



Fiber Optic Partnerships Feasibility Assessment Plan

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**Western
Area Power
Administration**



Western Area Power Administration: Fiber Optic Partnerships Feasibility Assessment

In its effort to deliver power in a reliable, resilient, and secure manner, the Western Area Power Administration (WAPA) must maintain robust transmission system communications, and at the core of this effort is fiber optics. During the past 20 years, WAPA has installed approximately 5,000 miles of overhead fiber optic ground wire (OPGW) on its transmission system. As part of prudent business practice, WAPA is engaging in the following activities:

- Inventory OPGW assets
- Review best practices for operation and maintenance of shared OPGW facilities
- Reviewing policies concerning fiber sharing agreements and identify key authorities

WAPA has also strategically entered into fiber sharing partnerships with neighboring electric utilities when doing so has made good business sense and promoted operational effectiveness. Success with such partnerships has brought further initiatives. A number of existing power customers and others now seek partnering agreements to access WAPA's fiber system to improve utility communications and broadband service.

As part of the American Broadband Initiative, WAPA is conducting a feasibility assessment to review its fiber optic facilities and existing partnerships and agreements. This assessment will address WAPA's future need for fiber capacity, maintenance of fiber infrastructure, and potential opportunities and issues of expanded participation in fiber sharing agreements. WAPA plans to deliver the completed assessment to the Department of Energy (DOE) in December 2019.

Introduction to WAPA

Congress established WAPA under Section 302 of the Department of Energy Organization Act (December 21, 1977). As stipulated in this act, WAPA assumed responsibilities from the Department of Interior's Bureau of Reclamation (BOR), U.S. Army Corps of Engineers and the International Boundary and Waters Commission that included power marketing and ownership of the transmission system. While WAPA's responsibilities extend to operation and maintenance of the transmission system, BOR, the Corps and IBWC remain responsible for irrigation, meeting water needs of municipalities, and constructing, operating, and maintaining dams and power plants.

WAPA is one of four power marketing administrations (PMAs) within the DOE that markets and transmits wholesale federal hydropower. WAPA's service territory encompasses a 15-state area of the central and western US. This territory is divided into four regions and a management center, and its headquarters is located in Lakewood, Colorado. The integrated high voltage transmission network through which WAPA delivers power extends for over 17,000 circuit miles.

In its capacity as a PMA, WAPA engages in three lines of business to benefit the American public:

- Marketing and transmitting wholesale hydroelectric power from 15 multiuse water projects
- Providing a backbone transmission system for delivering hydroelectric power
- Managing the Transmission Infrastructure Program (TIP)

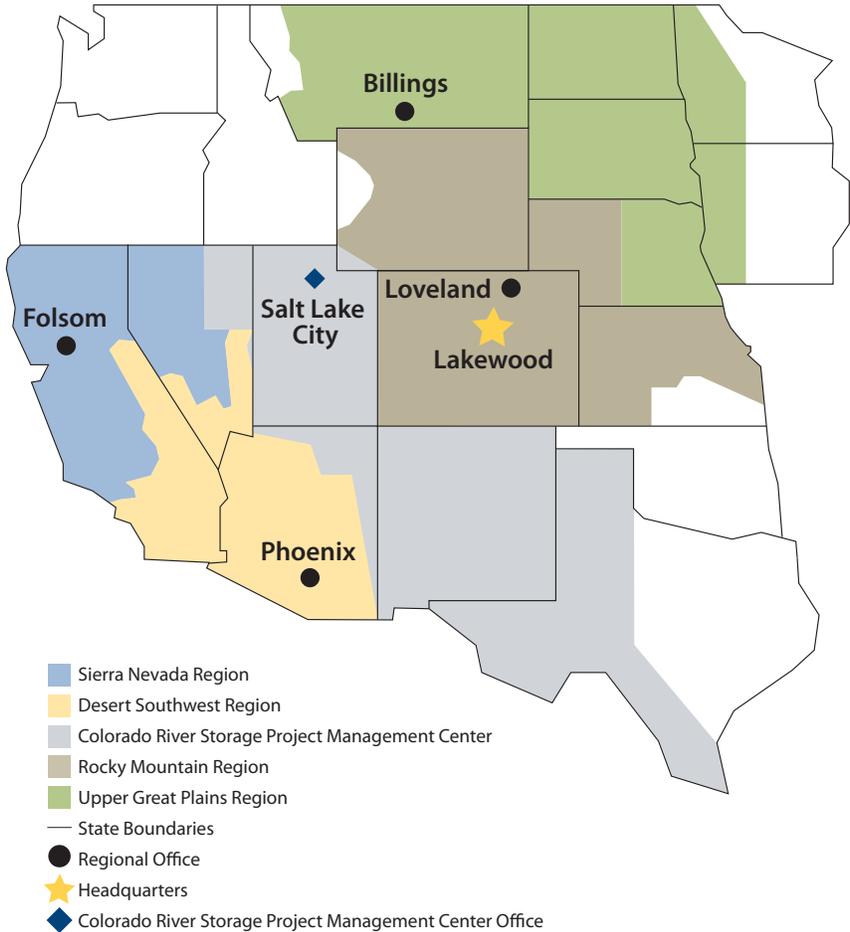
WAPA sells power to more than 680 wholesale customers, among whom are the following customers:

