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Keeping the Lights On while Cutting Costs

October 1998

In 1992, the Bonneville Power Administration spent $361 million in capital on a system to transmit electricity. By 1998, it was spending about one-third that amount: $123 million. In 1992, BPA's expenses for managing, operating and maintaining the transmission system ran $160 million. By 1998, BPA had cut expenses to $128 million. Maintainance costs alone were cut 28 percent.

In 1992, management of the grid was split into six organizations. Today, there is one. About 2,900 people worked for transmission in October 1992. By February 1998, the Transmission Business Line – TBL – employed 1,855. Transmission in 1992 for the most part meant new towers, lines and substations. Today it means computers, digital communications and electronic controls.

But has BPA gone far enough to cut costs? Is it positioned to meet what the public, legislators and customers expect from transmission in the future? Has it gone too far? Have cuts in capital, costs and staff endangered reliability? Will it be able to respond to new demands?

Six years of change in the Northwest federal transmission system

1992 was a watershed year for transmission. The National Energy Policy Act of 1992 set the stage for the most fundamental restructuring the U.S. electric power industry had seen in six decades. It brought deregulation, competition for wholesale electricity markets and a drive to reduce electricity costs. It led to separating transmission from power merchant functions.

BPA was not ready for deregulation in its organization – or its finances. BPA was facing the limits for borrowing from the U.S. Treasury for capital projects, such as transmission facilities. It planned to raise power rates 15 percent while prices for competing sources of energy, primarily natural gas, were falling.

According to Wall Street, congressional leaders and customers, BPA was clearly in crisis.

To survive and regain customer confidence, BPA the following year began a change. For the first time, it set an agency purpose and strategic business objectives. It linked the objectives to measurable performance standards. It set out to retain its competitive position as a public agency that also markets and transmits electricity.

BPA began a series of cuts in budgets – a harbinger of what is today continuous pressure to manage costs. The capital program was cut with a goal to extend the ability to borrow until 2001, then, with a goal to extend borrowing indefinitely. The expense budget – money spent on staff costs and small or short-term purchases – was cut in line with cuts in capital. BPA reorganized the agency and separated TBL from the power merchant function, consistent with rules from the Federal Energy Regulatory Commission and the 1992 Act. Finally, BPA downsized through incentives and attrition.

Making the most of the system

The confluence of competition and deregulation brought pressure on BPA from two directions. On one hand, it had to cut costs. On the other, it saw new and sometimes startling changes in the use of the transmission system. Starting in 1993, BPA changed transmission philosophy. It focused more clearly on delivering what the public and customers want, at the right price. Rather than continue developing and expanding the system, it began to use innovative technologies and techniques to operate and maintain and make the most of the existing system. Rather than maintain equipment based on the time elapsed, it began to maintain based on how critical the equipment was to reliability and the need for repair.

As a result, the number of circuit miles has virtually remained the same since 1993. So has the number of substations. That compares to the heyday of transmission line construction in the 1950s and 1960s. In 1953-54 alone, BPA installed nearly 3,000 miles of high-voltage line.

In 1992, BPA planned to build several large transmission projects. Within four years, these had been canceled or delayed. Instead, BPA met immediate needs by installing series and shunt capacitors and static var compensators. Compensators regulate voltage and keep it stable. Capacitors maintain and boost voltage to squeeze more capacity from the existing system.

While the number of substations and circuit miles remained the same, use of other types of equipment increased significantly.

It took 20 years – 1956-1976 – for BPA to install its first 200 shunt capacitor banks. It took just eight years – 1992-1998 – to install 150 more.

