loads and minimizing the

amount of power acquired from the market.

More recently, in June 2021 when the anomalous heat dome settled over the Northwest for several days and temperatures reached 115 degrees, the available capacity afforded by years of energy efficiency measures helped keep the grid operational for reliable power delivery. Customer experiences reinforce the value energy efficiency projects provided in maintaining system resilience in a time of stress. For example, a few central Washington utilities requested that some of their food processing customers shut off or reduce their refrigeration systems during the 2021 heat dome. Past energy efficiency upgrades to the refrigeration systems and facilities enabled some end users to turn off a portion of their refrigeration compressors to reduce the load on the grid by an estimated 1500-3000 kilowatts (kW). Facility management found they could ride out a several-hour period of peak system demand because of past efficiency upgrades.



2021 Accomplishments

In 2021, BPA and its customers delivered 84.1 aMW of total energy savings, which has the effect of reducing consumers' cost of electricity by \$63 million annually and avoiding emissions of more than 335,000 tons of carbon dioxide equivalent (CO₂e). This is equivalent to taking 73,000 cars off the road for a year.²

As shown in **Table 1**, last year's savings accomplishments included 39.6 aMW of programmatic savings, 29.3 aMW from the Northwest Energy Efficiency Alliance (NEEA) and 15.2 aMW of Momentum Savings.

TABLE 1: Savings by Type, FY 2021

Type of Savings	Savings (aMW)
Programmatic	39.6
NEEA Reported Savings	29.3
Momentum	15.2
Total	84.1

Programmatic Achievements

BPA's customers delivered 39.6 aMW of energy savings in 2021. As shown in **Table 2**, utilities acquired a diverse mix of conservation resources across all sectors—something our BPA program and planning staff aims for by offering a robust and wide range of measures and programs. Our diverse portfolio of measures allow our customers to match or surpass what their neighboring non-BPA customer utilities offer, helping them create positive engagement with their customers.

TABLE 2: Programmatic Savings by Sector, FY 2021

Sector	Savings (aMW)
Residential	9.7
Commercial	14.4
Industrial	12.6
Agricultural	1.3
Utility System Efficiency	0.5
Federal	1.1
Total	39.6

Residential Sector

In addition to acquiring 9.7 aMW of savings, the residential team continued to develop the infrastructure for scaling residential efficiency acquisition over the next several years. For example, BPA's Comfort Ready Home program continues to gain traction by supporting utility implementation of residential weatherization and

heating, ventilation and air conditioning (HVAC) measures and by ensuring a well-trained contractor pool to install these measures. Weatherization and HVAC measures are particularly valuable to BPA and our customers because they tend to contribute capacity savings during periods of peak demand. During extreme events, like the heat

² CO₂e reductions are based on the Northwest Power and Conservation Council's estimate of 0.91/kWh of CO₂e avoided. See https://www.nwccouncil.org/media/filer_public/ac/d9/acd94f75-20ef-4d1c-b0c9-ea5cf113778d/2018-1.pdf

dome of 2021, an air-tight, efficiently air-conditioned home pays considerably more benefits compared to a drafty home with a standard efficiency HVAC system. Discussions with customers continue to highlight the importance of these measures, which not only offer savings at the most important times of the year but are also touted for their grid resiliency benefits. Efficiency-created resilience is also important at the household level. An air-tight home enables households to endure brief power outages more comfortably and safely by slowing heat loss or gain and provides better protection against wildfire smoke infiltration. In other words, the 2.4 million square feet of living space that BPA customer programs insulated in 2021 created far more value than reflected in the energy savings reported here.

Adequate capacity is emerging as a regional issue for utilities in the Northwest. For example, Snohomish Public Utility District's 2021 Integrated Resource Plan identified seasonal capacity needs in both the short and long term and noted the utility's continued reliance on conservation playing a role in meeting those needs. Working with customers such as Snohomish, BPA's conservation program will continue to help avoid future capacity constraints and improve our ability to offer capacity products to our customers.

A simple example to illustrate energy efficiency's capacity value

During the last two years, BPA achieved 79 aMW of programmatic energy efficiency savings. On a winter morning, those 79 aMW translate to 178 megawatts (MW) of winter morning capacity. This is because measures like HVAC and weatherization have a greater impact on load and provide the most value when BPA's needs are greatest.

Using forecasted heavy-load-hour mid-C prices as a proxy for economic value of these savings, those 178 MW would be valued at \$1.8 million over the course of a single winter season. And this value grows over time. Each year, as BPA acquires more efficiency, it adds to the previous acquisitions.