- Federal and state agencies
- Cities and towns
- Rural electric cooperatives
- Public utility districts
- Irrigation districts
- Native American tribes
- Investor owned utilities

These and other WAPA customers distribute electricity and provide electric services to more than 40 million Americans.

WAPA delivers power from projects that encompass both WAPA's transmission facilities and the hydropower generating facilities. Power rates are set to recover all costs associated with power delivery, such as annual operating costs, the specific allocated multipurpose costs associated with recovering the federal investment in the generation facilities, with interest, and other costs assigned to power for repayment.

Figure 1
WAPA Regions and Projects



An Overview of WAPA's Fiber Facilities

The topics that follow provide a general, non-technical view of some of the key ideas and technologies associated with WAPA's initiatives involving fiber optics.

Optical Cable Basics

WAPA's fiber optic network is constructed from fiber optical ground wire (OPGW). This is a type of cable commonly used in overhead power lines because it is strong and versatile. OPGW combines the functions of grounding, lightning protection, and fiber optic communication pathways. As is shown in Figure 2, OPGW typically contains optical fibers inside a metal tube structure surrounded by layers of high strength steel and aluminum wire.

The OPGW cable runs at the top of high-voltage transmission line towers and serves to bond adjacent towers together (see Figure 3). On a more technical level, an OPGW can provide a way to augment grounding of the towers, and it can shield high-voltage conductors from lightning strikes.

Figure 2
OPGW Composition

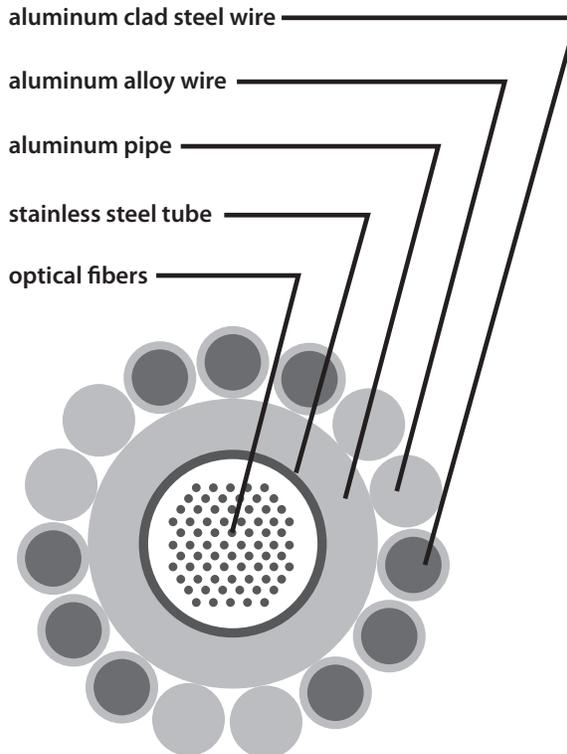


Figure 3
Photo depicting OPGW atop a transmission tower.