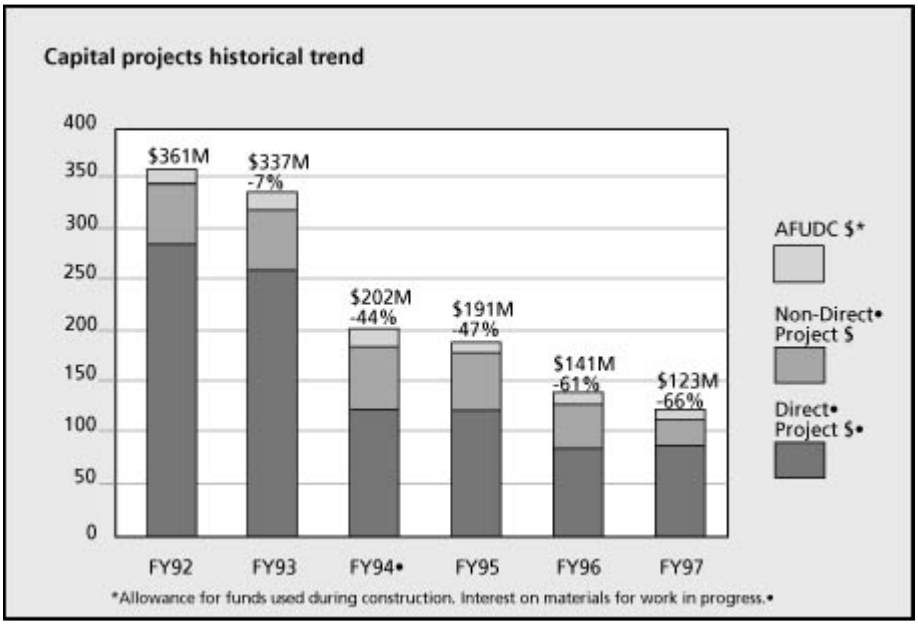
In 1992, BPA installed its first fiber optic cable to eventually control the system and handle a growing

number transactions. Today it has 1,800 miles. It upgraded its main transmission computer system - SCADA or supervisory control and data acquisition - twice in the mid-1990's. To monitor and correct outages, it installed remedial action schemes - automatic controls that can react in the blink of an eye to keep the system stable after a disturbance.

The direct-current intertie line that links the Northwest and California is the clearest example of how equipment is used to increase capacity. When completed in May 1970, the line carried 1,400 megawatts. Today it can carry 3,100 megawatts, not because of new lines, but because new state-of-the-art equipment was added at its terminals.

Making the most of money

Changes in capital borrowing went hand-in-hand with the change in approach to the transmission system. BPA took severe steps to control the amount of capital it borrows from the Treasury as the center of its effort to put its finances in order. Transmission consumes a huge portion of BPA's overall annual capital budget. BPA cut capital borrowing for transmission projects 66 percent, or from $361 million to $123 million, from 1992 to 1998. Borrowing for main grid projects dropped even more – by 84 percent. Replacements for equipment on the main grid dropped 75 percent.



However, dollars dedicated to new technologies for operations and system controls remained the same. For example, money borrowed for fiber optics communications grew from zero in 1992 to nearly $20 million for 1998.

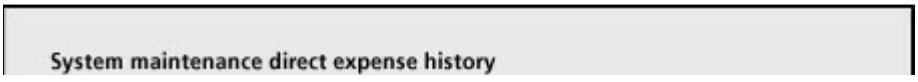
The cuts to main grid projects had a proportional impact on expenses. Dollars spent for short-term and small purchases, such as tools, dropped 21 percent.

The cuts had a profound impact on indirect costs, such as administrative support and overhead. Indirects dropped 56 percent.

The cost of maintaining the system dropped by $22 million, from $80 million in 1992 to $58 million in 1998.

Making the most of the Transmission organization

Cuts in indirect costs translate to direct changes in staffing.



BPA reduced TBL staff, not
by across-the-board downsizing, but by reorganizing, re-engineering and attrition. Categories of employees were offered incentives to retire or leave the agency.

Between 1992 and 1998, the number of TBL staff dropped 36 percent from 2,598 to 1,665 employees. The number of on-site contractors, who serve the same basic functions as staff, dropped 33 percent.

