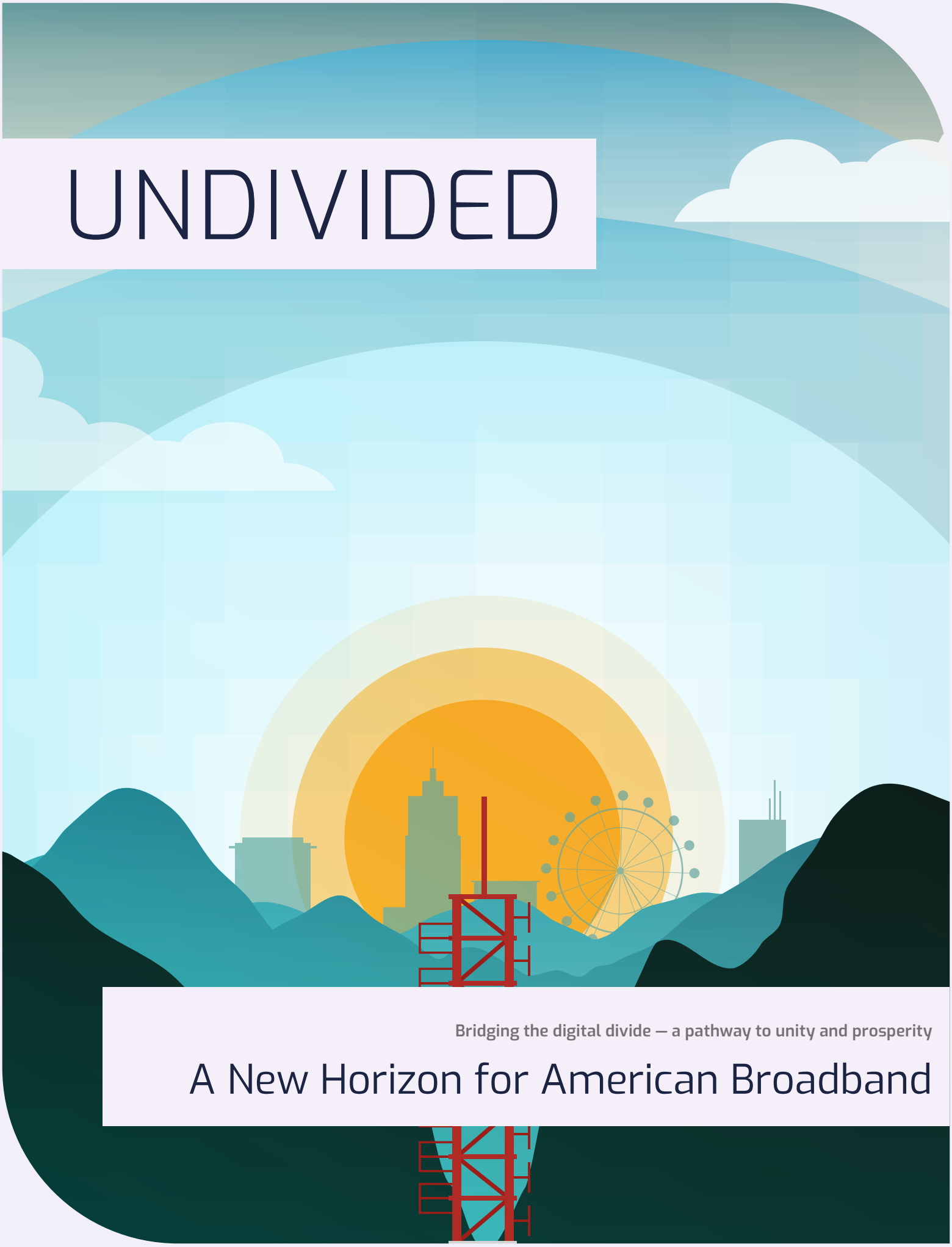
UNDIVIDED



Bridging the digital divide — a pathway to unity and prosperity

A New Horizon for American Broadband

Table of Contents

Executive Summary

In the United States, Internet connectivity is critical infrastructure, but it hasn't been treated as such. Because of our inability to classify broadband Internet as a utility, rural areas tend to suffer most. The dearth of the reliable, high-bandwidth Internet connections, typically more available in urban and suburban areas, holds back our rural areas economically and socially. In order to paint a clear picture of the digital divide we must look back 100 years, to the roots of this problem: the infancy of our electrical grid and national telephone networks. In doing so, we can better understand the patterns of behavior that feed the conflict between public and private interests, and create solutions to move the needle of progress.

In light of the many effects of the COVID-19 pandemic, the importance of broadband for rural communities cannot be understated. Politically, it is now widely acknowledged as a bipartisan priority. However, disagreements about implementation stem from near-deliberate attempts to cloud the picture about current broadband capabilities in the U.S. Due to a lack of accurate coverage data, America doesn't have a clear picture for distributing funding from programs like the American Jobs Plan, the Universal Service Fund, the Emergency Broadband Benefit Program, or USDA's ReConnect Fund. As such, achieving the goal of rural broadband deployment will be difficult to quantify and deem complete.

Given geopolitical uncertainty and the potential for future pandemics, federal and state governments, private industry and cooperatives, must move quickly to materialize results in mere months — not in years. It is incumbent on all communications service providers (CSPs) to think innovatively and build flexible, diverse networks that incorporate multiple data connection sources for backhaul and transmission to individual's households. Implementing agile, bleeding-edge solutions is not only imperative for CSP first-dollar revenue, but to bring necessary economic and physical well-being to areas where those were previously fleeting concepts. Wireless Internet is the key to providing quick turnaround, but even fixed wireless equates to many more months lost.

So, how do we do this now? Agile, mobile wireless towers. Aluma Tower recognizes self-supporting, mobile, deployable antenna towers provide *the definitive platform* for CSPs to achieve near- and long-term success in rural broadband. The towers are low-effort, low-overhead, and require low-maintenance processes and equipment used to deploy networks with lighting speed. Agile mobile towers will minimize the impact to an existing CSP workforce, and ensure that workforce scaling is a reasonable process for even the smallest provider. The unanticipated deployment of resilient and profitable local broadband networks throughout the United States ultimately will be a significant win that cements the nation once again as an innovative leader in technological and social progress.

Failure to recognize mobile wireless solutions will lead to its own pandemic of protracted deployment intervals, ongoing regulatory roadblocks, geographical impediments, squabbles over the supremacy of various communications technologies, and unfulfilled obligations. Ultimately, all of these failures will cost money and time that cannot be reclaimed. With no broadband in their homes or pockets, rural customers will continue to remain stuck in time, which only serves to hurt America and drive economic and social disparity. Aluma Tower believes that now is the time to act — and for CSPs to embrace mobile telescoping towers as the definitive platform for rapid broadband Internet growth.

Undivided: An Introduction

It's safe to say that throughout most of 2020 and into 2021, you or someone you know was affected by at least one of multiple simultaneous pandemics in America: COVID-19, poverty, and a stark divide between those with adequate Internet access and those without.

At this very moment, we believe America's ability to move forward rests on recognizing our place* in this crucial moment and seizing on our collective ability to rally around a simple yet bold concept: a *new, more inclusive* age of information and communication accessibility.

In this paper we want to show *you* how you are central to helping put affordable and ubiquitous broadband access into homes and hands of the citizens of the United States — quickly and cost-effectively.

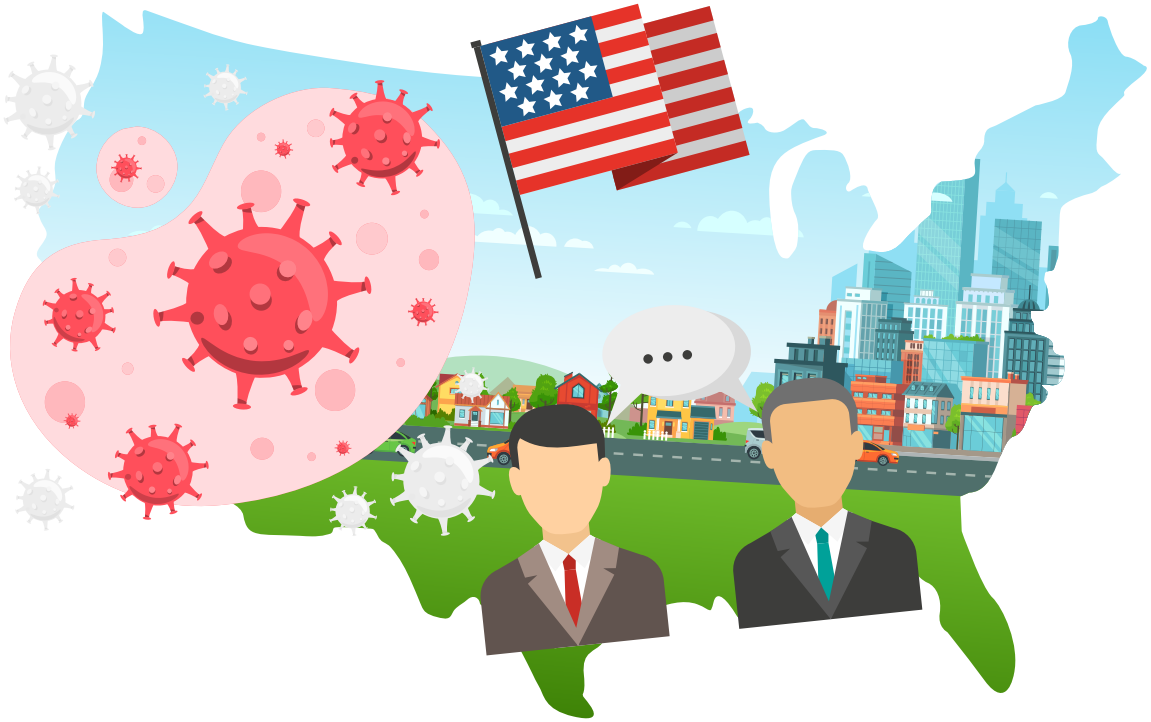
*So what does a company that started out making ladders and tuna towers know about rural broadband? Early on in our history, we developed a cultural competency at reading market forces and creating our own opportunities by pivoting toward what people need.

