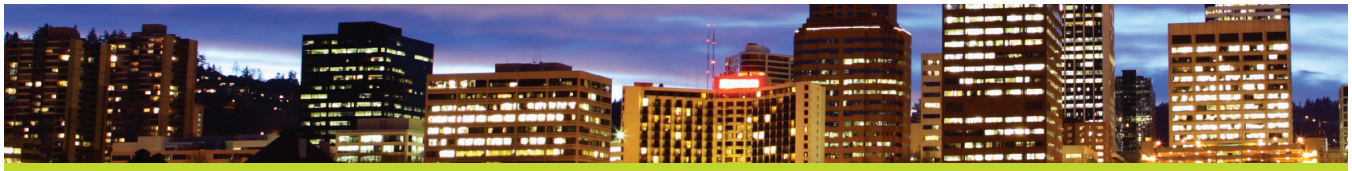


Fact Sheet

June 2013

BPA transmission: moving the power of the Northwest

Behind your light switch lies an engineering marvel that helps power the Northwest. BPA's transmission system contains more than 15,000 miles of high voltage line, enough to stretch over halfway around the Earth.

The Bonneville Power Administration's transmission lines help deliver the Northwest's power to your door. Throughout the region, BPA operates over 15,000 circuit miles of high voltage lines. That's about 75 percent of the high voltage grid in the Northwest.

But how does it all work, and how does the energy get from a dam in eastern Washington to a light bulb in Portland or Seattle?

First, let's make a distinction between BPA's transmission system and the distribution systems operated by your local utility. The high voltage transmission system — typified by the tall steel towers seen crossing the countryside — moves large amounts of electrical power from power stations to cities. Think of them as the interstate highway system. There are fewer places to get on, but they can carry lots of cars long distances.

This interconnected web of paths for electricity is punctuated with substations. They serve different purposes, but they all help get power where it needs to go.

Some substations serve as collectors to gather the output of a dam, fleet of wind generators or other source of power, and change its energy to match that of the transmission system. Others decrease the voltage for transfer to the lower capacity distribution systems in

Like a highway interchange for electrons, substations route electricity to the right place and help keep it moving to the consumer.

neighborhoods. Still others serve as traffic cops, ensuring energy moves to a specific line using giant switches or other technology; boosting power to keep it flowing over long distances; or protecting equipment and communities from a power overload with king-sized circuit breakers. Many substations serve several of these purposes simultaneously.

