Smart Grid Paybacks: The Chattanooga Example

Case Study

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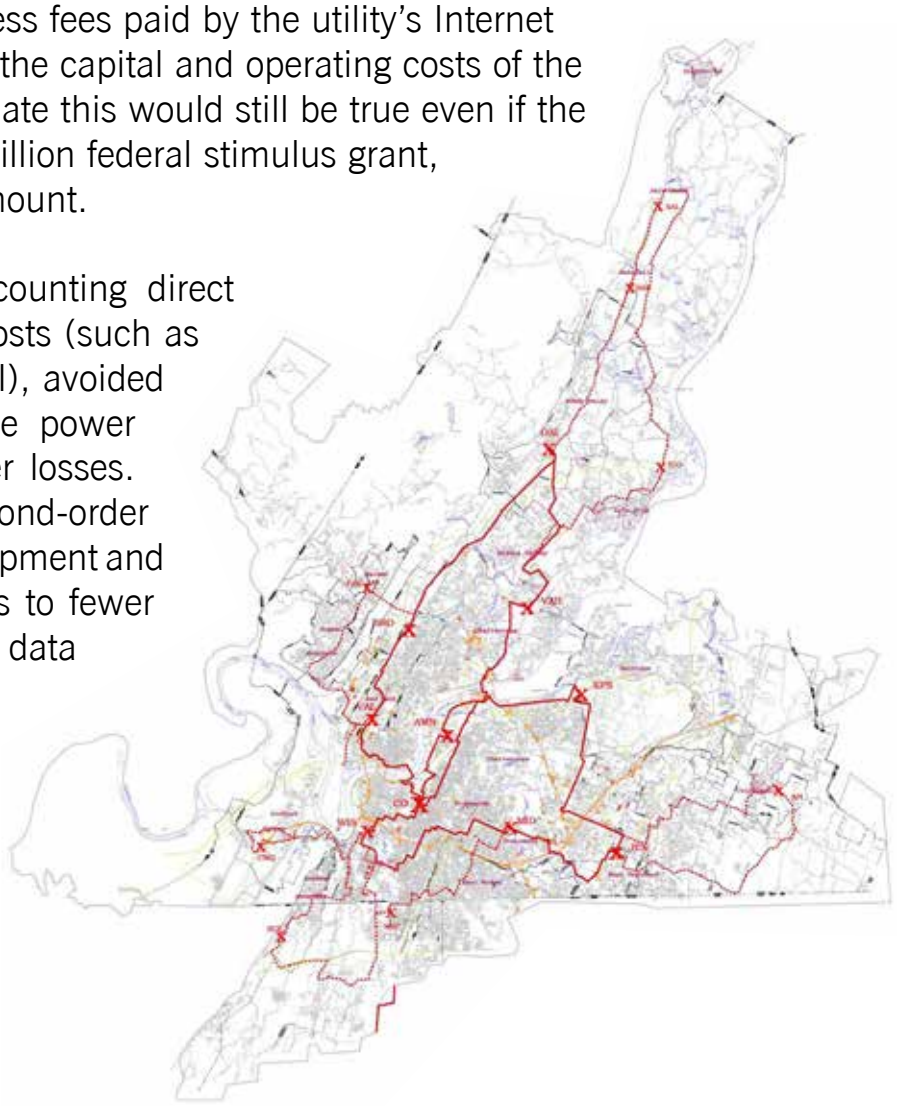
After building a fiber optic network throughout its service territory, the city-owned electric utility in Chattanooga, Tennessee, became the first U.S. company to offer Internet access speeds of 1 gigabit per second to customers. The fiber also serves as the backbone for a sophisticated smart grid. Data show that the savings produced by the smart grid, plus revenue from access fees paid by the utility's Internet access business, more than cover the capital and operating costs of the smart grid. What's more, we estimate this would still be true even if the utility hadn't received a $111.6 million federal stimulus grant, and instead borrowed the extra amount.

We reach this conclusion after counting direct savings in the utility's operating costs (such as labor, truck maintenance, and fuel), avoided purchases of expensive wholesale power at peak times, and avoided power losses. The region is also experiencing second-order benefits including economic development and savings to local businesses thanks to fewer and shorter power outages. The data on the following two pages were provided by the utility (known as the Electric Power Board of Chattanooga, or EPB), and include data on second-order benefits originally published by Bento Lobo at the University of Tennessee at Chattanooga.



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OVERVIEW

Chattanooga's Electric Power Board (EPB) serves approximately 155,000 homes and 25,000 commercial customers, most of them in Hamilton County, Tennesee.