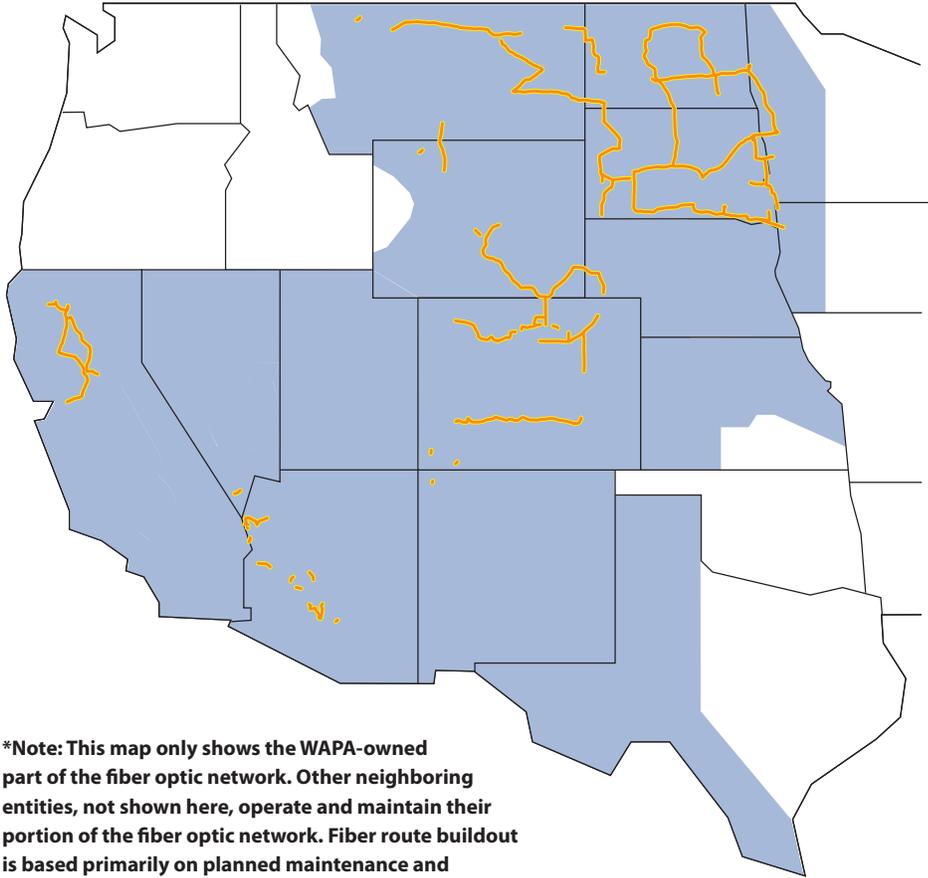
Overview of WAPA Fiber Network

In the past, WAPA primarily relied on its microwave system to meet its telecommunications requirements. Over the past 20 years, however, as the need for bandwidth has increased for data transport for system monitoring, control, remote access, and observation, WAPA has started to migrate to a hybrid microwave-and-fiber system. The hybrid system delivers significantly higher capacity and speed. The migration effort involves installing fiber over the existing transmission backbone as part of routine maintenance programs for upgrading and improving telecommunications capabilities.

As is shown in Figure 4, the WAPA fiber infrastructure consists of approximately 5,000 miles of installed OPGW located in many segments of WAPA's 15-state service territory. This is approximately a third of WAPA's total line mileage. The primary function of the fiber infrastructure is to support operation and maintenance of WAPA's electrical system and the day-to-day functions of the organization.

WAPA's fiber optic and microwave systems intersect communication systems of neighboring utilities, introducing a number of opportunities for enhancing services and capabilities. Where WAPA has identified intersections, overlaps, and gaps, it is in an excellent position to continue to propose partnering with neighboring utilities. In all such instances, WAPA enters into arrangements for communication sharing to save costs and achieve higher reliability of service.

Figure 4
WAPA-Owned Fiber Optic Lines



***Note: This map only shows the WAPA-owned part of the fiber optic network. Other neighboring entities, not shown here, operate and maintain their portion of the fiber optic network. Fiber route buildout is based primarily on planned maintenance and replacements to minimize cost.**

Dark Fiber

Fiber strands are generally identified by pairs. In a pair, the two fiber strands work together as a “to” and “from” communication path and are generally referred to as a pair when evaluating fiber availability. Dark fiber refers to unlit fiber in the OPGW bundle of fibers. WAPA’s strategic fiber allocation plan is based on each system’s data needs, system design, usage, configuration, sharing opportunities, network expansion, and other operational arrangements. WAPA’s dark fiber pairs varies with each of WAPA’s five regions and by the individual communication system. In general, WAPA’s dark fiber configurations are based on WAPA’s strategic fiber allocation plan that includes back-up reliability and WAPA future planned system communication use.

Communication Systems Costs and WAPA Project Revenue Requirements

WAPA’s rates are developed specific to power projects. Rates are set to ensure repayment of federal investment in hydropower facilities, associated transmission lines, and associated irrigation projects—as authorized by the various water control and storage projects. The beneficiaries of a particular project, such as power, transmission and other related services customers, pay for the project through their power and transmission rates. WAPA must maintain appropriate controls for accounting, repayment, and cost allocation. To ensure that beneficiaries share in costs, WAPA treats each project in which it participates separately and distinctly.

WAPA’s communication facilities are an essential part of WAPA’s ability to deliver power. WAPA works in close coordination with its customers on a project-by-project basis to ensure communication investments and related maintenance are appropriately supported within the power rates.

