

# The Benefits of Retiring Copper Today

DOLLARS, SENSE, & SUSTAINABILITY

FIBER BROADBAND ASSOCIATION  
TECHNOLOGY COMMITTEE  
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*When fiber leads, the future follows.*

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## INTRODUCTION

Fiber optic cable has been deployed for decades, first in the core of the world's networks, and then to individual homes, businesses, and wireless cell sites. Over this time, fiber has gained a well-earned reputation for superior performance and reliability versus copper-based and wireless communications media, such that fiber is the literal backbone of most global communications networks, regardless of last-mile type – coax/cable, copper, cellular, and fixed wireless.

Most telecommunications providers operating on fiber in the core and local access network still use legacy last mile infrastructure, such as copper pairs or coaxial cable today. This means that they are running multiple networks with both past and future technology, adding to their operational expenditures (OpEx). Operators struggle with how to eliminate this complexity and migrate to a simpler and less costly network. An aging skilled workforce, third-party maintenance agreements for legacy electronics, outdated operations support systems (OSS), license fees, FCC part 15 testing requirements, and batteries add to the overhead. In addition, theft of copper communications cable has been on the rise due to the value of copper.

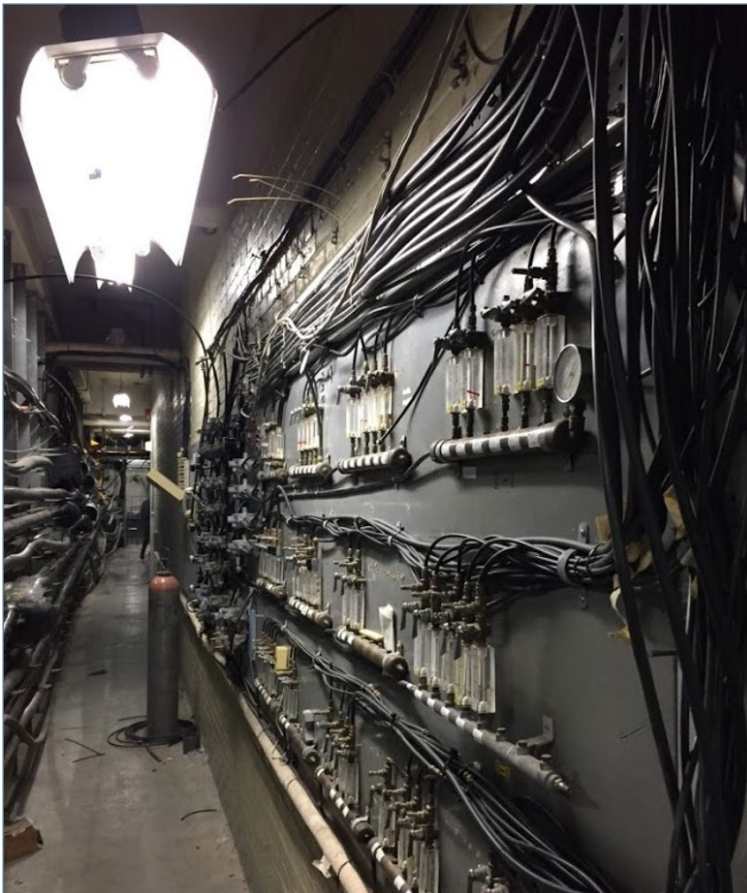
The Federal Communications Commission (FCC) has adopted rules setting forth the process for carriers to retire copper landlines (See [47 CFR, 51.333](#)). The FCC also has adopted other measures facilitating the retirement of copper facilities, including no longer requiring that incumbent providers unbundle copper loops ([Order 19-72A1](#)). Incumbent service providers are using various mechanisms to encourage customer migration onto fiber optic infrastructure, but it is not so simple. In many cases, a more detailed business case is required to justify full migration to fiber optics to key stakeholders.

This white paper, created by the FBA Technology Committee, explores various benefits possible from accelerating the transition to fiber and completely removing copper.

## THE MANY COSTS OF LEGACY COPPER

Most network operators have reported that lower operational expenses are among the greatest benefits of an all-fiber network. Legacy copper plant infrastructure such as amplifiers, air systems for pressurized cable (Figure 1), and batteries are just a few examples driving higher power consumption, frequent outages, truck rolls, and increasing maintenance, that could be all be eliminated resulting in significant operational savings.