Commercial Sector

The largest programmatic savings came from the commercial sector, which acquired 14.4 aMW of resources. Schools are included in this sector and are an example of how BPA and its customers partner on energy efficiency to make a positive contribution to local communities. In one instance, Okanogan County Public Utility District (PUD) leveraged BPA's support to help modernize its heating, ventilation and cooling systems. As a result, the school's energy bills dropped nearly in half, the maintenance burden was reduced, and the indoor environment became more comfortable.

BPA's customers' work in schools and other buildings does more than just save energy. With support from BPA, the Monument Elementary School in Monument, Oregon, installed a very high efficiency dedicated outdoor air system to improve air circulation, ventilation and thermal comfort. The project reduced HVAC energy use by 50% and overall building energy use by 35%. More importantly, indoor air quality improved and the risk of transmitting infectious diseases like COVID-19 was reduced.

Last year marked the end of the Seventh Plan Period, a six-year window over which BPA collaborated with its customers to invest approximately \$4.2M in over 300 schools, acquiring 1.9 aMW of power resource. If we assume \$0.08 per kilowatt-hour (kWh) that equates to more than \$1.3M in annual electric bill savings. These savings allow schools the flexibility to fund other efforts central to their mission and reduces tax burdens on local communities.

Industrial Sector

BPA and its utility customers acquired 12.6 aMW of savings in the industrial sector. Industrial savings have a significant impact for many key local employers' bottom lines, helping them stay competitive over time. In 2021, BPA supported 834 custom projects.

One such project took place in Okanogan PUD's territory. Working with the Energy Smart Industrial program, Honeybear Growers, a premium apple grower in Brewster, Washington, upgraded its facility with several energy-efficient measures. The project included new automated packing lines, updated refrigeration controls, new flume pumps with variable frequency drives for washing the produce and new fast-acting refrigeration doors. BPA and Okanogan PUD issued Honeybear a \$42,000 rebate check to acquire the resulting 153,000 kWh per year of energy efficiency savings. Assuming \$0.08/kWh, that's approximately \$12,000 in energy bill savings annually for this local business. Not only did the project reduce the company's operating costs, but it also doubled its produce sorting volume, and the refrigeration controls help Honeybear cool apples faster, allowing for longer storage time. The longer the fruit stays fresh, the better it is for growers awaiting sales.

Many energy efficiency industrial projects also create safer work environments. For illustration, when BPA supports an industrial end-user in replacing hydraulic systems with servomotors, we help them eliminate exposure to hot, high-pressure fluids. Similarly, insulating process furnaces to save energy provides the added benefit of protecting workers from high temperature surfaces.

More broadly, BPA's energy efficiency investments and efforts help many types of public facilities operate more efficiently while reducing energy costs. Between 2016 and 2021, BPA and its customers supported savings of more than 2.5 aMW in various public facilities such as wastewater, fire and police stations and courthouses equating to \$1.8 million in annual electric bill savings.

Industrial Energy Management

Industrial efficiency support includes "behavioral" programs. The Strategic Energy Management program support began in 2009 and concluded in 2021 with 16 cohorts completing the program. Taken together, these organizations have helped approximately 200 sites achieve a total of 13.7 aMW of savings.

Last year, BPA's evaluation team launched an effort to evaluate the program, focusing on how savings persist over time. BPA plans to complete this evaluation next year.

Agricultural Sector

BPA's work in the agriculture sector achieved 1.3 aMW of savings in 2021. A new irrigation sprinkler hardware measure was added to our portfolio, and we refreshed the cost effectiveness analysis for several measures, which allowed BPA to increase available incentive payments to participating customers.

With droughts of historic impact becoming the norm, water conservation is increasingly a focus in the Northwest, particularly in the eastern part of the region.

One agricultural sector example was a \$46 million project near Hermiston, Oregon. BPA engineers supported the installation of a dozen large pumps to irrigate 26,500 acres with water from the Columbia River. The goal of using the Columbia River as the water source was to recover and stabilize the declining basalt aquifers in Eastern Oregon. BPA worked with Umatilla Electric Cooperative to prioritize energy efficiency efforts included in this important water conservation project.

Northwest Energy Efficiency Alliance

Another critical element of BPA's energy efficiency portfolio is market transformation. These energy savings are achieved through BPA's partnership with NEEA. In 2021, NEEA saved a total of 29.3 aMW, which includes 6.0 aMW of direct energy savings from their market transformation programs as well as 23.3 aMW of NEEA Momentum Savings (see **Table 3**). NEEA's approach (see next page) does more than produce near-term savings. NEEA intervenes at various points in markets to remove barriers to new efficient technologies and sustain their adoption without continued direct investment, yielding a legacy of cost-effective savings.