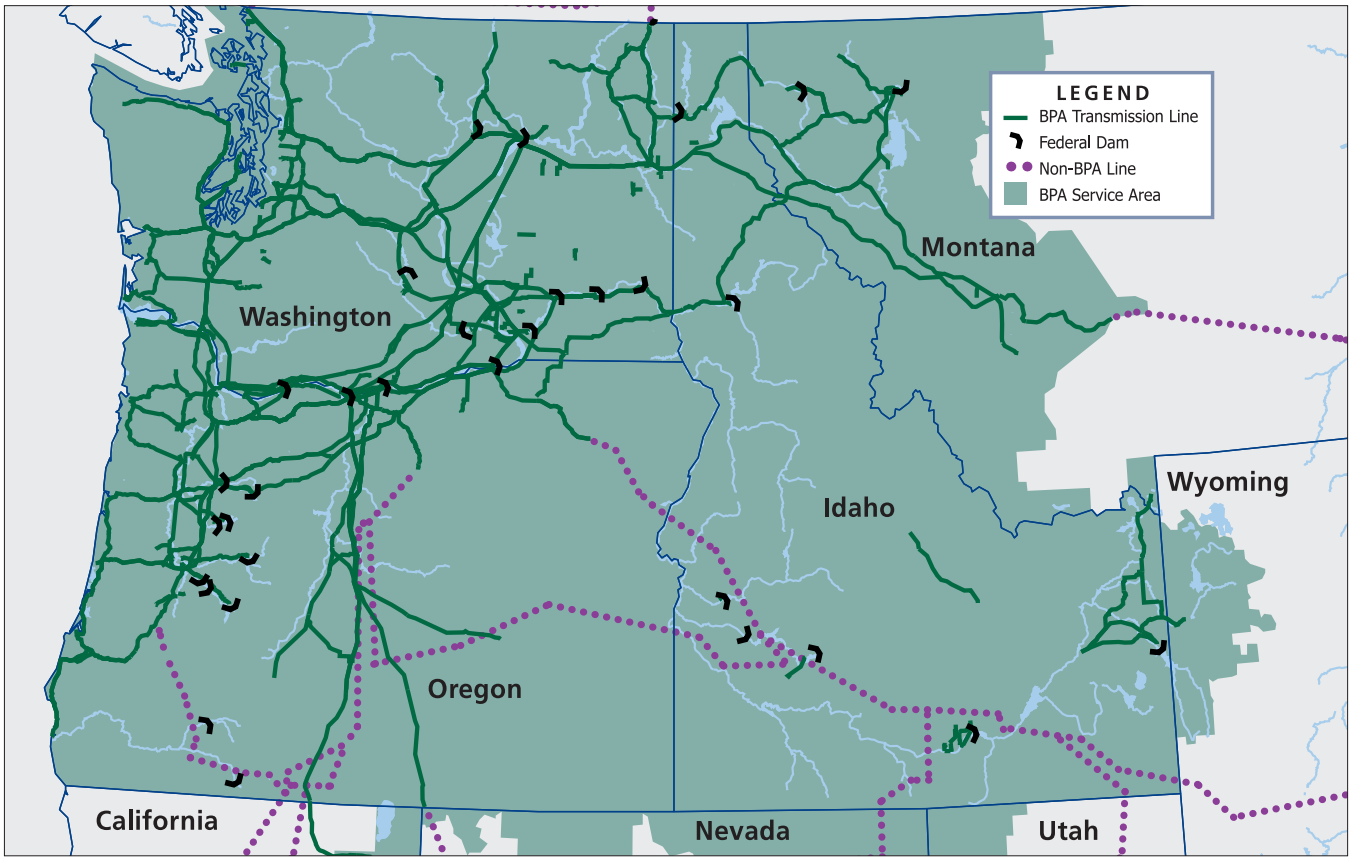
But more importantly for the consumer, substations act as the interchanges and on- or off-ramps to the network of wooden poles and wires — the distribution systems mentioned above — which are in every neighborhood delivering power to homes and businesses. BPA does not build or operate distribution systems, but these are analogous to local roads and even the driveway up to your house. The voltage is just right to light your home as power delivered from the massive transmission system is transformed, or "stepped down," to lower voltages for neighborhood service.

Network and Intertie

BPA's transmission system can be broadly divided into two types, network and intertie. Network refers to the central core of BPA's transmission grid — the linkage crisscrossing the Northwest between the major population centers in BPA's service area. Intertie lines branch off from the core of the transmission system and move power between BPA's network and other regions such as Southern California, Canada and Montana.

BPA's network transmission grid came about because the agency's early engineers recognized the need to both link the federal dams with each other to allow coordinated power operations and to connect the dams to the region's three major cities: Portland, Seattle and Spokane. The lines between the dams and the centers of electrical demand, or "load," also provided access points for the connection of rural utilities lying between generating infrastructure and population centers.

BPA Transmission System



BPA owns about 75 percent of the high-voltage transmission system in the Northwest.

BPA's first administrator, J.D. Ross, proposed a transmission grid master plan to reliably interconnect federal generators and loads in the region. The footprint of that early transmission grid will look familiar to anyone who has seen a current map of the BPA transmission system. The ingenuity of the master plan lies in a loop design that provides alternate paths between the dams and load centers, or redundancy, should one section of the transmission system experience an outage.