Energy-intensive systems were designed and built for supporting copper media decades ago, prior to today's environmental, social, and corporate governance (ESG) policies. Most of these legacy systems were deployed in the last century and require considerable labor and power to be operated and properly maintained.



**Figure 1:**  
*Pressurized air system in CO vault — Maintenance costs for air systems are expensive with regular leaks and breaks, allowing water to cause corrosion and faults. Additionally, finding the materials and skilled labor to maintain these systems is difficult.*

## The Aging Workforce

As equipment has aged, so too have the people who understand how to maintain it. Many of the master technicians who know legacy wireline systems are gone or will soon retire, leaving a knowledge gap. The dwindling workforce that understands these systems becomes more expensive to retain, and the legacy network is at risk as their knowledge leaves with them.

### **Declining expertise is found among the following areas:**

- *Copper/COAX cable troubleshooting, splicing etc.*
- *Amplifiers and electronic equipment*
- *Air pressurization systems*
- *Battery Systems*
- *Software and IT*

Legacy software systems represent a particularly unique vulnerability. Copper records kept in older antiquated systems are difficult to update and maintain, with few subject matter experts familiar with bespoke or now-un-supported systems of hardware and software. The paradox with these systems is that it is too costly to transition legacy IT systems supporting copper to modern commercial-off-the-shelf open standards servers and software, so they remain in place and continue to increase support expenses as both parts and personnel continue to age out every year.

Many of the legacy copper-based networks are supported by IT systems that only support the copper network along with the software licenses that the telephone electronics support. These again have limited skilled resources to support them, and the annual licensing fees can be very expensive.

Many copper cables in service today are well over 100 years old. The skills, institutional knowledge, and materials to support these networks continue to shrink every year. With more customers shifting to fiber, existing copper cables will have a small percentage of working lines left within service areas, further driving up costs to maintain as they continue to age.

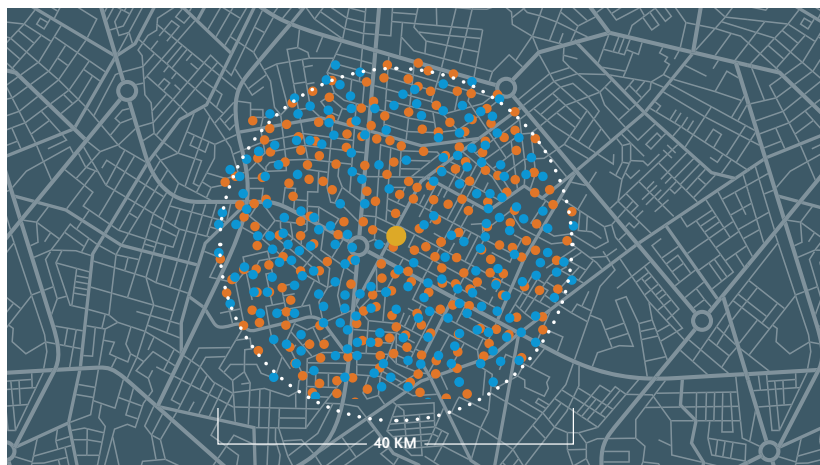
## THE MANY ADVANTAGES OF TRANSITIONING TO FIBER AND REMOVING COPPER

### Fiber Advantages

The OpEX advantages of Fiber have been analyzed and reported by FBA and others.<sup>1</sup> The analysis found that truck rolls to address network problems and churn management are the main OpEx drivers, and all-fiber networks, due to a simpler, more reliable, and higher-performance infrastructure, can save \$54/yr/home passed vs. HFC and \$91/yr/home passed vs. DSL. Over a 10 yr period the savings accumulate to \$540 per home passed vs. DSL and \$910 per home passed vs. DSL.