Quick Facts

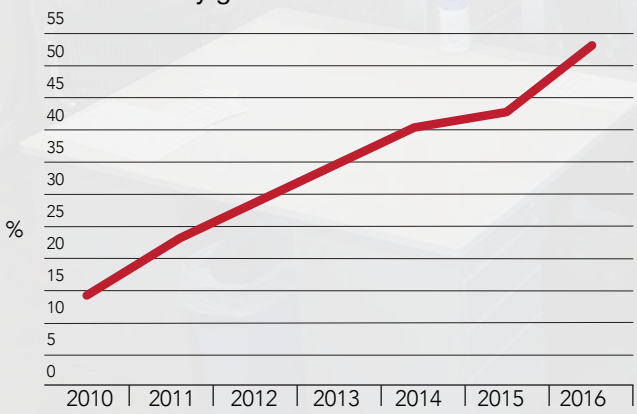
In 2009, EPB built a fiber network to serve as the communications backbone for a smart grid and also provide high-speed Internet access to customers. The entire project cost $369 million. (See next page for details.)

The smart grid includes 180,000 smart meters that provide two-way communication; 1,400 smart switches that allow the utility to isolate power outages; and sensors that allow for precise voltage management to reduce waste.

The EPB fiber optics business was the first in the nation to offer 1 Gbps data service, currently priced at $69.99 monthly. EPB's telecom, video, and Internet business is managed as a separate division that pays "rent" to the electric side for use of the fiber and shared services.

Residential Data Take Rate

EPB has steadily gained market share.



EPB's smart grid is managed from this control room, which includes a wall monitor that can show damage to circuits, failing equipment, and voltage fluctuations. (Photo courtesy of EPB)

SAVINGS SNAPSHOT

July 5, 2012, Storm: $1 Million One-Day Savings

On July 5, 2012, a severe storm struck the Chattanooga region, causing power losses. A joint study by EPB and Oak Ridge National Laboratory concluded that thanks to automation, the smart grid allowed EPB to isolate problems and make speedy repairs, reducing customer outage time by 55 percent and the costs to customers by 33 percent. EPB realized one-day savings of more than $1 million in overtime costs associated with restoring service, the study concluded.

Smart Grid Paybacks

EPB's fiber-based smart grid provides $23.6 million in annual paybacks and revenue to the utility (plus, by one estimate, $43.5 million in indirect paybacks to the community). EPB's debt service on the project is about $11 million per year for 25 years; if EPB had not gotten a federal subsidy, this figure would still only have been $18.3 million per year.*

PAYBACKS TO EPB (2015-2016)

$2.3 million in peak power purchase savings
Sensors allow EPB to detect power levels at customer locations and regulate voltages far more tightly to reduce wholesale electricity purchases at expensive peak times.

$2.3 million in reduced meter-reading costs
The communication network and 175,000 smart meters allow remote and automated reading of electric meters, saving on manpower and vehicle costs.

$200,000 in reduced switching costs
During power outages, crews formerly needed to drive around to look for the damage and manually turn switches. Now this is done with sensors and 1,400 digital switches, reducing labor and vehicle costs.

$5 million in avoided theft
New sensors allow EPB to catch power thieves. Based on national estimates that between 1 percent and 1.5 percent of revenues are lost to power theft, EPB estimates it is catching or deterring $5 million in theft.

$14.4 million in revenue
The telecom, video, and Internet side of the business is paying this amount to the electric side as access fees to the fiber network.

Total: $24.2 million
Less Incremental Operating Expenses: $600,000

NET PAYBACKS: $23.6 million

ESTIMATED INDIRECT PAYBACKS

$43.5 million in community paybacks
EPB's grid has become far more reliable. EPB can now detect failing equipment, isolate problems, and respond to outages much more quickly. By one estimate, shorter and less frequent outages improve regional productivity by $43.5 million per year.**

GRAND TOTAL: $67.1 million

***EPB spent $369 million to build its smart grid and Internet access project. Of this, the fiber network and smart grid components cost $280 million. To pay this amount, EPB borrowed $169 million and received a $111.6 million federal stimulus grant. According to EPB, debt service on the $169 million adds up to an average of about $11 million per year for 25 years. If EPB had borrowed the entire $280 million (meaning if no federal grant had been available) the annual payment would be closer to $18.3 million. The fiber is expected to last for at least 30 years.

**Analysis by Bento Lobo, University of Tennessee at Chattanooga.

AUTHORS

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