The interties linking BPA's network to diverse regions throughout the West allowed the Northwest to establish mutually beneficial energy transactions with Southern California through the Pacific Direct Current and California-Oregon interties. Historically, the Southwest needed the most power in the summer for cooling, while demand in the Northwest peaked during the winter heating season. The Northern Intertie connecting to Canada is critical to moving power under the Columbia River Treaty, and the Montana Intertie allows nearly 2,000 megawatts of power to move from sparsely populated Montana to the urban centers of the Northwest.

How it works: business vs. physics

The available capacity, the space for energy, on a transmission path — or line — and the energy itself are two separate products in the utility world. BPA has two distinct business divisions to manage these services. These functions are physically separate, with Transmission Services primarily operating from Vancouver, Wash., while Power Services is based in BPA headquarters in Portland, Ore.

Transmission is "scheduled," as is the energy that will flow on the grid based on power contracts that utility customers have with BPA. Scheduling helps maintain the constant balance between supply and demand that is the foundation of an electrical system, and helps maintain reliable and efficient system operation.

Scheduling takes place in steps and can start more than a day before a specific transaction is slated to occur, leading up to the within-the-hour management of the system. The teams responsible for this work help ensure business transactions take place as planned and that electricity purchased by a customer has adequate space to move across BPA's high voltage transmission system.

That's the business side of contract implementation. There is another group of dedicated professionals within Transmission Services keeping their eyes on the system itself, dispatchers.

Dispatchers are the air traffic controllers of the utility industry. These experts, who staff their positions day and night, holidays and weekends, are responsible for ensuring that the energy produced by power stations matches both the demand for electricity and the room available on the transmission lines and related equipment.

Electricity travels at the speed of light, so computers maintain the delicate system balance from second to second, but the work of a dispatcher is nevertheless a hands-on experience. And their expertise is used to continually balance the system. As an example, a storm knocking down transmission lines or large generators tripping offline unexpectedly mean dispatchers spring into action to re-establish order on the system to maintain safety and reliability.

In such an emergency, they are followed closely by the teams responsible for transmission and power scheduling mentioned above, who work to keep sellers and purchasers connected to each other.

A crew bolts together a new 500-kilovolt transmission tower.

Keeping pace with changing needs

As the region's population grows, load forecasters and transmission planners keep an eye on the future to ensure that BPA's transmission system is the right size at the right time.

Planning engineers make certain that the existing transmission lines and equipment are fully capable of delivering the power needed today, as well as preparing for the years ahead. Armed with estimates of the future demand for electricity, they map out transmission system improvements that will keep the energy flowing where it's needed in the years to come. It's important to note that many others work hard to ensure the transmission grid runs smoothly. As just two examples, line crews inspect and maintain the equipment while vegetation management specialists work to prevent trees from interfering with the lines and causing outages.

The need for additions and changes to the transmission grid doesn't start solely with internal studies on electrical demand for a growing population. Requests for service by BPA's transmission customers may create the need for new equipment and wires. The agency has developed a new way to bundle and organize these requests in a way that benefits BPA's transmission customers and ratepayers.

Starting in 2008, BPA offered a new process called Network Open Season to better manage requests for long-term transmission service and plan for expansion. This innovative approach to managing transmission requests has yielded significant benefits for BPA and its customers. Three years of experience in using the NOS model has also given BPA and NOS participants the chance to learn how to improve this pioneering policy.

To address some unintended financial consequences of NOS as originally conceived, BPA paused the program in 2011. This interval allowed the agency, working with regional partners, to evaluate alternatives to overcome these challenges. BPA has refined and improved the process to more effectively serve the region and began offering this refined approach to analyzing transmission construction requests again in 2013.

From instantaneous emergency actions to avert a crisis to long term plans to expand the transmission system — all this happens behind the scenes to ensure that when you get home after a day at work, open the door and slide your hand up the wall to the switch, the lights come on in the blink of an eye — today and tomorrow.