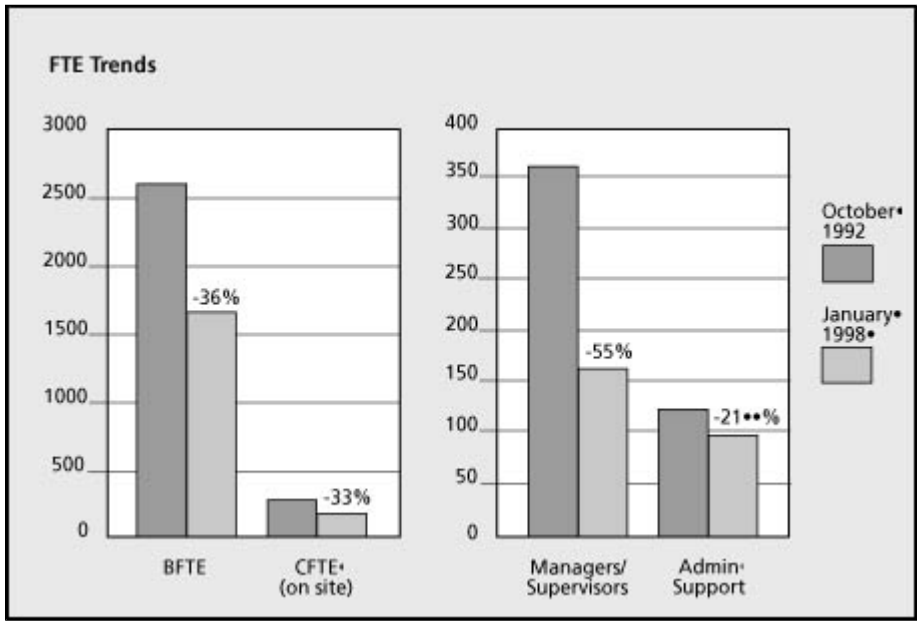
Between 1992 and 1998, the number of managers and supervisors declined by 55 percent. In 1992, the TBL employed 363 supervisors. By 1998, it employed 164. Support staff, too, declined by 21 percent.

As expected with the loss of main grid projects, the number of design engineers, and those involved in construction or in testing parts for the grid declined the most, between 48 and 79 percent. The total number of engineers dropped from about 355 to about 200.

Operations and maintenance staff dropped as much as 37 percent as O&M moved to a smaller permanent work force augmented by temporary or summer help. Staff was reorganized around geographic location and proximity to customers rather than a function or activity.

TBL flattened the organization. It pared it down to key functions and merged others. In 1992, building and maintaining the system was fractured between six organizations. Work was handed off across major organizational boundaries. The Office of Engineering designed structures. The Office of Operations, Maintenance and Construction controlled budgets and set standards. Four area offices carried out work, sometimes with limited consistency. Each organization had a senior executive in the lead with a supporting management and administrative staff. Staff had trouble sharing information and reaching common ground on projects. Technical differences at times became disputes that only the BPA Administrator could resolve.

By 1998, TBL was managed by one senior vice-president. Building and maintaining the system was under the control of one vice-president. Layers of management had been cut from five to three. The number of groups had reduced across the board. Engineering, for example, went from 20 subgroups to three. Staff could share information directly and work on projects together. Teams of employees resolved technical issues.



Impact on reliability

Summer 1996 brought two major outages to the western U.S. One started on power lines owned by private utilities in Idaho. The second started in Oregon on lines owned by BPA. Most of those affected were not in the Northwest, but in California, at the southern end of the intertie.

Triple-digit temperatures, high flows on the Columbia River, high demand for

hydroelectricity in the south, sagging lines and loss of generators at the Corps of Engineers' McNary Dam at a critical moment contributed to the outage, not the cuts in costs. Rethinking where TBL spends it time, effort and money has improved reliability. TBL installed more monitors and control equipment to detect and respond to outages. It changed operations and began operating the intertie - and the high-voltage lines feeding the intertie - more conservatively. It improved communications between BPA and other utilities connected within and to the Northwest. A new computer system to track schedules and show who is using the system when is in the works.

It shifted expense dollars. It increased the budget to control brush under and near power lines from $2.5 million in 1992 to $4.5 million in 1998. Outages directly caused by trees reached 42 in 1996. In 1997, there were seven. In 1998, there have been two.

Yet the grid BPA built to serve the Northwest and West Coast faces more demands in the future. Changes in the electric utility industry and the population in the Northwest bring new challenges. In its heyday, the system had as much as 70 percent excess capacity. But between 1992 - when deregulation began, and 1998 - use of BPA's grid increased by more than 31 percent. Brokers and power producers began using BPA's grid as the open-access freeway to get to desired markets outside the Northwest. Today in some areas, the margin of capacity is close to zero. Also, demand for electricity in the metropolitan areas of Seattle and Portland continues to grow. National, and regional groups such as the Western Systems Coordinating Council are considering mandatory standards for reliability with penalties for non-performance.