One of these pivotal encounters in Aluma Tower history was a request from a television antenna salesman, who asked us to create the first mobile TV antenna tower in the United States. He needed an effective and reliable demonstration method for better reception. In turn, our discovery of a market for mobile antennas leads us directly into our next pivotal moment — the future of American broadband.

Aluma Tower's passion for continuous improvement and redefining ourselves for close to 50 years gives us an uncanny ability to look for inflection points and pivot to them. We recognize that America is at a crossroads. Aluma Tower is here to help *you* bridge the divide.

ALUMA
TOWER COMPANY

01. How We Got Here:
Pandemics, Politics, and Geography



26/40

The U.S. ranks 26th out of 40 countries in the Organisation for Economic Co-operation and Development (OECD). As Americans we pay significantly higher prices for lower quality broadband than all but six developed countries.

Before we talk about the future, it's critical to recall a bit of Internet infrastructure history. The United States' Internet infrastructure rests on a largely informal patchwork of technologies and older networks owned mostly by local, regional, and national cable and telecommunications corporations. U.S. Internet is not so much a utility as an *arrangement*, overseen by the Federal Communications Commission (FCC).

Classifying Broadband

At present the modern FCC-designated standards for what constitues broadband are more than 6 years old, and delineated as service level at 25 megabits per second downlink speed and a 3 Mbps uplink speed (25/3 Mbps). The Department of Agriculture has an even lower standard for broadband, at a meager 10 Mbps per second. A frequent, but apt criticism in the media is that the FCC's current classification for broadband doesn't even take into account current-generation streaming technologies, or modern Internet user behaviors, including but not limited to online banking, media consumption, remote work via cloud applications, and video teleconferencing. Nor do the FCC or Deptarment of Agriculture take into account other critical metrics like reliability and latency (*where latency refers to response time from the device making an Internet request and the remote computer the first device is sending the request to*).

FCC Deregulation and the Resulting Political Divide

Looking back to the inception of the modern Internet in the mid-to-late 1990s, the FCC has taken a largely laissez-faire approach to Internet

THE BIG PLAYERS

1 The FCC

At times various incarnations of the Federal Communications Commission have attacked municipal broadband efforts, even considering it a violation of free speech. Across recent administrations the FCC has afforded carrier monopolies lax regulations and ample subsidies, without requiring specifics regarding outcomes, or accurate, granular coverage data from Internet providers.

2 Carriers, Cable, & ISPs

The FCC isn't exclusively to blame for our lack of broadband. Cable and telecom carriers for nearly a century have been building and maintaining an aged copper-wire infrastructure that has become so burdensome that it's nearly impossible to reliably serve customers in rural areas — fewer customers, spread out across great distances affects revenue and drives higher installation costs[8].
Most carriers have pivoted to wireless in recent decades.

3 Local Jurisdictions

Regional and municipal authorities frequently have had to adopt a go-it-alone approach to planning and deploying modern broadband solutions, often forming multi-community cooperatives or public-private coalitions. This ad hoc approach results in varying degrees of success, many of which serve as ongoing broadband experiments.

Where's the Money?

Currently there are hundreds of programs designed to incentivize and subsidize rural broadband rollout. Accounting for that money is another story, and an area where American broadband efforts are sorely behind that of other developed nations. Too often, initiatives meant to spur Internet development have lacked specifically scoped performance and availability requirements. Even more worrisome, carrier efforts to expand their broadband capabilities have become spending black holes, with necessary infrastructure degrading or sitting dormant, while quantifiable results remain elusive.

In May 2021, the New York State attorney general implicated numerous carriers in fraud by proxy when their PAC, Broadband for America, was found guilty of forging roughly 18 million public comments to the FCC, for the purpose of defeating net neutrality legislation that would have ultimately helped spur competition and held incumbent providers accountable.[3] Ulimately, American taxpayer dollars went toward depriving Americans of broadband.

infrastructure, entrusting its stewardship and expansion to handshake agreements various corporate entities. These agreements generally have lacked binding outcomes in the form of subscriber enrollment, specific geographic coverage, service level growth, or delineated responsibilities for specific types of infrastructure buildout and maintenance.

In parallel, attempts since the 1990s to enshrine the Internet as a utility have been heretofore politically unsuccessful. What does seem to persist is a perpetual battle between corporate and public interests, consistently ignited by local and regional grassroots efforts to affect change, and a merry-go-round of federal oversight and deregulation.[1] It was only in 2021 that bipartisan support materialized for ubiquitous broadband Internet. The New York Times in conjunction with Survey Monkey recently reported that 78% of adults said they supported broadband investment, including 62% of Republicans.[2]

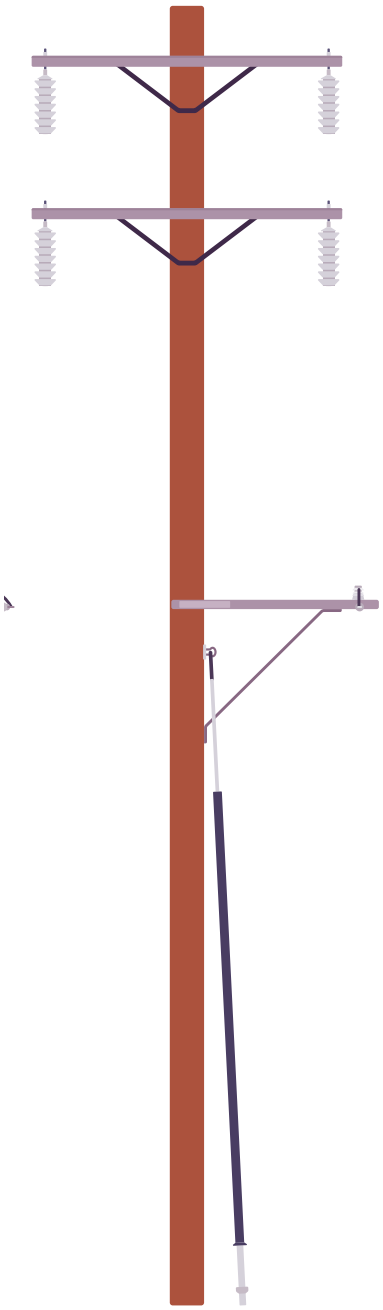
No matter the case, many Americans are *not* happy with their broadband coverage.[3] Unfortunately, one of the most pernicious deficits in the proverbial landscape of the digital divide is a lack of accurate information — or data. We don't know who gets what quality of Internet throughout most of the United States, at least not to any useful degree.

How Can We Improve Rural Broadband If We Are Destined to Fail by Design?

"The maps that show where there is service are horrible," said West Virginia Senator Joe Manchin. "I fought with [Trump Administration FCC chair] Ajit Pai about this for years. He just wouldn't come to accept that the maps were screwed up."[4] In response, Pai later said that the FCC had "initiated the creation of more granular, accurate maps," but to what degree we are still unsure.

Without accurate data, efforts to bridge the digital divide are bound to fail. In the absence of standards and good data, the U.S. government can't even make informed spending decisions or determine fulfillment of commitments to taxpayers. As such, any effort to improve broadband, rural or otherwise, really is destined to fail.

