July 2018 Introduction to White Paper

The following white paper was originally written in 2013 in response to questions about why the Knoxville Utilities Board (KUB) was not emulating the Electric Power Board (EPB) of Chattanooga in providing high speed internet service directly to its customers. The white paper was appended in April 2016 to include information on the accelerating trend of customers using mobile (versus fiber or wired) solutions to meet all their internet needs. This addendum was included to identify one more potential risk of KUB moving into a business area that is still evolving technologically.

KUB believes that the operational, strategic, and financial concerns originally identified in 2013 are still valid reasons for not providing fiber to the home (FTTH) retail telecommunication services to our customers. Therefore, no attempts have been made to re-write or update the body of this paper.

Since the paper was originally written, however, KUB has become aware of the growing concern with the disparity of high-speed internet availability between urban and rural areas. Studies have shown that this disparity is having negative repercussions in both the economic development potential and the educational systems of rural areas that are lacking high-speed internet. This is a concern to KUB, since rural areas comprise much of our 688 square mile electric service area.

As part of our Grid Modernization efforts, KUB will deploy roughly 300 miles of fiber optic cable to connect the electric substations and other key components of our remote system infrastructure. This work is expected to be completed by 2026. These fiber connections will provide almost instantaneous status information on KUB's electric distribution system, pinpointing problem areas and allowing us to respond more quickly to restore power when outages occur.

KUB is deploying much of this 300-mile fiber optic "backbone" in rural areas. We are open to leasing a portion of the excess fiber capacity of this backbone to telecommunications companies that are willing to partner with us in providing high-speed internet capability to areas that are currently under-served. There are several private telecommunication providers that target less densely-populated rural areas, and we are encouraging discussions with these companies and the local governments of these rural areas to identify potential partnerships.

For the reasons described in the following pages, KUB does not intend to pursue providing direct FTTH telecommunication services to our customers, but our fiber infrastructure may allow us to facilitate improvements in rural internet service with companies that do have this capability.

White Paper:

Comparing the Knoxville Utilities Board and the Electric Power Board of Chattanooga Regarding Their Involvement in Providing High Speed Internet

March 13, 2013

Executive Summary

KUB has been asked why our company can't provide the same type of high-speed telecommunication service to its customers that Chattanooga Electric Power Board (EPB) does. While KUB has both statutory and charter authority to provide this service (see the last paragraph in this section for a brief legal summary), there are operational, financial, and strategic reasons why KUB has chosen not to enter the telecom business.

EPB, which is an electric-only provider, invested $162 million in its electric system to run over 6,000 miles of fiber optic cable past all 170,000 homes in its service territory as part of its smart grid infrastructure. Fiber optic lines are capable of carrying much more information at higher speeds than traditional metal cable. The proximity of this fiber optic line to each home and business allowed EPB to further invest in infrastructure to then provide digital phone, TV, and internet service to these customers.

As a four-service (electric, gas, water, and wastewater) utility with overlapping service areas, KUB elected not to utilize the fiber optic strategy that EPB has employed, and has opted for an approach that better addresses KUB's operational needs. KUB is implementing a much less expensive ($3.4 million) wireless smart grid telecommunication strategy. A network of 18 sending / receiving devices has been strategically placed throughout KUB's 700+ square mile service area in order to provide 100% coverage. The signals from each meter will be sent to this network over an FCC-licensed radio frequency to ensure security and strength of signal. This approach will provide the same smart grid information for KUB's operations at a fraction of the cost of EPB's approach.

KUB will also install 244 miles of fiber optic line to connect each of its 59 substations as part of its smart distribution system strategy. However, since KUB is not going to the expense of running fiber optic past every home, it is not physically possible for KUB to provide the same telecom service that EPB is providing with our current infrastructure. That would require several thousand miles of additional fiber optic lines at a projected cost of over $450 million.

Chattanooga felt the need to provide its own municipal telecom system due to the historical lack of private telecom providers in the Chattanooga area. Knoxville has never had that problem. Today, AT&T, Comcast, Charter, Knology, MCI, Dish Network, and DirecTV all compete for service in the Knoxville area.

(Brief Legal Summary: More detail in the body of this report)
KUB has the statutory (TCA 7-52-601 through TCA 7-52-603) and charter (1102) authority to offer telecommunications services, providing it creates and submits a detailed business plan to the State Comptroller; publishes a notice of intent to provide these services; conducts a public hearing on the issue; and receives approval through either a 2/3 majority vote by City Council, or through a public referendum. If approved, a separate entity to provide telecom services would need to be created. This entity could not be subsidized by any other utility division, nor would it be considered a governmental entity for the purposes of the Tennessee Governmental Tort Liability Act.