NEEA continues to build its pipeline to develop savings in the 2021 Power Plan period. It expects its Extended Motor Products program, which is still in early development, to bring significant energy savings by increasing the efficiency of common motor-driven systems such as pumps and fans. NEEA integrated the Next Step Home Program with its codes work and plans to build upon relationships created with voluntary home certification programs and market actors to implement activities that increase adoption of technologies and practices outlined in its energy code roadmaps. In addition, NEEA is developing six new programs: Secondary Windows (commercial), High Performance HVAC (commercial), Fans and Pumps (commercial and industrial), Variable Speed Heat Pumps (residential), and High Performance Windows (residential).

TABLE 3: NEEA Reported Savings by Sector, 2021

Sector	Savings (aMW)
Residential	23.1
Commercial	6.1
Industrial	0.1
Agricultural	0.0
Total	29.3

NEEA also works with BPA to provide foundational research for the region's energy planning and program activities. In 2021, BPA collaborated with NEEA on its end-use load research and building stock data collection efforts. Previous similar data collection efforts yielded insights that have benefited nearly every aspect of BPA's business, including understanding the time value of energy efficiency. Our coordination with NEEA extends to programs, engineering, and building energy codes and standards support (see next page).

Market Transformation

BPA provides funding to NEEA to fuel its ongoing, long-term oriented market transformation efforts. Our relationship with NEEA aims to shepherd energy-efficient products and technologies along the market transformation life cycle.

Our Emerging Technologies group works closely with NEEA and utilities across the region to identify new technologies and demonstrate them in the field. For example, BPA is leading the development and adoption of large volume central heat pump water heaters to support the Advanced Water Heater Initiative (a national effort to accelerate the adoption of heat pump water heaters).

NEEA and BPA identify and remove market barriers. NEEA's combined infrastructure programs and BPA's Energy Efficiency Incentive (EEI) funding spur adoption with marketing and training of supply-side market actors. The goal is to make yesterday's new technologies today's market standard—recent examples include ductless heat pumps and LEDs in many applications.

Finally, with market adoption well established, BPA occasionally works directly with NEEA to influence state and federal codes and standards to make these technologies the new baseline. For illustration, BPA engineers supported efforts to file comments to the U.S. Department of Energy about efficiency opportunities in its distribution transformer energy conservation standard rulemaking.

Momentum Savings

One of the core functions of BPA’s market research team is to quantify “Momentum Savings.” Momentum Savings result when an end user chooses an efficient option without receiving a financial incentive directly from an energy efficiency program. Many factors may drive such choices, including the “momentum” generated by past efficiency programs, new codes and standards, corporate sustainability policies and technology trends. Momentum Savings are energy savings that are cost effective, not directly paid for by utilities, not part of NEEA’s Net Market Effects and above the Northwest Power and Conservation Council’s Power Plan baseline.

BPA’s market research team recently completed three quantitative market models which estimated 15.2 aMW of Momentum Savings in 2021. As shown in **Table 4**, Momentum Savings were driven by 4.9 aMW, 9.1 aMW and 1.2 aMW savings from the nonresidential lighting, residential HVAC and industrial adjustable speed drives markets, respectively.

In 2021, the market research team [charted a path](#) for future-looking research that could benefit BPA’s programs and the broader agency.

TABLE 4: Momentum Savings by Market Model, 2021

Model	Savings (aMW)
Residential HVAC	9.1
Nonresidential Lighting	4.9
Industrial Adjustable Speed Drives	1.2
Total	15.2

The Impact of BPA’s Market Research Program

Momentum Savings research benefits BPA’s conservation program and resource acquisition strategies in several ways:

Provides Market Intelligence to Maximize Program

Impact: Leveraging market data collected through Momentum Savings research helps BPA develop and refine programs by creating awareness of shifts in market dynamics, such as changes in price, market actors, or the supply chain. In the past, this research has been used to show which markets and measures no longer need utility support because the market has transformed and to uncover new program opportunities.

Informs Investment Strategies: BPA’s Momentum Savings research illuminates where energy savings are happening without utility funding so the agency and the region at large can better target investments. By quantifying the total efficiency resource in the market, BPA can direct its efforts to achieve the greatest impact. That may mean investing in harder-to-achieve measures, measures with greater demand/capacity value or areas of inequity.

Ensures Cost-Effective Resource Acquisition: Momentum Savings research identifies energy savings occurring in the market that do not need to be purchased through programs, but nevertheless represent a real resource acquisition to BPA. By quantifying the total efficiency happening in a market, whether it is achieved through an efficiency program or not, this research helps the agency meet its resource obligations in the most cost effective way. The reason why a kilowatt-hour is saved—and who saved it—is secondary to the fact that it was indeed saved.

Supports Data Driven Decisions: BPA’s research and data are used to establish more accurate potential assessments, load forecasts and measure baselines which encourage more informed decision making by power planners and analysts.