Public policy efforts to promote rural broadband adoption face unique challenges as a result. Federal and state support programs, such as the American Jobs Plan, the Universal Service Fund, the Emergency Broadband Benefit Program, or USDA's ReConnect Fund, are built on the assumption that reliable data actually exists for determining where high-capacity broadband services are and are not available to consumers. That assumption, however, is fundamentally flawed. The FCC and the rest of the federal government have



long relied on “Form 477 data” to determine broadband service availability.[5]

But Congress, the [Government Accountability Office], and third parties have pointed out in recent years that Form 477 data overstates broadband availability — often grossly. Despite these well-documented criticisms, the FCC has not corrected the significant and longstanding Form 477 data collection issues. For example, the FCC concludes that a census block is 100% “served” if any carrier is able to provide service to even one customer inside the block. Until these underlying issues with data are corrected, it is impossible for policymakers to accurately target public policy, including economic support mechanisms, in a manner that efficiently or effectively promotes the deployment of broadband services to the nation’s rural areas.[6]

With that in mind, it’s a fact that at the federal or local levels we don’t have accurate data on where broadband even exists. Compounding matters, we don’t know how *expensive* Internet costs are, relative to availability in a given geography, so strategies to ease connectivity to individual households are hampered, as the solutions and methodologies for providing them are tied in lockstep to the integrity of connectivity data. As such, any effort to correct the inequities of decades of poor broadband service is obfuscated by either an intentional or negligent exploitation of loopholes resulting in a lack of accurate Form 477 reporting — from both within the federal government and within the private sector.

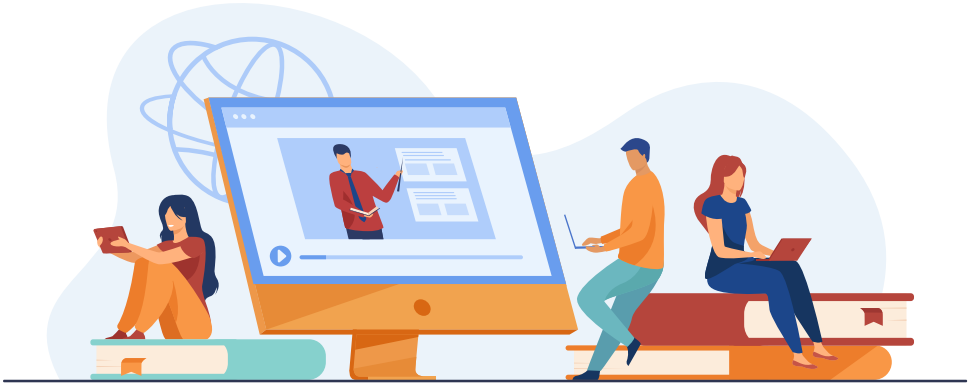
What Is Old Is New Again

The overall pattern of corporate resistance toward accountability and competitive growth, coupled with government aqueiescence and political division over Internet regulatory oversight, happens to follow an old playbook: our current Internet predicament is nearly *identical* to the fitful growth of the telephone copper-wire network and rural electrification in the early few decades of the 20th century.[2,]

A century ago, the United States government broke apart private sector gridlock with bipartisan passage of massive social welfare projects like the Rural Electrification Act from the New Deal, to funnel federal funds via low-cost loans into the non-profit cooperative electric power companies. These cooperatives were created by none other than frustrated farmers who had banded together[7], to bring light and distant voices into their communites and into peoples’ homes. And like the events of nearly 100 years ago a swirl of politics, social upheaval, a pandemic, and geographically-borne inequity are spurring us to boldly act.

The message has become clear: once again, average Americans must unite to ensure that *all Americans* have full and equal access to participate in the economy and social fabric of the United States if we are to advance as a nation and remain competitive on the world stage. Conflicting agendas between public and private interests hold America back. The digital divide was and is avoidable; we have the intelligence, material wealth, and capability to **create a nationwide, hybrid wireless and fiber network that is the envy of the world.**

02. The Truth Laid Bare: Educational and Financial Prosperity are on the Line



+35%

Of rural Americans have no access to home broadband Internet whatsoever.

The Distance Learning Gap

Prior to the COVID-19 pandemic, school systems were already experiencing budget and technology deficits that hampered their ability to offer consistent educational experiences across their districts. As a byproduct of U.S. educational structure, digital literacy and academic application of technology varies wildly from school district to school district, and from state to state. Nowhere, however, is that variance more pronounced than between rural and urban school districts. Additionally there is no national standard for access, mandated or otherwise, nor is there a baseline for educational connectivity from a technological or pedagogical standpoint. This is the “digital divide” in its most elemental form: disorder and imbalance.

When the COVID-19 pandemic struck in March of 2020, elected leaders quickly shuttered schools, forcing them to pivot to online learning models that had barely been tested in the past. Across the United States these distance learning efforts met with varying degrees of success. Educators, parents, and the media discovered quickly that many students were left in scenarios where they either lacked the devices, the necessary Internet connectivity to reliably participate in online class, or both. What then became apparent is the degree to which the nation’s Internet infrastructure was unprepared for the sheer bandwidth onslaught that would result from an emergency scramble to accelerate America’s distance-learning capabilities.

In the early months of the pandemic, and then again during the return to school in fall of 2020, school districts experienced a rush on funding to get students the devices and access they needed. The funding rush cascaded directly into hardware shortages across a technological spectrum that was further impeded by a global semiconductor shortage that continues into 2021. Compounding matters, the ongoing personal learning device shortage has been met with a parallel connectivity device shortage (ranging from modems to wireless routers and hotspots) to the most fundamental part of Internet access — the connection itself. School districts have

scrambled to shore up the lack of Internet access for sizable segments of their student populations, with districts resorting to the deployment of vans and schools buses at individual schools and other key locations, outfitted with mobile Internet gear to serve as temporary hotspots.

Even as of spring of 2021, school districts are still aggressively and proactively establishing their own Internet infrastructure to provide free wireless access in order to bridge the gap between the haves and the have-nots within their school communities. By summer of 2021 it is quite evident that Communications Service Providers of all flavors need to come together with the nation's school districts to provide more substantial long-term solutions to get students the necessary connectivity to receive modern educations, equipping this generation of "Zoom learners" to successfully enter a technology-driven workforce later on in life.

The Telecommuting Gap

Alongside the initial COVID-19 response that drove school closures, "nonessential" knowledge workers were widely

implored by their local governments and employers to work remotely. By late spring and early summer of 2020, nearly half of all American workers became remote workers in some capacity.[**] According to The Wall Street Journal, as much as a quarter of the U.S. workforce is expected to remain remote indefinitely. By some estimates, the corporate pivot to remote work even gave a boost to the then-flagging domestic economy as COVID-19 lockdowns put a particularly severe strain on small American businesses.

To compound an already strained situation, the COVID-19 outbreak put many in the at-home workforce in direct competition with distance learners. Throughout the pandemic, as many as 50% of U.S. households had at least one parent telecommuting, as well as one or more students engaged in remote learning. Where there was already significant pressure on households with one or multiple telecommuters indefinitely relegated to working in the home, households with students and remote workers felt an additional crunch. The rush to obtain bandwidth and technologies suitable for blending countless American homes into remote office environments ran parellel to school districts' nationwide technology rush, bubbling over into a sort of remote collaboration chaos. While demand for hardware is now leveling out in mid-2021, the lingering connectivity deficit looms large for telecommuting American households.

In fact, with many Americans unmoored from their live-where-you-work culture, the U.S. real estate market has experienced quite an unexpected upending. Smaller, secondary and tertiary metropolitan areas suddenly became extremely attractive for their lower population densities, lower costs of living, lower levels of traffic congestion, and more affordable housing (with some families reducing their living costs by 50% or more).

Companies as large as Zillow, Salesforce, Nestle, and Slack have made firm commitments to making remote work a cornerstone of their corporate culture. Remote workers are now being freed from time-sucking commutes and too-numerous in-person meetings, and other various environmental distractions that have ultimately become too common in the American workplace. Traditionally, however, the workers with the ability to telecommute have been higher-paid professionals. At the lower end of the pay scales, many workers have seen less support from employers for remote work. That includes employees in rural areas who often work for smaller businesses.

Our ability to quickly pivot to remote work saved many American jobs. Hybrid work environments likely are here to stay, primarily because remote work makes sense for many of our lives and has now been broadly experienced nationwide. Coexisting alongside our distance learners, also known as the Zoom Generation, telecommuting Americans need a resilient, scalable and ubiquitous connectivity infrastructure — sooner than later. An essential component in moving forward is ensuring that a greater segment of the workforce, regardless of geography, has the ability to participate in the telecommuting experience, for greater flexibility as needed..

The Workforce Recruitment and Retention Gap

Broadband, post-pandemic, will have an outsized impact on recruitment. As we have become accustomed as a society to engaging more online, the expectation is that employers in areas wanting to attract real talent can ensure access to connectivity.

For example, the owner of Weiler, an an asphalt paving equipment manufacturer based in rural Marion County, Iowa, doesn't see it any other way — recruiting is its No. 1 problem. "How do you get young people to want to move back into these rural areas when they feel like they're moving back into a time frame of 20 years ago?" Patrick Weiler asked his NYT interviewer rhetorically.[2]

Businesses like Weiler are not only experiencing a deficit of talent, they also can't fortify their enterprises against future crises like COVID-19 without adequate broadband. In Weiler's case, sending knowledge workers home as a precaution to protect its workforce meant that employees were faced with spotty and unreliable access that hindered their ability to perform their jobs: "We're talking 'seven minutes to download an email' type Internet access."[2] Such confounding work conditions don't bode well for the average American small business.

