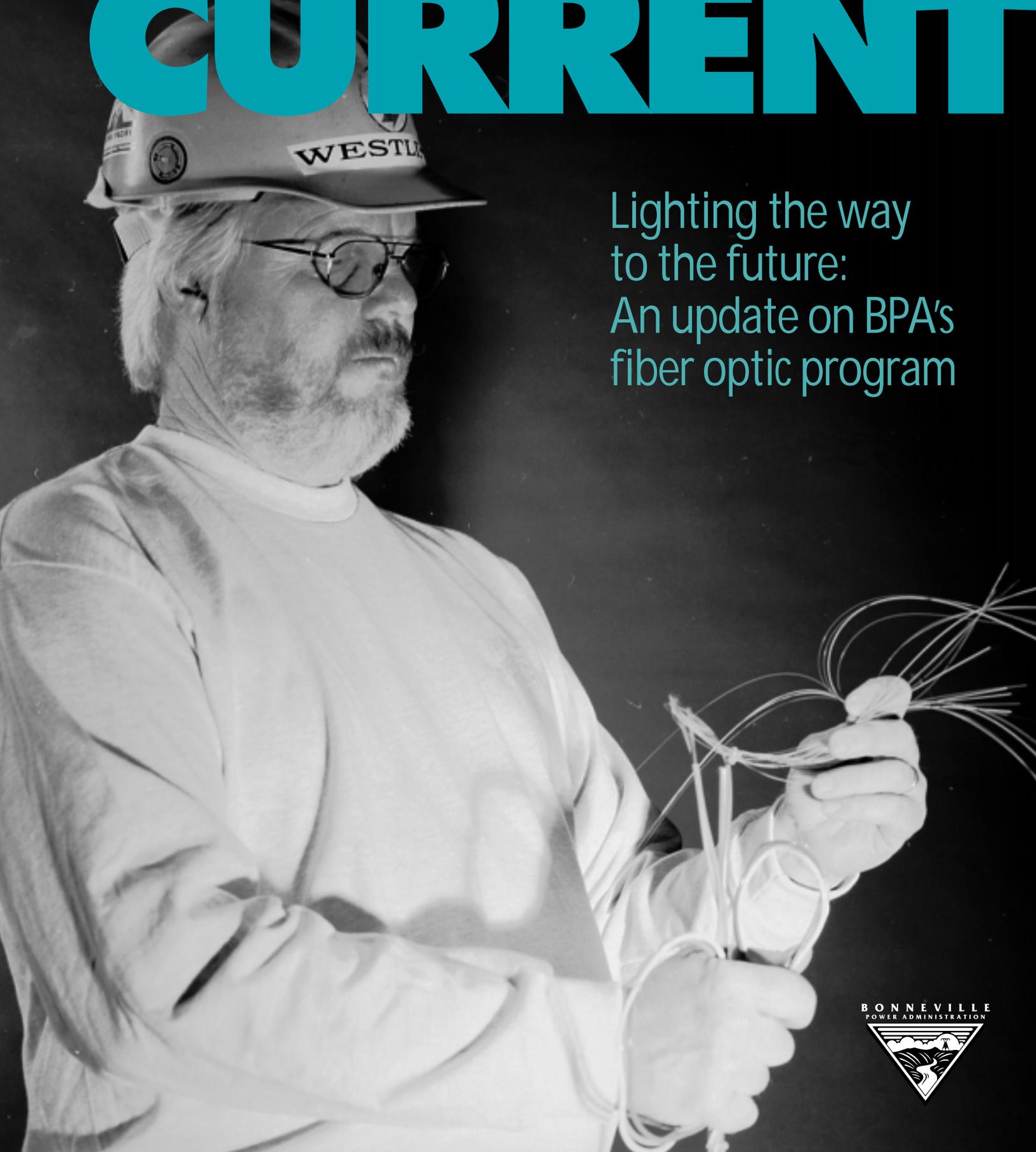


A PUBLICATION OF THE BONNEVILLE POWER ADMINISTRATION

keeping

CURRENT

November 2000



Lighting the way
to the future:
An update on BPA's
fiber optic program



The Bonneville Power Administration's transmission grid is recognized worldwide for its size, quality and reliability. To operate the grid and meet high reliability standards, BPA relies on an intricate telecommunications system. Since 1994, BPA has been upgrading this system to a fiber optic cable telecommunication system to ensure the safe and reliable operation of the transmission grid into the future. By the end of 2000, BPA estimates that 98 percent of the installed cable routes will carry BPA data. And, within

10 years BPA will be using nearly 30 percent of the total number of fibers installed today.

