ENERGY SMART
Reserved Power

Program Overview

What is Reserved Power?

The concept of reserved power was implemented in the Pacific Northwest region in the 1930s with the construction of the first hydroelectric facilities on the Columbia River and the signing of the Bonneville Project Act in 1937. Many Federal Irrigation Districts receive this reserve power. Hydroelectric facilities, BPA transmission substations, and some fish hatcheries receive their power directly from the Federal Columbia River Power System (FCRPS). These facilities have what is called station service, and they are not customers of a local utility.

BPA's Energy Smart Reserved Power (ESRP) program is designed to provide a financial incentive option for increased energy efficiency for these locations.

Path to Success

The ESRP program reaches out to a segment of the energy load that is often overlooked, with a focus to educate and assist these users in discovering and implementing energy and water-savings projects. Since 2012, BPA's ESRP allows reserved power and station service facilities the opportunity to update their electric equipment to generate energy savings.

One measurement of success of this program is reaching as many of the irrigation districts as possible, creating partnerships that lead to more efficient operations.

Delivering Value to the Northwest

Reserved Power is an area of energy use that is little known to the general public as its delivery is directly to the end user from the generation site—with no public or private utility serving the load. There is potential for energy and water savings within this segment. The entire region would experience the benefits of low-cost savings and retention of water in the river from projects initiated through ESRP.

Budget

ESRP currently manages an annual budget of approximately $2 million per year, which can generate 25M kWh of savings a year. Through a solicitation and ranking process, the projects with the greatest benefit to the region are given priority for funding. Any BPA-approved strategy or industry-proven measure will be considered as a possible measure. BPA is interested in assisting in the development of accepted project ideas.

Historic Savings

The FCRPS consists of 31 federal dams—of which 21 are owned and operated by the U.S. Army Corp of Engineers, and 10 by the U.S. Bureau of Reclamation. All of this power is distributed throughout the Pacific Northwest Region by BPA. The majority of BPA's regional load obligations is to provide power to its 146 utility customers, as represented in Chart 1 below.

The obligation to supply the Federal Reserved Power customers and Station Service with the energy to operate and maintain the FCRPS infrastructure including river navigation, recreation and fish enhancement is taken off the top. When these loads are met, BPA then fulfills its other load requirements, including retail sales.

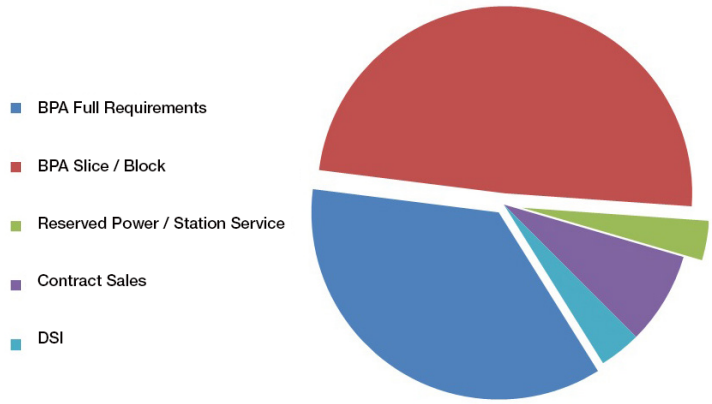

Chart 1: Breakdown of BPA load obligations

Measures

Canal Lining & Piping

Millions of gallons of water (up to 50% of the amount pumped) are lost each year through evaporation and canal seepage. Although some of the seepage provides recharge to local ground- and surface-water environments, much of the loss is considered a resource waste and carries with it the burden of unnecessary pumping load. By either lining an earthen canal with water-impermeable coverings or converting to a solid enclosed piping system, energy and water savings can be achieved.

The ESRP program is able to provide financial incentives to any Federal Reserved Power Irrigation District to perform relining upgrades to existing canals, and to convert existing open canals to closed piping delivery systems.

Please note: For a canal lining project to be eligible for an ESRP financial incentive, the project must be an upgrade to an existing system, not simply be the replacement of old or worn-out lining.

To be considered an energy-efficiency measure, the new elements must be an improvement on the existing system.

BPA can provide support for project development and maintenance of your system by assisting you in measuring water losses, and locating system leaks and faults in canals and piping. Additionally, BPA's engineering and technology staff can assist in helping to optimize the use of your funds to preserve the energy- and water-saving benefits.

Case Study 1: East Columbia Basin Irrigation District Canal Lining & Piping Upgrades

- ESBID submitted five separate canal and piping projects in 2013.
- Upgrades included relining failing open canals and conversion of open canals to closed pipe distributions systems.
- Savings for two of these projects: Moses Lake Project; 205,277 kWh/yr of pumping energy. Schedule A canal system; 625,810 kWh/yr of pumping energy.