**A summary of these OpEX advantages and other findings are shown here.**

- **A single active equipment location serves a large area** – One fiber location can serve a 40 KM diameter area through fully passive optical cabling, while DSL or Coaxial cable based last mile systems need dozens of locations to serve the same area. (Figure 2, see below)
- **Better reliability and therefore lower truck roll costs** – Fiber has .13 truck rolls per subscriber per year versus .45 for DSL.
- **Energy efficiency.** Fiber uses 2.409 KW per month per customer to power the network versus 3.066 KW for DSL. This difference relates primarily to fewer powered points in the network.
- **Lower pole attachment costs** due to less physical footprint of fiber cables and in some cases less cost to do make-ready.
- **Lower air conditioning costs** related to cooling legacy equipment.
- **Lower real estate costs** as legacy equipment is removed and replaced with more compact, power-efficient fiber equipment.
- **Higher resiliency to major weather events** such as hurricanes along the gulf coast or wildfires in the Pacific Northwest.
- **Greener** – According to FBA research, connecting every American home and business with fiber will be the equivalent (in carbon footprint reduction) to taking nearly 11 million cars off the road each year.



**Figure 2:** ● DSL ● FIBER ● COAX

<sup>1</sup> Operational Expenses for All-Fiber Networks are Far Lower Than for Other Access Networks



## Advantages of Removing Copper

In addition to eliminating the high operating expense of copper plant mentioned above, there are many additional advantages of retiring and removing copper.

### Reclaiming Assets and Reducing Licensing Costs

The ducts and poles that carry copper are valuable assets that can be reduced and/or repurposed to carry fiber, which can provide exponentially more capacity than existing copper cable in the same diameter. For example, a single fiber optic cable containing 144 optical fibers is only about 12 mm in diameter, yet has a huge theoretical capacity of about 86,000,000 Giga-bits per second over a distance of at least 20 KM.<sup>2</sup> All of the ~twenty copper cables of ~100 mm OD each shown in Figure 3 combined can support less than 0.01% of this capacity!

Attachments for cables on poles offer an additional savings opportunity. Pole attachment fees and other make ready costs are increasing in most areas and many feeder route lines have multiple strands on the pole as in the example shown in Figure 4, with each strand charged an attachment fee. Removing copper lines will reduce attachment fees as fewer fiber cables will be required, due to fiber’s exponentially greater capacity. Depending on the number of lines and local fees, the savings could be up to 50%.



**Figure 3:** Cable vault – Removing copper through migration opens duct space. The many copper cables shown here can be replaced by fiber cables (wrapped in orange), that take up much less duct capacity.



**Figure 4**

<sup>2</sup> “Fiber Scalability and Longevity”, Fiber Broadband Association Technology Committee, March 18, 2024. The theoretical capacity of a single full spectrum single-mode ITU-T G.652,D fiber is 600,000 Gbps, multiplied by 144 of such fibers to equal 86,400,000 Gbps. It is estimated there are 50,000 pairs in the copper cables in shown in Figure 3 and each pair has a capacity of 10 Mbps over a 6 KM distance.

In the 1980's through to the mid 2000's, copper based DMS and DSL active cabinets were deployed in great numbers. These "cabinet farms" (Figure 5) and comprised of multiple metal cabinets with heat exchangers, and a commercial power connection with a battery backup. With the migration of customers to fiber, many of these configurations are underutilized. In some instances, the cost to operate them is more than the revenue collected. The cabinets are becoming more difficult to repair and source parts, as back planes fail and side panels require replacement due to damage and corrosion.



**Figure 5:** *Fewer cabinets, less power – Fiber uses less space and no power with a single, smaller passive FDH cabinet replacing two brown DSLAM cabinets, making it green and aesthetically appealing.*