Background

EPB has created a separate entity, EPB Fiber Optics (EPBFO), which provides "triple play" service (digital phone, internet, and cable TV) to its customers at ultra high speeds. They are able to do this by running fiber optic lines past every home in their service area as part of their smart grid build-out. Fiber optic lines are capable of carrying much more information at higher speeds than traditional metal cable.

EPB's first fiber optic work took place in the 1990's as a way to monitor the electric grid. In the early 2000's, EPB expanded the network and made the business decision to offer broadband telecommunications services to local businesses. EPBFO's precursor, EPB Telecom, was established at that time. In 2007, the EPB board of directors approved a Fiber-to-the Home initiative designed to provide that same service to residential customers, and as one element of EPB's smart grid build-out. The "triple play" offering was launched in 2009, and EPB Telecom became EPBFO. Today, they are in direct competition with private companies such as Comcast and AT&T for these telecom services.

As of December 2012, EPBFO provides internet service to over 35,000 residential and 2,500 business customers. Their basic triple play package has a 50-megabit per second (mbps) speed, compared to the national average of 6.7 mbps. The current residential price for this package is $121 per month. A 1-gigabit connection is also offered to small-to-medium businesses at a cost of $575.99 per month for internet only (ie, digital phone and TV service costs extra). For this price, the customer is provided internet service at speeds up to 1-gigabit per second. However, since this bandwidth is shared with other customers, there is no guarantee that this performance level is available at all times. In order to receive guaranteed 1-gigabit per second performance, customers must sign up for the Fi-Speed Internet Professional Gigabit Service, which costs $9,000 per month. About 26 commercial customers now pay for the gigabit service, as well as eight residential customers. As a point of comparison, AT&T's Alan Hill confirmed that gigabit service is currently available in Knoxville for a similar price.

EPB has installed over 6,000 miles of fiber optic cable covering roughly 170,000 homes and businesses in urban, suburban, and rural areas. According to published reports in the public domain, EPB issued $229 million in revenue bonds in 2008 to pay for part of this work. Of this amount, $162 million was used to complete the fiber optic network, which is owned by EPB's Electric Division but is used for both the smart grid and telecommunications services. In October 2011, EPB received an additional $111 million grant from the US Department of Energy (DOE) under the American Recovery and Reinvestment Act to accelerate development of the smart grid. This infusion of grant money allowed EPB to complete its planned 10-year deployment, including the related fiber optic build-out, in less than 3 years.

Legal Authority and Perspective

KUB is authorized, pursuant to the City of Knoxville Charter and state statute, to own and operate systems delivering telecommunications, cable television, internet and related services. The statutes authorizing a municipality to provide telecommunications, cable television, internet and related services provide that such services by a municipality may only be provided through the board or supervisory body having responsibility for the municipality's electric plant. Therefore, KUB is the only instrumentality of the City of Knoxville that can provide these

services. The services may be provided in KUB's service area and, with the consent of other municipalities, within their corporate or county limits.

The process required for a municipal utility, like KUB, to enter the cable television, internet and related services business is extensive. (The statute authorizing telecommunications services is less detailed). Upon approval by and at the direction of KUB's Board of Commissioners ("Board"), the process would begin by the electric division filing a detailed business plan with the office of the comptroller of the treasury for the State of Tennessee. The plan would have to include a three (3) year cost benefit analysis, disclose the total project direct and indirect costs and project the revenues to be derived from providing the proposed services. The plan would also have to include a description of the quality and level of services to be provided, pro forma financial statements, a detailed financing plan, marketing plan, rate structure and any other information requested by the comptroller of the treasury or the comptroller's designee.

The comptroller would have sixty (60) days after KUB's submission to provide to the Knoxville City Council its written analysis of the feasibility of KUB's proposed business plan. If the Board then makes a determination to proceed, it would be required to publish a notice of intent to provide services in the *News Sentinel*. The notice would also have to provide a date for a public hearing on KUB's plan for the provision of services. No sooner than fourteen (14) days following the public hearing, the Board could consider a resolution to authorize the provision of services. After approval by the Board the matter would then have to be approved by the City Council. KUB would be authorized by the City Council to provide the additional services if Council approves the measure by two-thirds majority vote. In the event City Council provides only majority approval, then the matter would be submitted for public approval by referendum held at the next general election.