The Adult Education Gap

Across the past decade the proliferation of Massive Open Online Learning platforms like Coursera, Linda.com, Masterclass, and Pluralsight — to name but a few — speak to the incredible value and potential for self-improvement that Americans crave. Already many businesses and universities have leveraged partnerships with these platforms, or created their own, to enhance opportunities for adult learning. Prior to the pandemic, the demand for professional "micro-credentials" were on the rise.

The stark reality that many Americans were faced with in 2020-21 is that their ability to remotely engage in continuing education to develop new skillsets, or realign their career path, was severely hampered by poor connectivity. Lacking the ability to engage with in-class participation or to use sophisticated learning platforms put a professional boost just out of arm's reach for so many American adults under normal circumstances. The pandemic only exacerbated Americans' struggle here, too.

In retrospect if one weren't aware of the pandemic's relationship to poor broadband, they might be forgiven for posing the question: What better time to rely on online learning to pivot to a new career than when your office has been closed and you've been furloughed? The reality is that vocational programs which typically rely on work placement were hit the hardest by lockdowns, preventing workers from receiving hands-on training. Only the most sophisticated remote learning environments can provide comparable experience, and that requires — you guessed it — broadband.

As a result, rural American locales' obtaining certificates, enrolling in skills courses, and participating in adult education are all demonstrably threatened by lack of access — physically and digitally. Lack of broadband access in rural areas constitutes a form of professional and intellectual redlining that must be immediately resolved, for the betterment of the U.S. populace and for the American economy.

Smart Agriculture

Another sector that saw an abrupt disruption from COVID-19 was precision agriculture, coupled with agri-tech. Reduced

availability of semiconductors, raw materials and a precipitous drop in agricultural employment has temporarily cast a pall on this particular area of human progress and automation. As it regains traction, the agriculture Internet-of-Things market is set to explode and be worth an estimated $32.75 billion by 2027[**].

In order to run farms more efficiently, to sate our rising world population's demand for food, to more efficiently utilize water and land resources, to become less reliant on pesticides and practice more sustainable farming practices at scale, and to

maintain an orderly and dependable supply chain, tomorrow's farmer will be more reliant on the Internet and smart devices. This means that most farms will on some level rely upon devices like drones, a wide variety of sensors, irrigation and livestock monitoring systems, and big data processing to make sense of it all.

As of 2020, North America has the largest installed base of precision agricultural IoT ("Internet of Things") devices in the world. North American farmers have a demonstrated tendency to invest in upgraded smart hardware that has interoperability with existing and future technologies — to ensure the longevity of their livelihoods and to maximize their yields.

Yet despite being the most technologically-advanced region in the world for automated farming, the U.S. lags terribly in connectivity. The types of quantum leaps in agriculture we need for the food safety of our nation — and for the world — simply can't happen without widespread national adoption of broadband.

eCommerce and Logistics

With lockdowns came an explosion of online ordering and delivery demand. Where we saw closures and labor force contractions in the hospitality industry, overnight eCommerce became, quite simply, commerce.

At the same time that lockdowns put wage earners in a panic, eCommerce helped, at least a little, to preserve jobs during the crisis. For many of the restaurants that had to close during the economic freeze, online delivery services have become their lifeline.

Likewise, online fulfillment and grocery delivery became another lifeline. In the United States, Amazon announced that it will hire 175,000 new workers this year.

Online search patterns as well as credit card purchase data have given us a crystal clear indication of what role the digital economy is playing in this pandemic, and it has burst wide open former demographic barriers. Americans of all ages became overnight experts in online purchasing and payments.

Without connectivity, however, many businesses are still left behind in this reshaped economy.

Transportation and Autonomous Vehicles

In another not-unexpected pandemic twist, ride-sharing was severely effected. Post-pandemic ride-sharing prices have skyrocketed.

COVID-19 also has dramatically reshaped American perception of mass transit while simultaneously delaying autonomous vehicle testing and deployment. Part-and-parcel of that is a delay in the rollout of sufficient wireless networking service upon which driverless vehicle technology would rely.

Electrification and automation are huge priorities. While electric vehicles are undoubtedly mainstream, self-piloting

vehicles are still some way off in the future. How can we have self-driving cars that can only drive on certain highways, or delivery vehicles that get lost at the edge of towns, because they lack continuity of signal, or latency is so high that complex instructions can't be relayed back to vehicles in real time?

Real Estate

In addition to COVID-19 creating a rush to connect to school and work online, it shifted entire populations. Commuters no longer needing to combat rush hour traffic in urban and suburban areas began exfiltrating to exurban and rural communities where they sought to ride out the pandemic in relative peace.[10] Low interests rates have driven cutthroat competition for home purchases. People are buying houses off the Internet relatively sight-unseen, and sometimes for hundreds of thousands more than asking prices!

Smaller cities like Tulsa, Oklahoma, and Jackson Hole, Wyoming, are seeing real estate booms that are pricing out residents who have lived in those areas their whole lives. These small towns are now competing for the same tax-base and talent that were formerly housed by economic and tech powerhouses like Silicon Valley, Austin, and New York City.

They also share the same fatal flaw: a blessing for smaller real estate markets has turned to nightmares for some urban expatriates, where spotty DSL and astronomical cable and fiber installation costs hamper otherwise idyllic working conditions.[11]

In fact, the viability of entire job and housing markets is now being determined by an equation this simple:

"Will my home have adeqaute broadband?"

Because aging copper-wire infrastructure is being steadily phased out, grandfathered DSL plans are a hot commodity, so much so that sellers are paying the plans in perpetuity as a condtion of sale.

It sounds insane, but in reality it's more insane to not invest in our future. Homeowners are having to consider the long-term benefits to ensuring their homes are connected to wireless or fiber netowrks — not just for themselves but for future occupants.

03. A Matter of Life or Death: First Responders and Telemedicine

80%

Of routine doctor visits were conducted online in 2020... And there are no signs that doctors or patients want to slide backward post-pandemic.[**]

Telemedicine Tremors

Telemedicine in the United States has long been relegated to answering forms or questionnaires on medical network websites and insurance provider apps, requiring users to wind through bureaucratic decision gates in order to connect patients with medical professionals. Rarely did the technology live up to the promise of providing frictionless patient care, where everyone and everything is tidily prepared in advance of a patient's arrival at his or her appointment..

Prior to the COVID-19 pandemic, telemedicine adoption in the United States remained abysmally low. During the pandemic, however, usage surged since it was the main outlet for safe patient-to-provider contact. By April of 2020, 50% of doctors were using this method to treat patients, while in April 2018 this number was only 18%. This sudden shift to telemedicine was tectonic to the some 38 million Americans living in rural areas who had primarily only dealt with medical professionals in an analog capacity, especially for those rural residents who don't or didn't have reliable access to rural broadband. Even in urban settings, where transit options are often plentiful alongside options for primary care, emergency care, and specialists, the sudden shift to telemedicine proved jarring. The challenges for and risks to rural patients just rose that much more dramatically, with a sudden inability to receive in-person care.

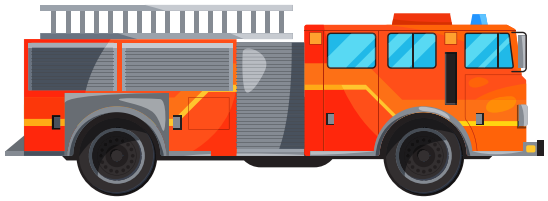
Our ability to provide new paradigms, secure and HIPAA compliant document transmission,

"Why did it take so long for telehealth to be widely used? There was no urgency. What you saw happen in March and April was sudden recognition that there was an existential survival issue for health care providers to move to a telehealth model—even if it was a little outside of workflow or slightly inconvenient. Since the onset of the COVID-19 pandemic, Mayo Clinic has conducted more telehealth visits per day than all visits combined in 2019."

— John Halamka, MD, president of the Mayo Clinic Platform

can convey the level of fidelity necessary to mimic in-person doctor's visits are all hampered by the glaring disparity in rural broadband. The absence of the hyper-availability that many of us take for granted in an urban environment can easily equate to a matter of life or death in rural settings.

Setting aside the human cost of poor rural broadband coverage, the economic potential of better coverage is quite evident. More consistent remote patient monitoring means



fewer surprise visits to medical providers and lower insurance premiums. A greater depth of information collected and transmitted on patient health means fewer health-affecting errors or oversights. Lower fuel costs and reducing the potential for lost wages benefit the individual patient, as well as employers and insurance providers. Reducing visit time and giving patients access to a much wider pool of physicians is a net positive for the nation. The potential to retain critical local business, like pharmacies, is also far greater.