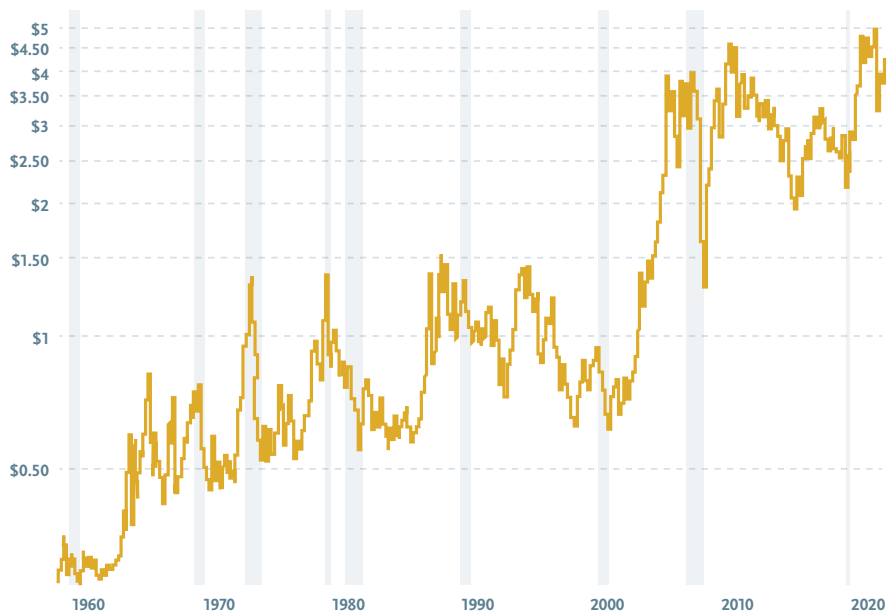


## Recapturing Asset Costs

Two assets can be recovered to help recoup the capital expenses of migrating to an all-fiber network: real estate and copper.

The many buildings and huts that house legacy powered copper electronics can be eliminated or repurposed. Many service providers that deployed FTTH build a centralized network using a single building or hut housing the powered fiber equipment to cover up to a 40 KM diameter area as shown in Figure 2. By doing this, FTTH service providers created a future opportunity to repurpose or decommission this real estate and sell the properties. Some surplus buildings are in high-value locations, providing significant post-service opportunities.

Salvaging copper for resale can also provide a revenue source, as several service providers have found. Copper has increased in price considerably in the last 10 years as shown in Figure 6 and is predicted to continue to grow in value for use in areas such as electric vehicle (EV) recharging stations over the next decade. The EV sector is expected to need 230% more copper by 2030 to meet anticipated demand. Some copper recycling companies, such as GreenPlanet21, suggest that the value of copper can sometimes pay for removal costs. The company suggests that 2.8 million tons of CO2 emissions reduction can be claimed for each ton of copper recycled in lieu of freshly mined copper with higher resulting CO2 emissions.



**Figure 6: Copper Prices – 45 Year Historical Chart**

Source: <https://www.macrotrends.net/1476/copper-prices-historical-chart-data>

## Building Community Goodwill and Sustainability

Some communities view DSLAMs and other above-ground cabinets as eyesores that detract and/or don't fit into historic or local architecture. Graffiti is also a big problem to manage along with the ongoing costs. Simplifying the telecommunications network by eliminating unsightly legacy cabinets can improve aesthetics. Removing copper provides additional sustainability benefits: By installing modern fiber networks with significantly fewer active elements, such as passive optical networks (PON), lower carbon emissions can be achieved from both reduced network power requirements, and fewer truck rolls for repairs and maintenance. And, as noted earlier, recycling copper assists in EV growth and meeting other demands.

## COPPER MIGRATION: THE TIER 1 EXPERIENCE

AT&T and Verizon have started the process of transitioning their legacy copper networks to fiber. AT&T is working to reduce its copper footprint by 50% by 2025 and plans to reinvest savings from the decommissioning effort to grow its fiber and 5G networks further.

Jeff McElfresh, CEO of AT&T's Communications division, said during an investor day event in March 2022 that the move will allow the operator to rationalize a cost base totaling \$6 billion, reported *Fierce Telecom*.<sup>3</sup> At the time of the event, AT&T had dismantled over 9,000 network elements and reduced over 4 billion in annualized kilowatt hours to date.

The company plans to spend between \$3 billion and \$4 billion a year on fiber as it works towards its target to cover a total of 30 million homes with the technology by 2026.

Also in March 2022, Verizon CTO Kyle Malady said the switch from copper to fiber infrastructure is saving the company millions of dollars per year and those benefits are expected to grow as it migrates more of its customers and central offices.<sup>4</sup> Speaking during an investor day event, Malady said Verizon has already upgraded 4.5 million circuits on its network from copper to fiber. It had converted 36 of its central office locations to all fiber at that point in time, retiring the copper plant at those locations entirely. The upgrade program delivered operational savings of around \$180 million, with more expected as the program continues.