When EPB sought to provide cable and internet services several years ago, it was sued by the Tennessee Cable Telecommunications Association (TCTA) alleging that EPB violated the authorizing statute by underestimating the capital and operational costs for providing services and overestimating the revenue to be generated by those services. TCTA argued that because of EPB's flawed business plan, EPB's cable and internet system would not generate sufficient revenue to repay its loans, EPB's electric system would be required to subsidize the cable and internet system and the cross-subsidy prohibitions of the authorizing statutes would therefore be violated. According to EPB's counsel, the lawsuit was eventually dropped after EPB received a federal stimulus grant and was able to avoid as much debt, which rendered moot the cross-subsidy allegations by the franchise providers. A similar suit by franchise service providers against KUB could be anticipated if KUB and City Council approve the provision of competing services.

An additional legal concern is the elimination of the Tennessee Government Tort Liability Act (GTLA) protection for municipal utilities providing cable television and internet services. The authorizing statute states that municipal electric systems delivering those services are not "governmental entities" for purposes of the Tennessee GTLA. At a minimum, this would create "gray areas" for liability flowing from accidents involving KUB's multi-division equipment and crews. Providing liability coverage for areas not protected by GTLA would result in additional costs to KUB.

Reasons KUB Has Declined to Provide Telecommunications Services

Operational

EPB provides only one utility service (electricity) to its 170,000 customers. On the other hand, KUB provides four services utilizing three types of meters (electric, gas, and water) to over 370,000 customers. In fact, KUB has more gas and water meters (174,000) than Chattanooga has total meters. Prior to the smart grid, there has never been a reason to run wires to gas and water meters. Therefore, KUB has adopted a more cost-effective approach to transmitting smart grid data from gas and water meters that is also applicable to its electric meters. Instead of incurring the expense of running fiber optic lines to each home, KUB will employ a wireless network that will achieve the same smart grid results at a fraction of the cost.

As stated in the Executive Summary, a network of 18 sending / receiving devices has been strategically placed throughout KUB's 700+ square mile service area in order to provide 100% coverage. The information from each meter will be sent over an FCC-licensed radio frequency to these devices, thereby ensuring both the strength and the security of the signal. The wireless network was built at a cost of $3.4 million as part of KUB's DOE-approved smart grid pilot project, for which KUB received a matching $3.6 million grant. The remaining portion of the grant will be utilized for AMI technology and operational improvements.

KUB will also employ fiber optic lines as part of our smart grid strategy. Instead of going to each home, however, we will use 244 miles of fiber optic line to connect each of our 59 electric substations as part of our smart distribution system strategy. In many cases, KUB will partner and utilize the Comcast fiber optics network to transmit data from the electric substations to our operations center. This approach is viewed as a more efficient use of rate payer funds.

In summary, KUB elected not to utilize the fiber optic strategy that EPB has employed for its smart grid build-out, and has opted for an approach that better addresses KUB's needs as a four-service utility. Since KUB does not have fiber running past every home, it is not currently possible for us to provide the telecommunication services that EPB does. It's estimated that such a build-out for KUB would exceed $270 million for the fiber optic cable alone.

Financial

There would be a significant financial impact of providing cable, internet and digital phone service on KUB's existing customers, reflecting the large capital outlay that would be required to install fiber throughout the electric system territory. KUB's electric customers would bear a large portion of a fiber system's initial costs. Based on assumptions detailed below, we estimate that KUB's electric customers would pay an additional $180 million over the first ten years to help fund the build out and operation of a fiber system. If fiber revenues were lower than projected, the cost burden on electric customers would only increase.

If KUB were to provide such services, state law requires a separate division be established that would be financially independent from KUB's other four utility divisions. This fiber optics division, in accordance with state law, would maintain its own system of financial accounts and could not be subsidized by revenues from KUB's other divisions. However, state law does permit a

municipality's electric system to lend funds for the purpose of funding the construction and working capital for the fiber optic system.

Strategic

KUB has long had the business philosophy of focusing on our core competencies as a provider of electric, gas, water, and wastewater services. One of our four corporate objectives is "to serve our community's growth," and we feel that competing with the private sector for telecommunication services would send a mixed message regarding our role as a catalyst for economic development in the area we serve.

Unlike some areas, Knoxville has always been fortunate to have several private sector telecommunication providers competing for customers. When cable and internet services were first becoming more popular and prevalent in the 1990's, cities were ranked by telecom providers based on market potential. These factors included total population, density, and other factors. Tennessee's four major cities were ranked as follows: Memphis (Tier 1), Nashville (Tier 2), Knoxville (Tier 3), and Chattanooga (Tier 4). The higher the tier ranking, the higher the market potential, and the more likely an area was to attract telecom providers.