Emergency Response and Public Safety

When discussing how rural broadband impacts and is impacted by public health, we also have take into account how rural Internet connectivity affects first responders as well: police, firefighters, emergency medical services, and agencies like FEMA all need access to current-generation communications and data technology in order to make informed decisions. Nowhere is wireless, high-capacity bandwidth in the field more critical than in rural environments.

The onset and precipitous rise of COVID-19 saw many EMS services and hospitals stretched to their breaking points. In these critical care scenarios, seconds can make the difference in a patient arriving to the ER dead or alive, and reliable communication and situational awareness tend to be the lynchpins. In-vehicle connectivity gives modern first responders coverage en route to emergency scenes or hospitals. Tablets, medical sensors and other diagnostic tools used to monitor patient health can relay information to hospitals in real time. Mobile telescoping wireless towers allow municipal and regional authorities the ability to equip mobile command centers to deploy or extend their own networks, extending coverage for individual responder activities, and ensure precision blue force tracking.[12]

Disaster Response and Recovery

In November of 2020, the FCC's Disaster Response and Recovery Working Group presented a paper to its parent group, the Broadband Deployment Advisory Committee, that showed voice traffic and texting rose significantly on cellular networksduring the pandemic. Mobile data usage spiked. Traffic patterns changed overnight, altering with them the

demand that specific cell towers experienced. Mobile hotspot usage soared exponentially from pre-pandemic levels.

We've seen the behavior of the American people pivot to digital communication during a slow-moving disaster. Without significant gains in wireless rural broadband connectivity, future disaster response and recovery efforts and corresponding social impacts will indeed suffer. In disaster scenarios, where drones can assist in search and rescue efforts, responders will be heavily reliant on high-resolution video streaming and telemetry from sensors to detect body heat and hazardous materials. For large events and natural disasters where video reconnaissance is essential to mountain a response, mobile broadband with the coverage, capacity, and speed is key. The networks have to be flexible and resilient enough to keep pace with real-time changes, and prevent spikes in civilian digital commuications from interfering with response efforts.

Connectivity Comorbidity: Corresponding Social Impacts

Rural enclaves aren't just reliant on broadband for their economic, educational, physical health, and safety reasons. Broadband also serves as a stitch in our social fabric. In normal times less-connected senior and disabled populations struggle with isolation. During the pandemic, that risk became heightened and nowhere more than in areas devoid of reliable connectivity. The pandemic forced people to become creative in avoiding large, ritualistic social events like concerts, graduations, church gatherings, wedding ceremonies, and funerals. Our collective ability to experience these fundamental social events is key to maintaining mental health and intrapersonal relationships.

Beyond that, school readiness, high levels of absenteeism, high air pollution levels, food insecurity, elevated crime, and

lack of transportation options typically coincide with areas that have a lack of broadband availability, creating atmospheres of isolation and hopelessness. We have societally come to a place where we acknowledge that health is interlinked with other parts of our communities' infrastruture.

The case can be made for a strong relationship between education, health and broadband. Universally accessible and affordable Internet would go a long way toward ensuring that Americans have the ability to absorb the daily hardships of life and the huge curveballs that come along every now and then, like global pandemics. With reliable, nationwide high-speed Internet we might even be able to innovate ourselves out of the next one.

Mobile broadband has to have three characteristics in order to support public safety use: coverage, capacity and speed.

— Fire Chief Charles Werner (ret.), director of DroneResponders

04. Racing Against the Clock: Achieving the Impossible

Time is absolutely of the essence. Do we have what it takes to rise to the occassion? Well, that depends on your vision.

Ultimate Cost of Ownership: Big Impediments Hold Back Broadband

Fiber optic connectivity is often billed as nearly limitless in terms of its upgradability — with only the sending and receiving devices at each endpoint needing to be changed out as network technology evolves. While the physical cabling has a lifespan of at least 50 years, communications service providers are reluctant to absorb the capital expense of creating this physical layer for their networks, because significant effort must go into literally burying it in the ground.

Communications service providers are nonetheless enthusiastic about the current windfall of government subsidies headed their way. What has become immediately apparent, however, is that there is no single governing philosophy and no ubiquitous, co-evolving method of governance in the broadband space to hasten rural broadband deployment. Moreover, old modalities of deployment only serve as additional stumbling blocks to slow the rollout effort.

What is required of us, at this very point in time, is a bold vision and new recipes for lubricating the machinery of bureaucracy in both public and private sector interactions.

Right of Way: Digging Ourselves Out

A significant portion of the mire bogging down the rural broadband initiative is right of way: where a legal easement or agreements define how a utility has the right to use, access or move across a piece of property.

State lawmakers across the nation must act quickly to put in place standardized agreements between public and private entities, which will be no small task. States will have to legislate more consistent systems to address how localities and utilities negotiate right of way. Additionally, they may have to step in and adjudicate how entities in the private sector grant right of way to each other for the purposes of broadband deployment.

Aluma Tower firmly believes that our range of commercial and consumer telescoping, mobile and fixed aluminum towers are the bridging medium to aid in near-term broadband rollout milestones.

"We have 159 counties and 600 cities, and everybody's doing something different. First we need to address the immediate concerns, then address the long-term concerns with a standardized system that benefits municipalities, the counties, the vendors, and most importantly benefits the citizen," said State Sen. Butch Miller, R-Gainesville, Georgia.[13]

Proposing a Hybrid Solution

Of all the many available topics of discussion and points of divergence and disagreement that rural broadband can elicit, one of the points most experts agree on is that there is no panacea; no magic bullet for reaching a solution to the digital divide. Just as today's rural Internet customers have become accustomed to bifurcated approaches to connectivity, toggling between 4G hotspots and satellite when their home access becomes unstable, we too must embrace more agile approaches to instituting nationwide broadband.[25]

Original Equipment Manufacturers and CSPs would do well to stop trying to take a bite out of the problem as a whole, and instead begin to triage at the state level. Approaching problems and implementing solutions incrementally is the path forward — so we can better chew and digest broadband rollout that way. Setting priority for the areas in greatest need will be a critical first step.

Determining intervals for deployment within areas of highest need and then triaging — creating near-term and long-term targets for connectivity — in terms of coverage, bandwidth, and reliability will be the second most important step. According to the National Governors Association 2020 Governor Strategies to Expand Affordable Broadband Access:

"Governors have many policy and programmatic tools at their disposal to provide both immediate and long-term access to broadband. The below strategies are marked to symbolize either solutions for service that can be deployed quickly and at lower cost, but may not provide full connectivity or the highest speeds (referred to as "nearer-term solutions"), or longer-term, more permanent solutions for technologies such as fiber (referred to as "longer-term solutions"), or marked with both symbols for strategies that can be applied towards both objectives."

States themselves are recognizing and embracing their outsized role in providing either monetary, material, or legislative vehicles for hastening broadband rollout. They just need some helping hands and an extra push from subject matter experts to fill in the knowledge gaps.

Last, but most critically, all 50 states and D.C. must encourage counties and localities to pull together a range of providers — terrestrial fiber installers, fixed wireless vendors, mobile wireless vendors, and communications service providers of all types — and then set about creating an achievable game plan for buildout within specified areas. That plan should be iterated upon and revisited without fear of commitment to grandiose promises or unachievable goals. No one city or town, cooperative, OEM, or CSP is going to be able to provide all the answers.

Ultimately, the smartest play will be the one that gets connectivity to the household AND first-dollar revenue in the pockets of CSPs, municipalities, and cooperatives. Aluma Tower firmly believes that our range of commercial and consumer telescoping, mobile and fixed aluminum towers are the bridging medium to aid in near-term broadband rollout milestones.

Aluma Tower: A Platform for Innovation

Aluma Tower has spent the better part of 20 years perfecting the art of lightweight aluminum tower fabrication to solve unique communications problems for a range of clients including private industry, the U.S. government, and the military.

It began with a question. “Could you attach a tower to my truck?”

The call came from a traveling salesman looking for a mobile way to demonstrate the superior picture quality of his television antennas to his customers. Piquing the owners’ interest, this question opened a pathway to creative application-focused solutions. Matching engineering expertise with the superior benefits of aluminum, the Aluma team developed the solution while proving collaboration with customers is the key to success.

In the design phase, Aluma engineers quickly realized just how strong this unique tower would be, yet it would be light enough to stow and deploy multiple times a day. The customer accepted the tower delivery and was ecstatic. He stopped by the shop on a regular basis in the following months to provide positive feedback and to brag about how his sales increased with the Aluma tower.

Our heritage as a pioneer of customer-focused solutions was born. Standing apart from competitors, Aluma saw the future and kept moving forward.

Aluma introduced another popular product, the Cell on Wheels, or COW. The COW was an inventive response to market demands for an antenna mast to use in meteorological forecasting, environmental testing, and military exercises. This enclosed shelter was mounted on a trailer with a tower that could be hoisted up. It could be towed with a light-duty truck to all terrains, including the most difficult areas, and serve as an instant telescoping antenna mast.