As it reaches the technical limits of its capacity, the transmission system could become more vulnerable to potential outages. About half the workers who know how to install equipment and plan and operate the system to maintain reliability are eligible for early or full retirement by 2003.

To respond, BPA and TBL continue to strengthen communications and control equipment to monitor outages, frequencies and power quality. It is developing a business plan to replace aging equipment, based on importance to reliability, importance to customers and likelihood of failure. It seeks to share costs to bolster the system with others that benefit from improvements. It is benchmarking its replacements and costs with those of similar systems.

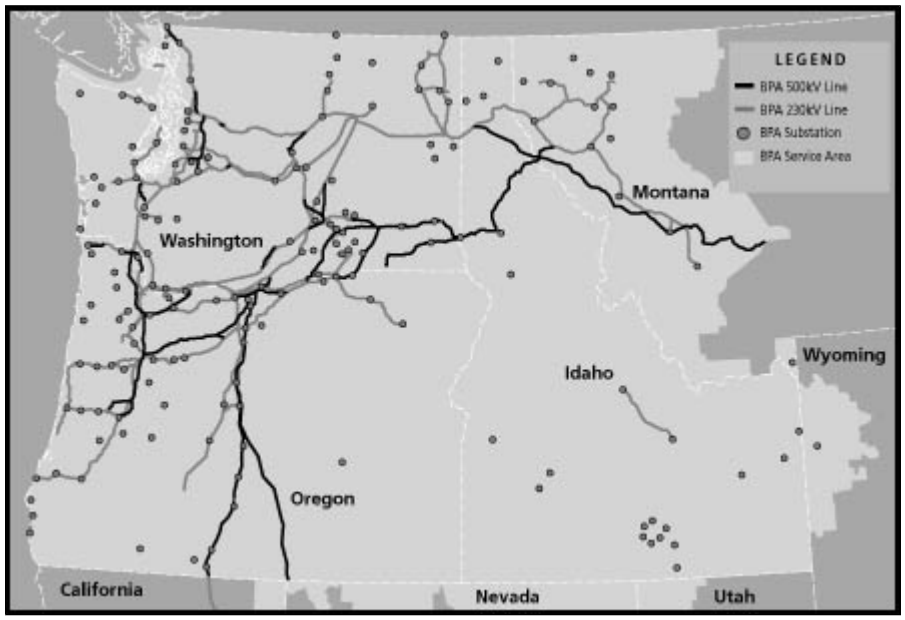
It is planning ahead to replace important staff members in such areas as maintenance, operations and network planning before they retire, so they can transfer their skills. TBL is recruiting now for apprentices, craftsmen and students. It is updating its technical and training programs.

BPA once had a goal of cutting capital costs for transmission projects to $60 million a year and transmission staff to about 1,500. To meet the latest challenges and stay ahead of the work needed to maintain system reliability, it now plans to keep capital and staffing near current levels – about $120 million a year and 1,700 people.

Conclusion

From 1992 to 1998, BPA changed the way it looked at transmission system development. It moved from expanding to maintaining the system to make the most of existing capacity. It quickly cut costs and thoughtfully downsized to adapt to a new environment in the electric utility industry. It brought a new philosophy of efficiency into its changed organization.

The past six years give context for the future, and insights into the direction BPA Transmission should take as it moves forward. It will preserve and enhance the transmission system to the benefit of the public it serves. It will continue to control costs, especially those for capital projects. It will focus on how to get the most out of the system, while making sure the system safely delivers electricity reliably.



BPA's transmission system began in 1937 with three miles of line built from Bonneville Dam to the City of Cascade Locks. Today, it owns and operates more than 15,000 circuit miles of transmission lines -- enough to stretch halfway around the globe. It has more than 4,400 circuit miles of 500-kilovolt, and more than 6,000 circuit miles of 345-kV and 230-kV transmission lines. This system provides about 80 percent of the high voltage transmission capacity in the Northwest states of Oregon, Washington, Idaho and western Montana. It also manages the northern portion of the one direct-current and three alternating-current intertie lines. These lines connect the Northwest and California.

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