Technical Expertise on Speed Dial

BPA's achievements extend beyond the energy resource acquired. Many of our customers rely on BPA's technical expertise to support their customers' projects. BPA engineers and energy efficiency representatives enable utility customers to do more than they could on their own. Whether designing a school retrofit, tracking emerging technologies, vetting vendor claims of product performance or navigating the Implementation Manual, BPA's energy efficiency staff stretch the capabilities and bandwidth of our customers. Here is a look at some highlights of technical support provided in 2021:



- In the past year, multiple utilities contacted BPA about possible custom projects for **ultraviolet disinfecting/filtering technologies** to reduce the potential spread of COVID-19 through HVAC systems. Several vendors of this technology claimed their products would also save significant energy. The BPA engineering team analyzed the technology and found it would increase the facilities' energy use, and some would not provide the sanitizing level claimed by the vendor. We provided the information to the utilities, who then shared it with their customers, including school districts, saving these cash-strapped customers from well-intentioned but ultimately not cost effective expenditures.
- For **Idaho Falls Power**, BPA engineers consulted on both the preliminary design phase and the building permit phase of the new Idaho Falls Police Headquarters. The team identified six potential system improvements at the design phase that were incorporated into the final building design. The facility is under construction and is expected to be 20% to 30% more efficient than the original design.
- In **Inland Power's** territory, the Riverside School District sought to apply for grant funding. BPA audited and performed a systems analysis for the district's five schools. This support provided some of the required data and information on the grant application and the analysis proved invaluable in helping the district secure funding to upgrade their HVAC systems.

Better Systems, Better Service

Customer service is a central tenet of BPA's energy efficiency work. A focus on enhanced customer service led to several system and process improvements. A few examples from 2021 include:

- **The residential sector team analyzed the workflow required to participate in residential programs. This self-audit resulted in the elimination of nearly three-fourths of our forms, while simplifying the implementation and reporting requirements for most of our measures.**
- **Energy efficiency representatives facilitated more than 40 bilateral transfers of EEI funds, which allowed for flexibility in deploying more than \$5 million.**
- **Over a nine-month effort, energy efficiency representatives updated and then facilitated the timely signing of customer energy conservation agreements for the FY 2022-2023 rate period.**
- **BPA provided continuous ad hoc custom reports to support customer reporting needs associated with their external and internal audits.**

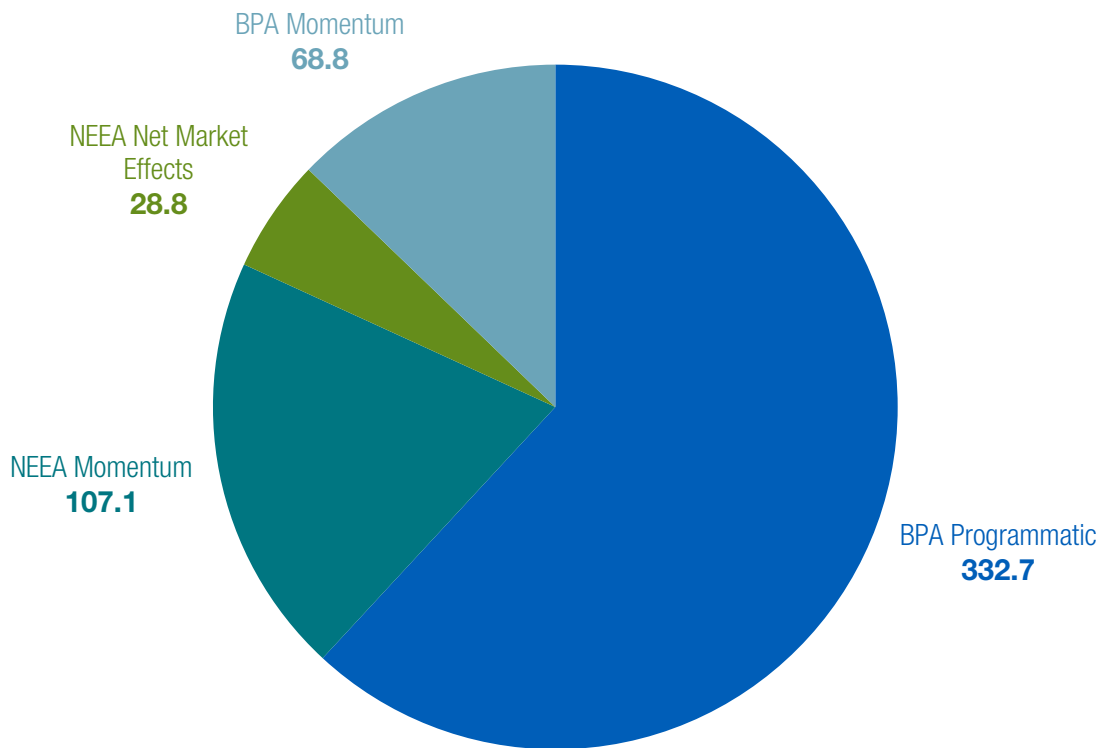
Seventh Plan Accomplishments

Historically, every five to six years the Northwest Power and Conservation Council sets a regional conservation goal that includes all the cost-effective energy efficiency that should be acquired. BPA has provided conservation program infrastructure and incentive funding that enabled our customers to obtain approximately 40% of the regional conservation goal.