Lands and Right of Way

WAPA has land rights that date back to the Department of Interior’s original electrification of the West. Referred to as Rights of Way (ROWs), WAPA land rights extend across private and public lands, typically in rural areas. A single transmission line in WAPA’s 17,000 circuit-mile system may cross dozens of different properties. Among these are public lands managed by federal entities; the leading entities in this respect are the following:

- Bureau of Land Management (BLM)
- US Forest Service (USFS)
- National Park Service (NPS)
- Bureau of Indian Affairs (BIA)

In addition to complexities involving relations with different land owners or managers, the language in the WAPA’s ROW agreements varies, ranging from simply the right to “construct, operate, and maintain” an electric transmission line, to more recent language, which includes the right to “attach appurtenances for communication purposes.” Because of the complexity of WAPA’s land rights, WAPA realty experts must understand and manage a wide range of ROW agreements. As front-line representatives of WAPA, they coordinate agreements with landowners such as farmers, ranchers, and federal land agencies, and they handle notification of maintenance activities requiring access to WAPA ROW. In still one other area of activity, WAPA management specialists support environmental review of federal actions and undertakings. A federal action associated with communications funding, permitting, installation, and construction is subject to review under the National Environmental Policy Act and other environmental laws, regulations, and executive orders.

WAPA Fiber Optic Partnerships Feasibility Assessment Plan

To ensure that routine, planned fiber optic additions and future fiber sharing partnerships will continue to promote WAPA's ability to deliver federal hydropower to its customers, WAPA is assessing its fiber optic capabilities. This feasibility assessment will identify opportunities and issues related to fiber optic partnerships.

Approach

Through the course of this analysis, WAPA will seek to outline remedies for any identified barriers to future fiber sharing partnerships. Remedies will be identified for future discussion and consideration. WAPA will seek input from its customers on future arrangements for fiber sharing partnerships. WAPA will take this input into consideration as it prepares the final version of the assessment.

The following list provides WAPA's initial review of operational and policy topics and is not intended to be comprehensive:

- **Fiber asset inventory:** WAPA will conduct a comprehensive inventory of WAPA's fiber routes and the fiber allocations on those routes. It will identify factors that may impact current and planned communication replacements and routine communication maintenance. It will also address the estimated 40-year lifecycle of existing fiber maintenance and replacement that affect power and transmission customers.
- **Fiber partnership types:** WAPA will inventory its current and past fiber partnership agreements and fiber partnership requests. The assessment will categorize these partnerships by the type of service request and the identity of counterparty entities. Among service request areas are exchanging fiber pairs and possible future leasing of fiber pairs. Among the entities included are utility districts, municipalities, utility cooperatives, Native American tribes, federal agencies, and possible broadband service providers. WAPA will survey these agreements for commonalities and best practices.
- **Outage policies and governance:** WAPA will review how its current practices and policies address planned and unplanned fiber outages and restoration of service. Additional operational issues—such as planned and unplanned outage coordination and prioritization—will be considered.
- **Opportunities and risks:** WAPA will identify benefits and risks associated with expanded fiber partnership agreements, including impact to grid resiliency and power delivery obligations. Physical security, cyber security requirements and risks related to access to WAPA facilities will also be reviewed.
- **Legal authority:** WAPA will identify authorities that need to be addressed in future fiber partnerships.
- **Cost recovery:** WAPA's accounting processes and controls will ensure that costs and revenues associated with fiber partnerships will be properly allocated.

- **Land-related agreements:** WAPA will identify concerns related to lands that must be addressed in future fiber partnerships. ROW, easements, NEPA review, and related lands issues will be included in the assessment.
- **Compliance requirements:** WAPA will identify electric reliability compliance issues associated with current and future fiber partnerships.

This list provides the major areas for further research and investigation identified during our initial planning sessions. As we conduct further research and review, new areas may be identified and will be addressed in the final feasibility assessment.

Customer Outreach

As a federal power marketing agency, WAPA operates to serve its customers. WAPA manages its many requirements as a federal entity in concert with the needs of its many stakeholders to provide reliable, cost-based hydropower to customers who, in turn, serve millions of Americans. Therefore, as with any large initiative, WAPA has developed an outreach plan to gain customer insight as the feasibility assessment is conducted. This plan includes a variety of forums that will allow customers to ask questions, identify issues, and voice concerns. These will range from in-person meetings across the regions to conference calls. Input will be used to inform the final feasibility assessment. The input will be carefully considered and the level of interest voiced for fiber optic partnerships will help to shape the direction of WAPA's future plans.

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