As part of its budget review process, Congress requested that all federal power marketing agencies submit a report on their plans to use fiber optic cable for telecommunications. BPA submitted its report in May 2000.

Elements of the Congressional report

- A high-speed fiber optic communication system is needed for the safe and reliable operation of the transmission grid.
- The fiber optic program's strategy is to upgrade the system to meet present and future needs, without burdening ratepayers with the entire cost.
- To offset some of the installation costs, BPA is leasing to others some of its temporarily excess fiber.
- Through its public benefits program, BPA has the opportunity to provide affordable interconnection to rural communities that have limited or no present high-speed telecommunications capacity.
- BPA will encourage third-party or joint ownership through limited competition for new fiber optic projects in cases where it meets the agency's reliability and safety requirements as expressed in the pole attachment criteria and when it is the least-cost alternative. However, in order to ensure the security, reliability and adequacy of the BPA transmission grid, BPA will maintain the fiber network.



BPA is upgrading its telecommunications system to a fiber optics system to ensure the safe and reliable operation of the transmission grid into the future.

Background

BPA has installed about 2,000 miles of fiber optic cable with an expected life of 40 years. In the past the agency has used radio frequency carrier signals imposed on the transmission lines and, more recently, analog microwave radios for its communications. The analog radio system was highly reliable and worked well. However, the 1960s analog technology is now obsolete.

Simultaneously, there is a growing need to transmit more data and at higher speeds. The analog microwave system doesn't work well with high-speed data, transmitting data at about 9.5 kilobits (kbs) per second. Compare that to a typical home computer modem that transmits at 28.8 or 57 kbs.

In addition, fiber optics may form the backbone of the Regional Transmission Organization's communication system. Fiber can control and integrate the information from many utility members into a control center operated by the RTO.

Building for today and the future

It makes good business sense to build for future needs. That's what the Northwest found when BPA started building the transmission grid 60 years ago. When the first loops of the grid were built, the agency did not have them fully subscribed, but saw the capacity would be needed in the future. That prediction proved to be true. Likewise, because BPA anticipates increased data traffic in the future, it estimates it will need in the neighborhood of 72 strands of fiber — more capacity than is presently needed. The numbers of

fibers in a particular route may be less than this number for some applications (perhaps some radial lines) or more than 72 fibers (a heavily loaded backbone route with high communication demands). In the next 10 years, BPA estimates it will need 12 fibers for operational purposes and 64 fibers within the next 20 years. Estimates indicate that by 2025, BPA will need 76 fibers. The numbers of fibers needed for operational purposes is expected to increase beyond this number on certain routes.

So far BPA has installed fiber cable on eleven projects on its existing transmission towers and rights-of-way. The incremental cost of materials associated with installing a fiber optic cable larger than is presently needed is small compared to what additional construction costs of repeated installations or later retrofits would cost.

BPA is not a telecommunications company. Because of this, it has a different philosophy about how to use fiber. Transmission system reliability is the agency's number one concern, so it doesn't want to consume all of its fiber capacity. For reliability purposes BPA holds back up fibers in reserve. If fibers in use do go out for some reason, the system will still function because data can be moved to other fibers.

As the need for more data increases, BPA will have the fiber capacity it needs. Fiber may even enable the grid to operate differently from today. For example, the agency may be able to install video cameras in substations and do real-time spot checks on security systems. Reading meters and diagnostic equipment remotely will be a possibility. Using monitoring equipment throughout the 15,000-mile federal transmission grid will more carefully assess available transmission capacity as demand for capacity grows.

Leasing temporary excess fiber offsets costs

Until the agency needs the additional fiber, it is temporarily leasing excess "dark" fiber strands to others. Revenues help offset the installation costs that would have factored into the rates BPA charges its customers. Lease agreements range from five to 25 years.

Why BPA has the fiber program

BPA's first priority is to operate and maintain the transmission grid. Secondly, it must ensure it meets future needs of the region. The fiber optics program is part of both of these. The program's goal is to upgrade BPA's existing telecommunications technology to enhance the safety and reliability of the transmission grid. At the same time it will generate revenue to offset installation costs by temporarily leasing excess dark fiber to others. In addition, the program could assist



BPA uses fiber optics to monitor, control and instantly correct problems on the transmission grid.