In February 2016, the Council released the [Seventh Plan](#). As this first publication of BPA's Annual Review coincides with the end of the Seventh Plan action plan period, this section provides the final savings accomplishments achieved by BPA and its utility customers from 2016 to 2021 (the Seventh Plan period).

BPA and its customers delivered 537.5 aMW of energy savings over the Seventh Plan despite a far more challenging environment than in previous years. As the lighting market has transformed, low-cost, high-volume savings have become harder to secure. The COVID-19 pandemic introduced major barriers to delivering energy efficiency. In light of the unprecedented challenges of recent years, we consider our achievements hard-won despite falling just short of the overall Power Plan goal of 581 aMW. **Figure 2** shows BPA's portfolio by type of savings acquired over the Seventh Power Plan period.

FIGURE 2: Savings by Type, 2016-2021 (aMW)



SEVENTH PLAN ACCOMPLISHMENTS

BPA and customer accomplishments during the Seventh Plan period had a substantial positive impact for the agency and region. The amount of energy efficiency resources BPA customers acquired between 2016 and 2021 is enough to power approximately 392,000 homes in the Northwest for one year or provide about one-third of Seattle’s annual power needs.

The numbers in this report are somewhat different from the Council’s accounting of accomplishments during the Seventh Plan period because the Council applies a regional market adjustment (RMA). The Council manages the difficult task of assembling efficiency achievements reported from many jurisdictions over different time periods and across different measure definitions and baselines. The Council uses the RMA to attempt to true up the regional savings goal and correct for inconsistencies, including updated Regional Technical Forum assumptions made after the publication of the Seventh Plan and

inconsistencies in measure baselines. BPA numbers are not similarly adjusted because the process of truing up analytical inconsistencies can inadvertently misstate the magnitude of the resource acquired by BPA and its customers.

Programmatic Savings

Table 5 breaks out programmatic achievements over the Seventh Power Plan period by sector. Savings declined in the last two years of the plan period across all sectors. This reflects a decline in savings from lighting measures as that market transformed, as well as the impact of the COVID-19 pandemic. In the federal sector, BPA successfully sunset the Energy Smart Federal Partnership in 2021, completing all projects with its federal agency partners.

TABLE 5: Programmatic Savings by Sector, 2016-2021 (aMW)

Sector	2016	2017	2018	2019	2020	2021	Total
Residential	21.5	22.0	13.0	12.1	10.3	9.7	88.5
Commercial	17.1	20.6	23.3	23.5	10.6	14.4	109.6
Industrial	21.0	19.9	15.3	15.1	10.8	12.6	94.7
Agricultural	4.2	4.5	5.2	5.6	1.0	1.3	21.8
Utility System Efficiency	0.1	0.6	0.3	0.3	0.0	0.5	1.9
Federal	1.1	5.0	1.1	1.4	6.6	1.1	16.3
Total	64.9	72.6	58.2	57.9	39.4	39.6	332.7

SEVENTH PLAN ACCOMPLISHMENTS

Northwest Energy Efficiency Alliance

Table 6 shows NEEA's contributions to BPA's efficiency portfolio over the Seventh Plan period. During this six-year period, NEEA saved a total of 136.0 aMW, which includes 28.8 aMW of direct energy savings from its market transformation programs as well as 107.1 aMW of NEEA Momentum Savings. The residential sector provided the majority of resource acquired. Of the 106.1 aMW saved in this sector, 75.8 aMW came from lighting efficiency.

NEEA's Seventh Plan savings come from three broad sources, which are apportioned to BPA on a pro-rata basis:

1. Programs currently in the market development phase of the market transformation life cycle.

These active programs include Heat Pump Water Heaters, Retail Products Portfolio, Luminaire Level

Lighting Controls, and Manufactured Homes.

2. Savings from previously funded initiatives.

NEEA's work with BPA and others creates the sustainable conditions for efficiency adoption to grow on its own even after NEEA exits the markets. In the Seventh Plan period, residential lighting was by far the biggest saver.

3. Codes and standards. NEEA acts as a voice for the Northwest to influence the adoption of increasingly stringent building energy codes and federal appliance and equipment codes and standards. This activity can lock in the market transformation that NEEA, BPA and its customers work so hard to achieve.