A Platform for Excellence and For The Future

Aluma forged the aluminum tower industry, leading the market with state-of-the-art ideas that completely reinvented how portable tower and mobile tower-trailer solutions were engineered and fabricated. The entire engineering library, created over our 50 years of existence and containing thousands of tower models, greatly reduces engineering charges passed onto the customer. We use our unique approach to customizing solutions to enhance the customer experience.

All products are designed in our in-house engineering department, and with complete transparency in a collaborative relationship with the customer. From inception, Aluma has produced the highest quality products using the best material. Aluma designs and delivers customized, robust, innovative and integrated solutions and services for our customers.

Aluma Tower envisions near-term scenarios where localities, cooperatives, and CSPs will band together to deploy small fleets of trailer-mounted mobile towers in key strategic locations, creating agile and scalable networks to connect previously underserved communities until more permanent fiber and fixed wireless solutions can be implemented.

Back to Terrain and Mapping Network Quality

We have to fix the data. As mentioned previously, without knowing far more precisely who has what Internet coverage, at what data rates and reliability, and more importantly — who doesn't — the United States can't possibly begin to allocate the necessary resources for undertaking ubiquitous nationwide broadband coverage. America needs an honest appraisal of its broadband deficit before it can begin to truly make a dent in it. While there is no comprehensive, centralized, publicly available broadband map for the entire United States, the Fiber Broadband Association has compiled separate broadband maps from 43 out of 51 states and the District of Columbia (not documented are Alaska, Arkansas, Florida, Georgia, Hawaii, Maine, Missouri, and Wisconsin). The sources of coverage maps vary from states themselves to associations, cooperatives, and NGOs. We've compiled these resources into a list available on the Aluma Tower website:

https://www.alumatower.com/coverage-maps/

Synchronizing Our Efforts

Despite the extant issues with right of way, experts believe there's plenty of potential for public and private partnerships. One such proponent is Taylor Reynolds, director of Technology policy for the Massachusetts Institute of Technology (MIT) Internet Policy Research Initiative. He believes that creating regional backbones, perhaps in each county, is the best route. Boosters of strategic "dig once" efforts assert that synchronizing fiber deployment dig efforts with local governments as they engage in road construction projects is probably the most efficient route to ensure guaranteed success for terrestrial fiber rollout. In such a proposed model, government absorbs the cost for installing and maintaining terrestrial fiber, and it would lease fiber access back to the private sector to recoup the costs.

Adding to that hypothetical, a scenario involving Aluma Tower products to assist in terrestrial fiber deployment, our mobile towers are ideal for being stationed, and periodically repositioned, at key fiber endpoints as the fiber network expands. The mobile towers can serve as temporary ad hoc wireless distribution and access points, where some flavor of wireless connectivity can serve as a stopgap to connect households nearly immediately. This would give localities the ability to gradually introduce higher bandwidth access to new areas while simultaneously recouping revenue from CSPs, thus resolving an ages old "chicken or the egg" paradox when it comes to infrastructure funding.[14]

"Having such a dissonance between data and reality makes it difficult to allocate resources to the places and people that need them most."[24]

> "Among American citizens, there should be no forgotten men and no forgotten races."
>
> Franklin Delano Roosevelt
> **32nd U.S. President**

Current-Gen Woes and Quantum Leaps: Wireless, Spectrum Sharing, and Satellite

Without a doubt fiber optic cabling presents a monumental cost and undertaking. Industry estimates suggest that installing fiber optic cable — the gold standard of broadband service — can cost $30,000 per mile.(*9*) This means that delivering sufficient broadband to remote parts of the U.S. would cost billions of dollars, on the order of $80 billion or more [**], an expense the private sector has not yet been willing to pay.(*10*)

Pre-pandemic, governments and wireless carriers seemingly had hung their hopes on 5G, as a reasonable alternative to fiber; primarily as a means for mitigating the high costs and time constraints of deploying rural broadband via terrestrial fiber optic cabling. However, American efforts to roll out 5G haven't materialized in any meaningful way, largely because of our inability to acknowledge and invest in a solid fiber backbone for wireless Internet to coexist with. The mere physics of wireless data transmission require that 5G technology incorporate a fiber backhaul component.

There's also the not-so-small issue of the allocated spectrum for 5G. In the U.S. instituting the short-band, millimeter wave frequencies that underpin American 5G technology requires a transceiver densification that, while potentially achievable in urban areas, is nearly impossible in the American rural expanse. The density of 5G transmitters necessary to cover the American expanse is a more physically and economically insurmountable proposition than just covering the country in fiber optic cabling to begin with.

Within the wireless telecom industry itself, 5G isn't regarded seriously as an appropriate platform for fixed wireless service to rural homes and businesses. Coupled with maximum distance limitations of a couple hundred feet, 5G suffers from the potential for minute physical obstructions to cause large signal disruptions. 5G microwave signals' inability to penetrate coated glass is yet another stumbling block to 5G in the home.

> "5G is a not a solution to rural broadband issues."[**]
>
> *Shirley Bloomfield, CEO of NTCA-The Rural Broadband Association*

The two incumbent players who stand to benefit most from 5G are AT&T and Verizon. Their terrestrial footprints almost never overlap, and through as series of agreements over the years, they've largely ceded their residential and commercial wired services to cable companies and other carriers[**]. Without lightning-fast deployment of last-mile fiber access to ultra-densified 5G transmitters mounted on poles throughout U.S. towns and highways, 5G is just fantasy as it relates to the rural broadband effort.

5G Alternatives

So, what are the alternatives? It's absolutely true that despite the lack of true competitive alternatives to fiber optic, we have existing cellular and wireless technologies that offer experiences similar enough to broadband. 3G, 4G LTE, WiMAX, and other proprietary protocols from companies like Cambium Networks and Mimosa are still popular choices in rural America[**].

Some school districts in rural Texas and Utah are experimenting with using portions of the 3.5 GHz band which was opened up as a pilot for the Citizens Broadband Radio Service Spectrum. Microsoft has experimented in earnest with TV white space[**]. Its pilot envisions adding TV white space (aka "Super Wi-Fi") signals in the VHF and UHF spectrum to LTE fixed wireless, and satellite coverage to reduce initial capital expense by approximately 80% compared to fiber, and close to 50% compared to current-gen fixed wireless hardware. In Microsoft's experience, they've been able to provide Internet connections at up to 10 miles from these white space base stations — a promising technology indeed.

Satellite Saviors?

For some time now Americans in rural areas have been able to subscribe to Internet services via satellite providers. Satellite Internet, until recently, was regarded as extremely expensive relative to the speed and reliability of the service. Older radio-based satellite signals are also renowned for their high latency, or lag, making gaming or even mundane usage like streaming a movie or basic video conferencing a frustrating experience.

The landscape, or skyscape, as it were, is changing in that regard. A number of satellite startups are launching simultaneously and aggressively — with Amazon, OneWeb, and incumbent Telesat all scrapping for dominance in an already crowded orbit. These new satellites services are a bit different, though, as they employ massive swarms of smaller "cubesats" in asynchronous, low-earth orbit to create redundant connections beamed to subscriber dishes via laser, and into the home.

As of May 2021, SpaceX has already launched 1,442 satellites into low-earth orbit, and plans to launch a grand total of 42,000[**]. Starlink has had over 10,000 beta testers, and by most accounts those customers enthusiastically endorse Starling-based broadband as more than adequate, with some seeing up to 200 Mbps download speeds. Of course, the service is still in beta, and the service's bandwidth and reliability could change significantly as it adds more customers to its roster[**].

At $500 to purchase the equipment to get started, and at $99 per month for the subscription, Starlink and competitor

services could remain out of reach for many rural customers. Cost notwithstanding, satellite can literally remain out of reach if a subscriber doesn't have a clear, 100-degree unobstructed field of view of the sky (in the case of Starlink). Fortunately, the agility of Aluma Tower and our ability to quickly develop mobile telescoping masts for a variety of applications is advantageous in this scenario: we've developed three specific products that can elevate 30 to 100 feet to achieve the necessary field of view.

Aluma Tower also has factored in easy adaptation for future generations of Starlink's "Dishy" product, as well as dishes from other providers. We see opportunities, at the commercial and community levels, to leverage satellite connections shared amongst multiple rural subscribers to provide more affordable satellite broadband than is achievable via their current wired or wireless offerings, at less expense than individual Starlink dishes cost for a single household. Consequently, Aluma Tower is actively exploring the possibility of partnerships with satellite providers, to create those access points for serving multiple satellite customers.

WISPs: Heroes of the Day

Despite a dismal lack of fiber connectivity to the home, gains are being made by scrappy upstarts on the CSP side, specifically by wireless Internet service providers. They don't carry the same clout or garner the same attention as incumbent telecoms and cable companies, but WISPs are bringing signal to formally dark rural areas when no one else would. WISPs are typically able to lease dark fiber for middle-mile backhaul. They can serve an area in a 3-5 mile radius from a single distribution point, usually from a tower or tall landmass[**], and are able to do so at a cost far cheaper than the cost of laying fiber to the home.