Pacific Northwest communities in obtaining or increasing access to fiber-optic technology.

In fiscal year 1999, the agency received \$3.7 million in lease revenues and anticipates \$10.5 million in fiscal year 2000 and \$16.5 million by 2003. In addition, BPA has received terminal equipment, new wood poles and access roads worth \$17 million through various agreements with other participants over the last five years.

Third-party participation conclusions

As stated in its May 2000 fiber optic report to Congress, BPA will continue to encourage third party or joint ownership of fiber optic cable through limited competition for new fiber optic projects, where such ownership meets BPA's pole attachment criteria and is the least-cost alternative.

BPA received input from interested parties during August 2000 to explore opportunities for third party or joint ownership of fiber optic cable on BPA rights-of-way. While parties in general, and parties specifically interested in temporary surplus BPA dark fiber capacity, have shown very limited interest in pursuing third party or joint ownership options with BPA, BPA will continue

to retain and encourage the option within its existing legal authorities, permits and easements, and electric reliability-based maintenance practices. BPA will assist requesting third parties to obtain BPA transmission easement information. BPA will also work with parties interested in pursuing third party or joint ownership of fiber optic cable on the approximately 5 percent portion of BPA's transmission system where BPA has significant fee ownership of a transmission route. BPA's pole attachment policy is being revised and one revision will allow for potential third party ownership of fiber optic cable as described above. That policy covers issues beyond fiber optic cable attachment and will be published for public comment before being finalized.

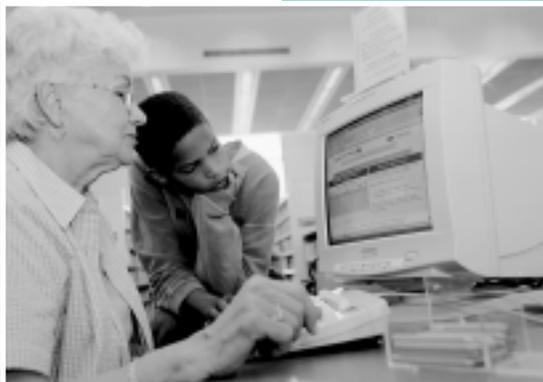
Rural communities may benefit, too

Telecommunication companies have focused on offering advanced telecommunication services in urban areas because of their high population densities. But, this has left rural communities lagging in the technology race.

Because the federal transmission grid is widespread, BPA's fiber optic cable may be near many rural communities that otherwise could not obtain access. The proximity of BPA's fiber network should reduce the cost of extending fiber to rural areas and assist in making broadband access available at end-user rates roughly comparable to those in metropolitan areas.

This availability of access could provide enhanced telecommunication services to rural hospitals, schools, libraries and government agencies. It also could enhance a rural community's economic development activities, making it easier for the community to retain existing and attract new businesses.

Although BPA has fiber highways that reach the rural communities, someone else will have to light the fiber and provide the interconnection between BPA and the home or business. BPA will work with both telecommunication service providers as well as non-profit organizations to make these connections. BPA already has such an agreement in place with Northwest Open Access Network.



BPA's fiber network may benefit rural schools, libraries, hospitals and government agencies.

Making fiber operational

Installing BPA's fiber optic system is a time consuming task. First engineers must design the system. Then technicians must install the fiber cable and convert BPA's existing analog microwave radio systems over to fiber.

- Cable is installed through each substation yard, from the first to the last substation on the route.
- SONET (Synchronous Optical Network) terminal equipment is installed at each substation. The SONET software changes a high-speed electrical signal into light that can be sent over the fiber.
- For control equipment to use the high-speed electrical signal, a channel bank converts the high-speed electrical signal down to a 56 kbs channel (similar to a 56K computer modem) or to a standard voice channel.
- The new system is now compatible with the existing analog microwave system. Unfortunately the only way to move from the analog system to the fiber system is one channel at a time and BPA currently has 2,800 channels. To move these channels costs about \$4,000 each. Each channel can require several days to change. BPA plans to have about 450 channels switched over to the new fiber system by next year.

For more information

Contact Bob Lahmann, (360) 418-2092, or visit the fiber Web site at <http://www.transmission.bpa.gov/orgs/tn/tnf/fiberoptic>.

BONNEVILLE POWER ADMINISTRATION
P.O. Box 3621 Portland, Oregon 97208-3621
DOE/BP-3300 November 2000 16M