Moses Lake project area of ECBID, water flowing into a newly installed underground piping distribution system conversion from open ditch.

After conversion to a closed pipe system. No longer exposed to air and evaporation losses or canal seepage and leakage losses.

Pumps, Motors, and VFDs

There are two major electrical components to an irrigation system: The motor to provide the rotational power and the pump to provide the flow. For maximum efficiency, these components must be sized and operated in a manner that matches the load requirement. Specifically for irrigation, it must move the right amount of water for the right amount of time. As equipment gets older and as system requirements change, the demand on the pumping system also needs to change. This may be done either by resizing and/or remanufacturing the existing equipment. However, this is sometimes not enough to provide best energy use.

Another way to improve the efficiency of a pumping system might be to install a variable frequency drive (VFD).

A VFD controls the rotational speed of an electric motor by regulating the frequency of the electrical power supplied to the motor. They are proven to substantially reduce energy use. Non-VFD motor-driven systems are often designed to handle peak loads. A VFD can slow down the motor to better match part load requirements. They can also reduce the impact of starting the motor (sometimes called hard-start impact).

Controlling motors with a variable frequency drive offers energy savings when motor-driven processes and power demand vary over time. Energy savings from variable frequency drives can be significant, although the amount of energy reduction will vary depending on the motor's operation and energy use. On a turbine pump, even a small reduction in motor speed can reduce a pump's energy use by as much as 30%. Payback can range from years to a few months.

On-Farm Irrigation System Improvements

If an irrigation district provides either pressurized water, or water and electricity, then irrigation hardware upgrades may apply. Depending on the system design and equipment inventory needs, there are several possible energy-efficiency upgrades available for consideration. This would include:

- New sprinkler nozzles, section and drain gasket.
- Goose necks, drop tubes, regulators, and sprinklers.

Other Building & Equipment Improvements

If there is a backup engine generator onsite, there is a block heater upgrade that is proven to provide a small amount of energy savings.

Other possibilities in electrically heated facilities could include:

- Insulation, window retrofit.
- Ductless heat pumps (or mini-splits) to replace electric resistance heating.
- Building HVAC and HVAC thermostats.
- Electric heat pump water heater upgrades.

The best way to determine if you may have a viable project is to contact the BPA ESRP team to discuss your situation and needs.

Lighting Upgrades

Lighting is one of the easiest and at times most cost-effective ways to initiate energy savings within any location. Lighting improvements are a great way to get started. With new technology now available, it may be time to reconsider if nothing has been done in the past 5 – 10 years. Some of the more common upgrades are:

- Replace exterior security lighting with LEDs.
- Replacing fixtures or lamps with LEDs.
- LED Exit lights.
- Replacing mercury vapor, metal halide, and other high-energy fixtures with LED fixtures.
- Motion detectors for occupied spaces.
- Timers for unoccupied spaces.

As with any possible project, contact the BPA ESRP team with questions.

Case Study 3: Chemawa Exterior Security LED Wall Packs

- BPA's Chemawa substation was in need of new lighting improvements.
- Proposed project was to replace 29 old High Pressure Sodium 400 watt security lights with 50 watt LED exterior wall pack units.
- Savings for this project: 56,794 kWh/yr.

Chemawa Substation Wall Packet: Note the difference between the one original light fixture on the left and the two upgraded fixtures on the right.

Case Study 2: Anderson Ranch Dam Lighting Upgrades

- Anderson Ranch Dam is a U.S. Bureau of Reclamation project located north of Mountain Home, Idaho.
- New energy-efficient lighting upgrades were installed in the power and control houses by U.S. Bureau of Reclamation staff.
- Fixtures included LED and high-efficiency T8 fluorescent.
- Staff has commented on how much better the lighting and working conditions are after upgrades.
- Savings for project: 54,235 kWh/yr.

Hollow Jet Galley before lighting.

Hollow Jet Gallery after installation of energy-efficiency fixtures.

Flow Control

Throughout the entire Pacific Northwest region is a complex system of irrigation canals and tributaries. The water that flows in these systems is either pumped from local rivers and reservoirs, pumped from ground water, or captured directly out of the river systems through diversion dams and weirs. Water is typically ordered by the end use irrigator and sufficient water is then provided by the area irrigation district. Being able to accurately measure and control the amount of water that flows down these lines has the potential of saving millions of gallons of water each year and as a result reducing the pumping load necessary to provide the needed water supply. Any water that can be left in the river system is water that can be used for other purposes.

There have been many techniques for controlling the flow of water down irrigation canals. Some of these methods are basic and require hundreds of labor hours to monitor and control. As a result, controlling volume and timing of water may not be as efficient as it could and should be.

An ideal method of flow control would be to use automated flow gates with real-time metering. When integrated into active canal systems, irrigators from around the world are finding water savings of up to 60% using this technology.