TABLE 6: NEEA Reported Savings by Sector, 2016-2021 (aMW)

Sector	2016	2017	2018	2019	2020	2021	Total
Residential	11.9	10.6	17.4	23.1	20.0	23.1	106.1
Commercial	2.4	2.4	4.7	6.4	6.8	6.1	28.8
Industrial	0.1	0.2	0.2	0.3	0.2	0.1	1.1
Agricultural	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	14.4	13.1	22.3	29.9	27.0	29.3	136.0

Momentum Savings

In addition to programmatic and NEEA achievements, BPA's market research team built three quantitative market models that estimated 68.8 aMW of Momentum Savings since 2016, as shown in **Table 7**.

TABLE 7: Momentum Savings by Market Model, 2016-2021 (aMW)

Model	2016	2017	2018	2019	2020	2021	Total
Residential HVAC	2.7	4.3	5.3	5.3	8.8	9.1	35.5
Nonresidential Lighting	-5.2	-6.9	10.9	11.7	10.0	4.9	25.4
Industrial Adjustable Speed Drives	1.2	1.4	1.5	1.1	1.6	1.2	7.9
Total	-1.3	-1.3	17.7	18.1	20.4	15.2	68.8

Looking Ahead

BPA and its customers have successfully acquired much of the most cost-effective efficiency potential. As we plan for the future, we recognize the energy landscape is changing:

- **Renewables rapidly continue to come down in price and are cost effective relative to many types of resources, including some energy efficiency measures.**
- **Emerging regulatory trends in some states and local jurisdictions are accelerating decarbonization efforts and highlighting the importance of equity.**
- **Thermal plant retirements and electrification make capacity an emerging regional issue.**
- **The increasing frequency of extreme weather events, combined with the above trends, places emphasis on the timing, location, and flexibility of energy conservation measures and demand-side resources.**

Considering these challenges and changes, BPA's Energy Efficiency staff will continue to evolve programs and systems to meet BPA's and customers' needs. We plan to examine the benefits of our energy conservation program by improving our methods for calculating capacity reductions and avoided emissions. We look forward to

continuing conversations about how to enhance program accessibility, ensuring we have diverse and equitable portfolio offerings and program participation. We will also complete the new BPA Energy Efficiency Tracking System, which will enable BPA and our customers to utilize an integrated, self-service system to submit, manage, track, and report energy conservation acquisitions.

In the coming months, BPA will publish its Energy Efficiency Action Plan (Action Plan), describing our conservation goals, portfolio management strategy and program measures. The Action Plan will be informed by the Council's 2021 Plan, BPA's Resource Program and Integrated Program Review. BPA will also consider customer needs and other benefits of conservation such as capacity, resiliency and avoided emissions. During the Action Plan development process, low-cost flexible load management solutions that can be frequently deployed with minimal customer impacts will also be assessed.

Looking ahead, BPA will work with customers and stakeholders to chart a course for energy efficiency acquisition under long-term preference power contracts. Creating a post-2028 future for BPA's energy efficiency program provides an opportunity to think creatively about how to best continue a legacy of energy conservation.

Appendix A

FIGURE 3: BPA's Annual Conservation Savings (aMW), FY 2016-2021

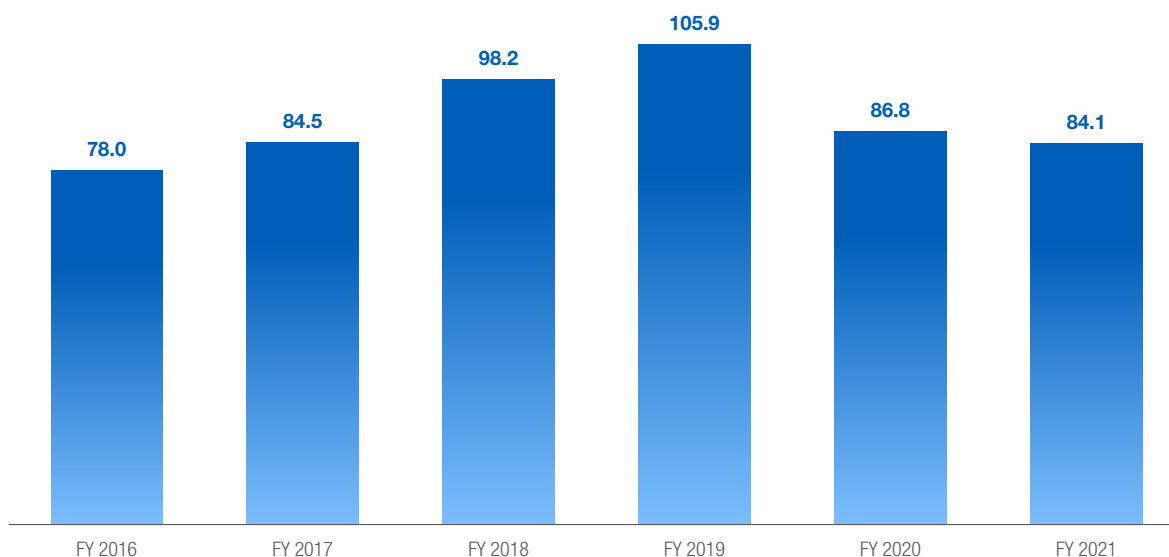


TABLE 8: BPA's Annual Conservation Savings, FY 1982-2021 (aMW)