WISPA estimates that there are about 2,000 companies providing fixed wireless broadband access across all 50 states, serving an average of 1,200 customers each.24

That's an impressive amount, but not nearly enough to cover the some 30-to-50 million Americans living in rural America with almost zero access to modern broadband. The fixed wireless industry needs a huge shot in the arm in order to accelerate its deployments to get America connected. And by all accounts WISPs deserve it: they are uncharacteristically well-liked by their customers. Anecdotally, this type of CSP is started by people from communities with storied histories of self-reliance. They're the people who got fed up and decided to do something about it. They have low customer turnover, bring better connectivity than traditional satellite Internet services and DSL, create local jobs, and spur economic growth in areas that desperately need it. What's not to love?

Aluma Tower feels a special affinity for fixed wireless providers, as our missions and technological expertise overlap. We see towers like fiber, in that they can be used as infinitely upgradeable media or platforms to deliver signal to underserved areas for a fraction of the cost of terrestrial last-mile installation. High-bandwidth wireless broadband also can be brought to market in much quicker intervals than fiber or other terrestrial solutions.

Our vision for collaboration with WISPs looks something like this: Aluma Tower mobile telescoping towers are perfectly positioned to expedite WISPs in establishing and expanding their network footprints. With a half-ton pickup truck and two workers, an Aluma Tower trailer can be deployed in a matter of hours. Mobile telescoping towers can provide significant return on investment, enabling WISPs to recoup first-dollar revenue much sooner than traditional installations as they can be used almost immediately and don't require zoning or surveying. Aluma Tower trailers are self-leveling and can be deployed on a 5-degree slope, which means very little siting has to be performed prior to deployment. For more inaccessible sites, we carry models with ISO-certified helicopter hooks. Aluma Towers are reusable as well, so as fixed sites are brought online, our telescoping towers can be relocated to expand WISP network footprints or densify signals. There's also huge potential for Aluma Towers to be used in emergency situations, for redundancy when fixed equipment fails or for disaster recovery efforts.

The Money Game

In the late 2010s and early 2020s, American leadership finally committed to subsidizing its rural broadband rollout. Under the USDA's Reconnect Program, aimed at connecting rural agricultural areas to modern broadband Internet, applicants have a shot of up to $200 million in grants, 50/50 loan combinations, and low-interest loans. During the pandemic the FCC unveiled The Emergency Broadband Benefit Program. The EBP is a $3.2 billion federal initiative that provides qualifying households discounts on Internet service and opportunities to receive discounted prices on

computing devices. SpaceX's Starlink receiving a large tranche of funding via the Rural Digital Opportunity Fund, which makes available $20.4 billion to deliver fast and reliable Internet across America[**]. The RDOF is an FCC program, funded by small fees added to cell phone bills, with its intent to persuade CSPs to deliver broadband specifically to underserved or unserved markets.

"[Broadband] creates jobs connecting every American with high-speed Internet, including 35 percent of the rural America that still doesn't have it."

—President Joe Biden

The American Jobs Plan commits $100 billion to broadband funding alone. While the details of that plan are still murky and Congress debates allocation, it's a significant signal. Under the administration of President Joe Biden, the message is clear: broadband Internet connectivity is a national priority, made affordable and available to everyone, particularly in underserved rural areas. CSPs in turn have little time to come to the same conclusion that investing in fiber, wireless, and satellite networks is of the utmost importance. Fortunately there's now funding in place. Concerns about capex and loan repayments are still very real, but the government subsidies offered in 2021 far eclipse anything we've since the REA in the 1930s or the Federal Highway Act of the 1950s.

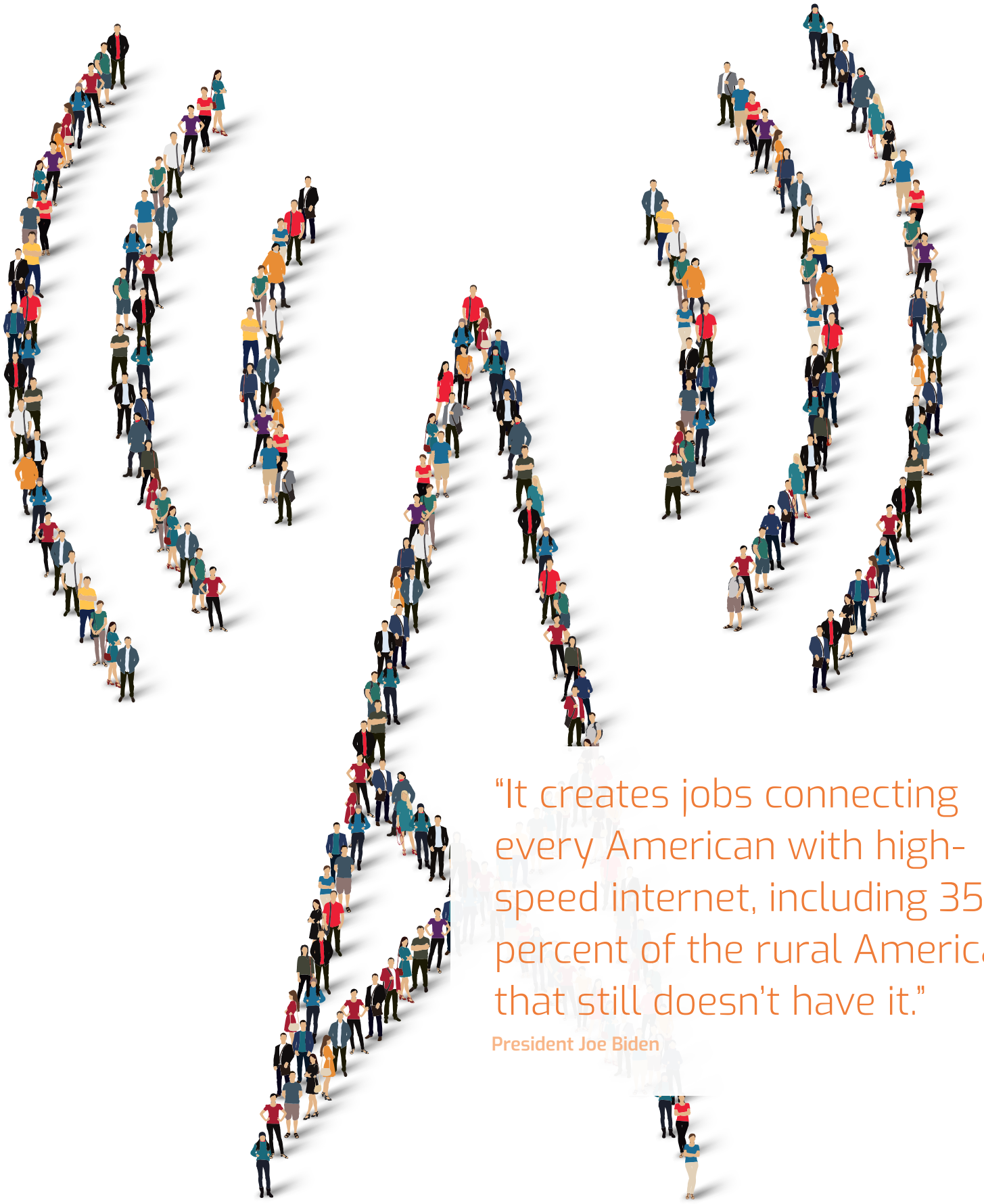
It's crucial that we all have skin in the game and have a long-term vision — these are just fundamental to human nature and achieving the goals we set for ourselves [**]. Cities, counties, and towns will still need to consider bonds, and taxpayers will need to be educated that as long as broadband projects are successful they'll never be on the hook for a dime. Governments and CSPs will have to sweep aside short-term, revenue-optimized thinking. We must do well to remember that value isn't all ROI, either — after all, sewers and highways don't return a profit, but they are critical aspects of our modern lives. As subscriber payments start to bring in revenue, CSPs will be able to lease more dark fiber and get broadband into homes and businesses.

It's clear that none of us is in this alone, either. The Internet is full of broadband success stories from towns like Chattanooga, Tennessee, Wilson, North Carolina, and Santa Monica, California. These city and regional entities have been able learn from one each other, tweak and refine their approaches for their community and geographical limitations, and prove that their networks are returning value back to the community. The templates are there, America just needs to apply them strategically… and quickly.

None of this becomes a reality without wireless or fiber, used in masterful combination with one another. Aluma Tower sits at the center of that equation, making sure CSPs can bridge the digital divide in innovative ways, at a reasonable investment, so that residential and commercial Internet subscribers can start receiving signal in a matter of months, not years. When true, modern broadband connectivity comes to town, everyone benefits — it will just take some time, and there's no time to waste now.

Aluma Tower has compiled a freely available, comprehensive of list of funding resources at the federal and state level:

http://www.alumatower.com/funding/



"It creates jobs connecting every American with high-speed internet, including 35 percent of the rural America that still doesn't have it."