In the mid-1990's, the City of Chattanooga felt that there wasn't a sufficient number of telecom providers to ensure a high level of customer satisfaction and price competition. As a result, they made a strategic business decision to work with EPB to develop their own publicly provided telecommunication service.

As previously stated, KUB's service area is currently served by Comcast, Knology, Charter, AT&T, MCI, Dish Network, and DirecTV. In addition, there are a number of smaller telecom providers specific to business and technology companies such as KDL, ITC DeltaCom, and IRIS Networks. KUB and its customers benefit directly and indirectly from the number of providers in the area. For example, KUB receives pole attachment revenues exceeding $3.5 million per year from these and other telecom providers in our service area.

Experiences of Other Tennessee Utilities as Telecom Service Providers

Aside from Chattanooga, Memphis has been the only other major Tennessee city to develop a telecom service. There was no shortage of telecom providers in Memphis. However, Memphis Light, Gas, and Water (MLGW) saw the market enthusiasm for broadband technology in the late 1990's and created a for-profit entity, Memphis Networx. The company built 250 miles of dark fiber around the City of Memphis that was connected to many of the major buildings in downtown Memphis and surrounding Shelby County. MLGW, along with several private investors from the Memphis business community, invested a total of $32 million in Networx over several rounds of financing from 1999 through to 2006. Networx lost money every year, however, and was eventually sold to a private firm, Zayo Bandwidth, in 2007, for $11.5 million.

In addition to Memphis and Chattanooga, several small electric utilities in Tennessee have also entered the telecommunications field, with varying degrees of success. Dr. Ronald Rizzuto is a University of Denver professor who researches municipal issues. In a recent study, he reported that Tennessee utilities in Bristol, Chattanooga, Clarksville, Columbia, Fayetteville, Jackson, Morristown, Pulaski, and Tullahoma provide some level of telecom service to its customers. Of these, only two (Columbia and Jackson), have generated sufficient revenues to cover all the costs of their operations. Collectively, these utilities have accumulated deficits of $176 million

since their inceptions. During 2010, Tennessee's municipal communications ventures required $14.4 million in additional public debt and/or loans from sister electric utilities to cover deficits.

The Connecticut state government is currently considering whether utility-provided telecom services are feasible in their state, and conducted a comprehensive case study of Chattanooga EPB. In December of 2012, the Connecticut General Assembly's Office of Legislative Research (OLR) issued a report on its findings. The results included how much EPB's system costs, how it is being funded, and its impact on local economic development. Despite several claims and assertions from EPB and others that the "broadband network was a 'key element' in helping Volkswagen choose Chattanooga," and that it is "an important economic development tool…when attracting new businesses to Chattanooga," the OLR report concludes that "we have not found any empirical evidence of the impact of the broadband initiative, which has only recently been deployed, on economic development."

(Note: Regarding the influence of EPB's fiber optic system on Volkswagen's decision to locate its plant outside Chattanooga, it should be noted that EPB does not provide telecom service to the main plant, production, or engineering facilities. That service is provided by AT&T through the national account it has with Volkswagen. However, EPB does provide telecom service to a training and educational facility that Volkswagen has created for its employees in the downtown Chattanooga area.)

Addendum: April 2016

A recent study provides additional reasons for KUB not to pursue high speed internet. The report was published by *The Washington Post* on April 18, 2016 under the title: "New Data: Americans are abandoning wired home internet." The article reveals the results of a recent Commerce Department study of 53,000 Americans conducted by the US Census Bureau. The study revealed that US households are moving away from wired residential broadband internet and toward mobile-data-only by using their smart phones or other mobile devices.

In the last three years, the percentage of US households that are mobile-only has doubled, moving from 10% in 2013 to the level of 20% in 2016. While mobile-only has traditionally been associated with lower-income demographics, the study revealed that it is now increasing across all demographics. Mobile-only percentages have more than doubled since 2013 in the following income categories:

- $50,000 - $75,000 (increased from 8% to18%)
- $75,000 - $100,000 (increased from 8% to 17%)
- Over $100,000 (increased from 6% to 15%)

Experts say that this shift is suggesting a conscious choice by wealthier consumers to have only one form of internet access, and "paints the clearest picture yet of a country moving away from fixed networks toward wireless networks." Wireless providers such as Verizon are moving to exploit the trend by prioritizing mobile service over the traditional wire and fiber services provided by cable companies.

It is unclear what impact this trend toward wireless internet will have on companies that have already invested millions of dollars in a wire-based infrastructure. The complete report can be found at: www.washingtonpost.com/news/the-switch/wp/2016/04/18/new-data-americans-are-abandoning-wired-home-internet/.