"The savings are in part driven by a reduction in technician dispatches in maintaining the network and supporting customers. Additionally, we see savings because of energy from converting the copper to fiber," he explained. Malady said its savings were expected to "continue to grow as we convert more and more customers and more and more COs."

<sup>3</sup> [AT&T wants to cut its copper footprint in half by 2025 | Fierce Telecom](#)

<sup>4</sup> [Verizon CTO: We've already converted 4.5M copper circuits to fiber | Fierce Telecom](#)

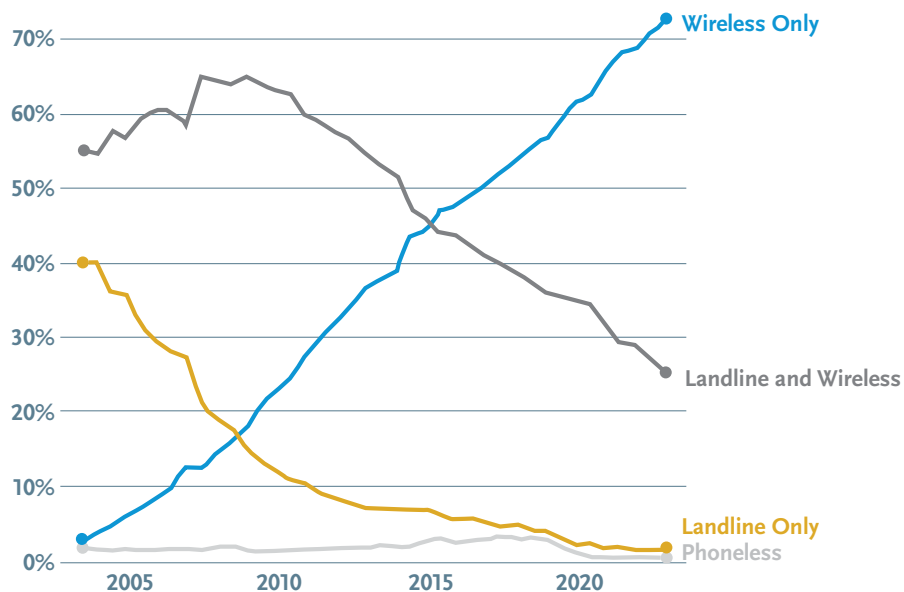
## PLANNING YOUR COPPER MIGRATION

Phasing out legacy plant is not a trivial experience but is one that is ultimately necessary to reduce costs and provide improved new services. Service providers must carefully plan a transition that considers all stakeholders and their various needs and requirements.

Working with the FCC and local and state regulatory agencies is key to getting approval for removing copper. Public officials will have to be made aware of the reliability and environmental benefits in upgrading to fiber as well as the potential for economic benefits to the community through job creation and retention.

Being able to offer equivalent or better services to existing copper-based offerings will be key in providing a transition path from legacy offerings onto fiber. For example, traditional wireline voice services will have to have an IP-based voice equivalent offering. In many cases the move to this is seamless to the customer, phones in homes do not need to be replaced. Business customers will be especially concerned about “losing” certain types of services, such as fax, unless they are presented with equivalent or better alternatives.

Be prepared to address objections to replacing services, with wireline phone service for emergency use being among the most critical concerns raised. As noted in a 2023 Washington Post story,<sup>5</sup> the percentage of continuing to maintain a wireline house phone service is dropping rapidly and less than 2% today rely on only a landline phone. Over 70% of households only rely on mobile services for voice communications and emergency use.



**Figure 7: Landlines Lost**  
Adult Population by phone options available in their household

Source: National Center for Health Statistics

<sup>5</sup> [Barely a quarter of Americans still have landlines. Who are they? - The Washington Post](#)

## THE FUTURE IS FIBER, THE QUESTION IS WHEN

Copper, be it twisted pair or coax cable, has served its purpose connecting millions of people and enabling an information-based society. The only question for service providers is when to move completely from yesterday's legacy media to tomorrow's future-ready network. Making the transition to an all-fiber network will deliver significant operational cost savings, enable the delivery of new services both today and in the future, improve network reliability, improved customer experience and provide substantial ESG benefits.