	Total FY 82-2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Total FY 82-2021
Residential	462.9	21.5	22.0	13.0	12.1	10.3	9.7	551.4
Commercial	352.8	17.1	20.6	23.3	23.5	10.6	14.4	462.4
Industrial	243.8	21.0	19.9	15.3	15.1	10.8	12.6	338.5
Agricultural	54.8	4.2	4.5	5.2	5.6	1.0	1.3	76.6
Multi-Sector	108.9	-	-	-	-	-	-	108.9
Utility System Efficiency	1.1	0.1	0.6	0.3	0.3	0.0	0.5	2.9
Federal	8.6	1.1	5.0	1.1	1.4	6.6	1.1	24.9
Sectors Subtotal	1,232.9	64.9	72.6	58.2	57.9	39.4	39.6	1,565.6
Residential Building Codes	128.6	-	-	-	-	-	-	128.6
Commercial Building Codes	59.9	-	-	-	-	-	-	59.9
Building Codes Subtotal	188.5	-	-	-	-	-	-	188.5
NEEA Net Market Effects	237.3	3.6	3.7	4.8	5.0	5.7	6.0	266.1
NEEA Momentum	-	10.8	9.4	17.5	24.9	21.3	23.3	107.1
BPA Momentum	308.5	-1.3	-1.3	17.7	18.1	20.4	15.2	377.4
TOTAL SAVINGS	1,967.3	78.0	84.5	98.2	105.9	86.8	84.1	2,504.8

TABLE 9: BPA's Annual Conservation Savings by Sector, Funding Source, FY 2016-2021 (aMW)

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Total FY 2016-21
Programmatic Residential							
Low-Income Weatherization, State Implemented	0.2	0.3	0.1	0.2	0.1	0.2	1.1
Programmatic Low-Income Weatherization, Utility Self-Funded	0.1	0.2	0.1	0.1	0.0	0.1	0.6
Programmatic Low-Income Weatherization, EEI Funded	0.5	0.3	0.5	0.3	0.2	0.2	1.9
Programmatic Utility Self-Funded	5.8	11.8	3.2	5.5	1.1	0.8	28.2
Programmatic EEI Funded	14.9	9.5	9.1	6.0	8.8	8.4	56.7
Programmatic Residential Subtotal	21.5	22.0	13.0	12.1	10.3	9.7	88.5
Programmatic Commercial							
Programmatic Utility Self-Funded	5.0	9.0	7.1	11.8	0.7	3.8	37.3
Programmatic EEI Funded	12.1	11.6	16.2	11.7	10.0	10.6	72.3
Programmatic Commercial Subtotal	17.1	20.6	23.3	23.5	10.6	14.4	109.6
Programmatic Industrial							
Programmatic Utility Self-Funded	2.4	8.3	5.9	4.1	2.2	2.5	25.3
Programmatic EEI Funded	18.6	11.6	9.4	11.1	8.6	10.1	69.3
Programmatic Industrial Subtotal	21.0	19.9	15.3	15.1	10.8	12.6	94.7
Programmatic Agricultural							
Programmatic Utility Self-Funded	0.0	0.2	1.2	1.7	0.0	0.2	3.3
Programmatic EEI Funded (with Scientific Irrigation Scheduling [SIS] adjustment)	4.2	4.3	4.0	3.9	1.0	1.2	18.5
Programmatic Agricultural Subtotal	4.2	4.5	5.2	5.6	1.0	1.3	21.8
Programmatic Utility Systems Efficiency							
Programmatic Utility Self-Funded	-	0.5	0.1	0.1	-	0.3	1.0
Programmatic EEI Funded	0.1	0.1	0.2	0.2	0.0	0.2	0.9
Programmatic Utility Sys. Efficiency Subtotal	0.1	0.6	0.3	0.3	0.0	0.5	1.9
Programmatic Federal							
Programmatic Federal	1.1	5.0	1.1	1.4	6.6	1.1	16.3
Programmatic Federal Subtotal	1.1	5.0	1.1	1.4	6.6	1.1	16.3
NEEA and Momentum Savings							
NEEA Net Market Effects	3.6	3.7	4.8	5.0	5.7	6.0	28.8
NEEA Momentum	10.8	9.4	17.5	24.9	21.3	23.3	107.1
BPA Momentum	-1.3	-1.3	17.7	18.1	20.4	15.2	68.8
NEEA and Momentum Savings Subtotal	13.1	11.9	40.0	48.0	47.4	44.5	204.8
Total Savings	78.0	84.5	98.2	105.9	86.8	84.1	537.5
ALL EEI-Funded Programmatic Savings	51.7	42.7	40.6	34.6	35.3	32.1	237.0
ALL Self-Funded Programmatic Savings	13.3	29.9	17.6	23.3	4.0	7.5	95.7
All Programmatic Savings	64.9	72.6	58.2	57.9	39.4	39.6	332.7