Case Study 4: South Columbia Basin Irrigation District Upgrade to Rubicon SlipMeter Flood Gates

- Historic control of water flow from a main canal system has been with manual wheel gate controls where a District Water master would physically go onsite and turn a wheel to open or close a flow gate.
- Regulation of the amount of water was by guessing or what is called ‘sticking’ a ditch to estimate the amount of water that is released.
- With an automated flow meter system like the Rubicon SlipMeter, this process is greatly simplified and managed. The SlipMeter is not only a control gate but also a flow meter that measures the exact amount of water passing through.
- With automated flow control, District staff can enter into a computer the amount of water to be released and the SlipMeter will adjust without having to go to the site.
- Savings for this project: Estimated at 989,914 kWh/yr of pumping energy and 1,933 acre feet of saved water.

Original manually operated flood gate. Operation had to be made on site by District personnel.

Newly installed Rubicon SlipMeter flood gate. Solar powered and remotely operated. The unit is capable of not only regulating the amount of water released, but monitoring the exact flow rate through the system so adjustments can be made at any time necessary.

General Program Policies

The ESRP program provides an opportunity where irrigation districts, hydroelectric facilities, transmission substations, and fish hatcheries that receive reserved power from the FCRPS or station service may receive BPA financial incentives for increased energy-efficiency projects. Qualified facilities must receive their power directly from the system and not a local utility.

The ESRP budget is limited each year. The application process for ESRP financial incentives is competitive, intended to obtain the greatest electric savings with the available funds. Eligible projects include energy-saving measures such as efficient pumps, variable speed drives, canal lining, and more. Projects which also provide water savings for the FCRPS are given some preference. The ESRP application identifies maximum incentive rates for different project types. Applicants are encouraged to request less if the full amount is not needed. Projects with lower incentive rates are more competitive and allow the ESRP program to support more projects with the available funds.

All applications received will be reviewed, evaluated, ranked, and selected for award based on best incentive/kWh and benefit/cost-ratio to BPA as funds are available.

This competitive application period will be followed by an open season for applications as funds remain available.

Table 1: General Timeline for ESRP

Action	Time Frame	Duration
Request for Applications	Spring	8 Weeks
Review/ranking/selection	Aug.	2 Weeks
Announcement of Projects	Sept.	2 Weeks
Develop Agreements	Sept./Oct.	4 Weeks
Project Implementation Open Season	Remainder of FY	N/A

Applications from the open season will be ranked based on the incentive/kWh requested and will be awarded based on eligibility, available funds and the likelihood of project completion during the required timeframe.

ESRP Agreements are structured to match BPA's funding cycles. The energy savings from completed projects support the achievement of BPA's agency savings targets for the fiscal year in which they were funded. Projects may be designed to be completed in phases allowing partial payments for each phase as it meets the Measurement and Verification (M&V) Plan requirements. In special situations, agreements may be designed to span fiscal years.

Applications must be submitted prior to beginning a project, including ordering parts. Eligible project costs may include in house labor, contracted labor and services, materials and studies or design services necessary to develop the project. Exclude the cost of on-hand materials used in the project. Applicants are encouraged to seek and include funding from other agencies and programs to supplement BPA's funding; however, the combined funding cannot exceed 100 percent of project cost.

BPA realizes there may be projects undertaken without its financial support. The savings for these projects can still be counted toward regional energy-efficiency goals. Please inform BPA of those projects as soon as possible.

An example of a self-funded or co-funded project would be a BPA-qualified measure implemented with the assistance of a WaterSmart grant. This can be accomplished by:

1.Submitting an application without an incentive request from BPA to determine if any of the proposed measures meet BPA requirements.

2. Develop an M&V Plan to be performed when the project's completed to verify the savings. BPA can provide assistance to develop projects and program applications.

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Collaboration and Target Market

BPA continues to strategically expand its partnerships with irrigation districts and other agencies to identify opportunities to partner with financial and technical assistance. Many irrigation districts have limited funding and staff time.

Eligible Organizations

Federally Chartered Irrigation Districts

Bureau of Reclamation Hydro Facilities

Corps of Engineers Hydro Facilities

Federal Fish Hatcheries

BPA Facilities/Transmission Services

Contacts

Federal Sector Team Lead: David Lee
503-230-4349 djlee@bpa.gov

ESRP Acting Program Manager: Michelle Lopez
503-230-4352 esrp@bpa.gov

Technical and Field Engineers:

Tom Osborn, Pasco
509-527-6211 trosborn@bpa.gov

Dick Stroh, Idaho Falls
208-612-3154 dcstroh@bpa.gov

ESRP Website: https://www.bpa.gov/EE/Sectors/federal/Pages/Energy-Smart-Reserved-Power.aspx

General Questions: esrp@bpa.gov

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