President Joe Biden

Fixed Wireless Towers

High Long-Term Operating Costs

Slow Fixed Deployment

High Maintenance

KEY DATA POINTS

- 10-24 months to deploy
- Require zoning and permitting
- Lead times on tower manufacturing
- Extensive use of heavy equipment for siting
- Require highly-specialized, limited-availability maintenance teams to perform work under hazardous conditions
- Over time the material degrades, and permanent installations will need to be taken offline for refurbishing and replacement.

VS Mobile Telescoping Towers

Low Long-Term Operating Costs

Rapid Mobile Deployment

Low Maintenance

KEY DATA POINTS

- 10-12 weeks to order fulfullment
- Can be used almost immediately
- Can be used temporarily, onsite while fixed installation is being developed
- Trailers are self-leveling, deployable on a 5-degree slope
- Towable by 1/2 ton pickup (some models)
- Helicopter hooks for drop-ins on more remote locations
- Regular maintenance requires far less skill and time vs. fixed wireless installations
- Reusable across geographies and can even be recycled

05. A Duty to Our Nation

Smarter Cities, Smarter Countryside Smarter Everyone

Our Generation's Call To Action

Deploying adequate, accessible, infinitely-upgradeable, and open broadband infrastructure is the clarion call for our time. Weaving layers of fiber and wireless access points into the tapestry of American culture and the American landscape will inevitably enhance our everyday lives in small ways, and create opportunity to change and improve our lives in far bigger ways than we can currently imagine — for individuals and for the greater whole.

These changes will come incrementally, and they will not be without struggle. We at Aluma Tower see it as a national priority, and our individual duty, to ensure that current and future generations of Americans from all walks of life have the potential to participate in their local and global economies, and to live healthy, prosperous lives. Access to broadband is the lynchpin to propelling forward everything — from American education, to industry, to an innovative healthcare system.

Failing to at least begin recognizing that broadband is indeed critical infrastructure and that other aspects of our physical and social infrastructure are dependent upon broadband, is an avoidable shame.

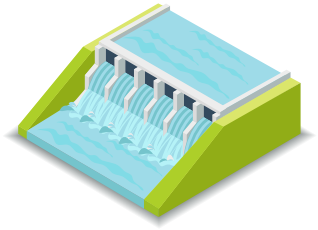
Infrastructure Modernization

Understanding the needs of the community are the needs of cities are the needs of the nation, may be the greatest hurdle that we face.

In 2007 the Interstate 35W bridge over the Mississippi River in downtown Minneapolis collapsed. The disaster sent bumper-to-bumper rush-hour traffic comprised of cars, trucks and a school bus down into the river below and onto the shoreline. In May of 2021 a routine inspection of the Hernando de Soto Bridge in Memphis, Tennessee, turned to panicked evacuation when an inspector discovered a crack in critical support beam that was nearly fully severed. Luckily, disaster was averted… This time.

As America's infrastructure ages, we find ourselves increasingly dependent on luck to escape the extreme consequences of negligence. Putting broadband on par with and using it in conjunction with water, sewer, and electrical utilities will have an amplifying effect on those utilities' longevity and resilience. The smartest path achieving that goal is to smarten our roads, bridges, rails, and waterways. The only way to accomplish that is to make fiber, wireless, and mobile broadband coverage ubiquitous thought out the United States.

Physical infrastructure equipped with smart devices is the future: bolstering human capabilities, smart-sensor equipped infrastructure will be giving us real-time awareness and empirical understanding of our environment and the impact to critical economic arteries. Fiber and wirelessly-enabled electrical grids can be monitored and optimized in real time, helping providers assess demand and preventing the waste of the 33% of electricity we give up to attrition. Smarter water utilities remotely linked with agricultural monitoring will help us conserve an essential requirement for life. The side benefits, seen even now in fiber-enabled cities, is that smarter utilities actually help pay for themselves.



The National Rural Electric Cooperative Association (NRECA) has prioritized broadband as part of its mission, “Broadband is a key part of modern co-op operations. It can improve grid reliability and efficiency and help pinpoint outages and speed the restoration of service.”[**] The NRECA goes on to say that some 6.3 million households currently within its member cooperative services areas would receive an estimated average of nearly $2,000 in economic benefits per year if those households had broadband access.

Revitalization and transformation of formerly industrial cities and towns is entirely dependent on connectivity. Storefronts and waterfronts will remain gritty ghosts of their former selves without widespread access to broadband signals, because no one wants to rent or buy homes in, or relocate major business to, areas with insufficient broadband. Hollowed out cities equal diminishing tax bases and further internal decline.

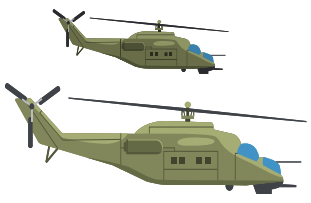
The only path forward is to smarten our roads, bridges, rails, and waterways. And the only way to accomplish that is to make wireless and mobile broadband coverage ubiquitous. IoT-equipped physical infrastructure bolsters human capabilities, giving us real-time awareness and empirical understanding of our environment and the impact to critical economic arteries.

"Next generation energy efficiency relies on streamlined data collection, automated and centralized controls, two-way customer communication, powerful data analytics..."

Rachel Smith,
Lesley Jantarasami
Bipartisan Policy Center

Climate Change + National Security

In the middle of 2021 alone, the U.S. has seen an alarming number of climate-driven events that have endangered American lives and confounded authorities. Extreme heat in the Pacific Northwest that rivaled summertime in Mississippi. For the second time in a decade, historic drought that has nearly emptied California reservoirs of the water that powers its farms and nourishes its population. Mudslides that have left Colorado motorists stuck for days in a remote mountain pass until rescuers could make their way through. The western U.S. engulged in wildfires that belched smoke plumes stretching all the way from Washington State to Washington, D.C. for months, altering entire summer sunsets and weather patterns in strange and eerie ways.



Humans are now undeniably masters of many domains in the air, on land, and at sea. In spite of all our numerous achievements and progress, we remain undeniably at the mercy of our climate, mostly due to our current level of understanding. That could change quickly, with the proper motivation and technology. Constructing a broadband-equipped wireless infrastructure purpose-built to combat climate change would allow the U.S. to proactively and effectively monitoring reservoirs, sewers, cloud formation, rainfall, river and sea levels, agricultural resource usage, electrical grid demand, and the impacts of natural disasters in real time — all vital areas in which our nation must excel, if we are to adapt to our changing ecosystems and lead the world in surviving our coming challenges.

As climate disasters multiply and resource insecurity becomes more commonplace, social tensions are likely to be at an all-time high. Fierce competition from adversaries abroad is a near-certainty. Force protection and homeland security will require universal access to data and connectivity, both of which will have a central role in securing our nation from within — and without.

Absent broadband to aid in the transmission, aggregation, and processing of massive amounts of energy and climate data, the United States will remain rooted in the ways of the past, unable to respond to a fast approaching tide, *quite literally*.

Conclusion

Shane Mullan
General Manager

Aluma Tower is optimistic that you will use the knowledge gleaned in this whitepaper to seek bold and creative solutions for deploying broadband throughout rural areas of the United States. We envision a future where CSPs can gain a competitive edge, get first-dollar revenue, and become leaders in rural broadband deployment. We encourange you to see Aluma Tower telescoping mobile towers as the foundation upon which you put access in the hands of the people who don't have it... Now, not later.

Mobile deployable antenna towers provide a definitive platform for CSPs to achieve near- and long-term success in rural broadband. Our towers are low-effort, low-overhead, and require low-maintenance processes and equipment used to deploy networks with lighting speed. Mobile towers minimize impact to an existing CSP workforce, and ensure reasonable workforce scaling. Deployment of resilient and profitable local broadband networks throughout the U.S. will prove to be a profitable win that cements the nation once again as an innovative leader in technological and economic progress.

Failure to recognize mobile wireless solutions will lead to its own pandemic of protracted deployment intervals, ongoing regulatory roadblocks, geographical impediments, squabbles over the supremacy of various communications technologies, and unfulfilled obligations. Ultimately, all of these failures combined will equate to lost money and time that cannot be reclaimed. With no broadband in their homes or pockets, rural customers will continue to remain stuck in time, which only serves to hurt America and drive further economic and social disparity. Now is the time to act — and to embrace mobile telescoping towers as the definitive platform for rapid broadband Internet growth.

Over the coming months Aluma Tower will be conducting webinars and remote roundtables where we examine our customer successes in rolling out military and private LTE networks with Aluma Tower products. Aluma Tower will also commit to providing participants a substantial list of agencies and contacts from whom they can procure more information about grants and other subsidies. Details will be published soon on our website. Sign up for our newsletter for more updates.

Endnotes

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» *2* ***Rural Areas Are Looking for Workers. They Need Broadband to Get Them.***
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