Glossary

Average megawatt, or aMW	aMW refers to a unit of energy output over a year, equivalent to the energy produced by the continuous operation of one megawatt of capacity over a period of time. It is also an average of one million watts transferred over a period of time (often a year, thus average annual megawatts). One aMW is therefore equivalent to one megawatt produced continuously for 8,760 hours (the number of hours in a year) for a total of 8,760 megawatt-hours.
CO₂e	Carbon dioxide equivalent or CO ₂ e means the number of metric tons of CO ₂ emissions with the same global warming potential as one metric ton of another greenhouse gas.
Conservation	Conservation means any reduction in electric energy consumption resulting from an increase in the efficiency of electric energy use, production or distribution, the direct application of a renewable resource, or modifications in consumer behavior that decrease energy consumption.
Energy conservation measures, or ECM	Materials or equipment installed or activities implemented to produce electric energy savings. A specific action or installed device that saves energy. Also referred to as conservation measures.
First-year savings	BPA programs are reported in terms of the savings that occur in one year, although the cost effectiveness of measures is based on the expected life of the measures. Measures can last 10, 20 or more years. Therefore, total savings are calculated by multiplying the first-year savings by the measures' life.
HVAC	Heating, ventilation and air conditioning systems include furnaces, ducts, air control system filters, baffles, motors, vents, sensors and chillers. These systems present many efficiency improvement opportunities. HVAC systems are found in houses and industrial facilities, but the primary use of the term is associated with cooling, heating and venting of air within large commercial structures.
Low-Income Residential Weatherization (state-implemented)	This program mitigates the rising energy costs that make it difficult for low-income citizens to adequately heat and cool their homes. The program helps low-income earners use less energy, reduce their energy bills, and live in safer and more comfortable homes using BPA funding through state programs and partnerships with local community action agencies, like Community Action Partnership in Idaho. Low income means household income that is at or below 200 percent of the federal poverty level, unless a statewide eligibility definition is provided.

Market Transformation	The strategic process of intervening in a market to create lasting change in market behavior by removing identified barriers and/or exploiting opportunities to accelerate the adoption of all cost-effective energy efficiency as a matter of standard practice. Market transformation refers to a specific programmatic effort operated through NEEA that receives funding directly from BPA and additional funding from utilities.
Momentum Savings	Momentum Savings are energy savings that are cost effective, not directly paid for by utilities, not part of NEEA, Net Market Effects, and above the Northwest Power and Conservation Council's Power Plan baseline (Council baseline).
Multi Sector	Multi sector is a catchall term for savings that don't fit into a single sector.
NEEA Momentum Savings	Savings above the Power Plan baseline from naturally occurring market change without direct utility, NEEA, or BPA incentives.
Sector	Sector refers to a segment of a market, such as residential, commercial, industrial and agricultural end users. Each sector employs a different approach and program design specific to its contents.
System efficiencies	System efficiencies refer to improvements in transmission, distribution and transformers that save energy. Examples include lower-loss transformers (silicon core), reconductored distribution lines with higher voltage and conservation voltage reduction, which lowers the voltage on distribution lines and saves energy during low load time periods.
Utility	Utility refers to an electric utility that is either consumer-owned or investor-owned. A consumer-owned utility can be a municipal electric utility, a public utility district, an irrigation district, a cooperative, a mutual corporation or an association that is engaged in the business of distributing electricity to one or more retail electric customers.
Utility self-funded	Beginning in FY 2007 and continuing through today, utilities can choose to self-fund conservation and achieve credit towards the conservation adjustment as described in the Tiered Rates Methodology, which went into effect in FY 2012. To be eligible, conservation activities must meet the same requirements as BPA-funded activities.
Weatherization	Modifying a building's exterior to reduce energy consumption for heating or cooling. Weatherization measures include adding insulation, installing insulated windows and doors and air sealing.

B O N N E V I L L E P O W E R A D M I N I S T R A T I O N



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