State Broadband Rate Regulation

Impact on Investment and Competition

Prepared for: ACA CONNECTS

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Introduction | Open Letter from ACA Connects President & CEO

The broadband industry, due in no small measure to enlightened pro-entry policies, has invested trillions to bring digital opportunity to all Americans. The small and mid-sized Member companies of ACA Connects-America's Communications Association are doing their part by making transformative investments to connect their communities with state-of-the-art, affordable broadband, including in some of the hardest-to-serve corners of rural America. These investments respond and contribute to a market that is fiercely and increasingly competitive, with performance soaring while real prices drop.

As businesses with deep roots in communities they serve, ACA Connects Members are eager to bring the benefits of broadband to all. The vast majority participated in the Affordable Connectivity Program, and they welcome the adoption of a sustainable, well-designed broadband subsidy program to help households who struggle financially. They are concerned, however, by the growing trend of States seeking to regulate broadband prices. Such laws may be well-intentioned, but they undermine their own goals by inhibiting investment, new entry, and competition. Smaller providers in rural areas and their communities feel these impacts most severely.

We have engaged the business consulting firm Cartesian to assess the marketplace effects of broadband rate regulation, nationally and by State. Their findings show that even mild forms of rate regulation would reduce revenues to a degree that materially depresses investment and competition, and these effects worsen as regulations get stricter. In brief, regulating broadband rates is unwarranted, counterproductive, and anti-competitive.

We offer this study as a resource for policymakers as they consider options for promoting broadband adoption by those left behind. The vibrant free market for broadband delivers enormous benefits to households and businesses across America. States can achieve their adoption aims without jeopardizing this success by micromanaging broadband prices.

Grant Spellmeyer

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Executive Summary | Key Findings

Broadband rate regulation would negatively impact investment, competition, and consumer welfare

Background ▶ **Competition in the US market is healthy and growing, driving prices down and expanding options for consumers without the need for regulatory intervention**

Lower Investment

Rate regulation at any level would reduce investment in broadband networks

- Rate regulation would harm the case for further investment in networks and services by lowering expected returns
- With weakened business cases, fewer locations would be economically viable for expansion/upgrade, resulting in less network investment
  - Even a modest 6% drop in blended ARPU ($30 low-income plan) is estimated to reduce investment in networks by approx. 19%
  - More restrictive pricing ($15 low-income plan, $60 plan for others) would decrease ARPU by 14%, leading to an estimated 41% cut to investment
- Further, providers will face higher capital costs as regulatory intervention introduces risk and removes providers' ability to set their own prices

Less Competition

Rate regulation would hinder competition by reducing the economic space for providers to make returns

- Areas with rate regulation would support fewer competitors as there would be less total revenue to fund multiple business cases
  - Smaller providers and new entrants are most likely to be squeezed out when economic space reduces
- Areas that are no longer attractive to providers due to weakened business cases would miss out on the additional competition
  - A 19% drop in investment (per $30 low-income plan) would result in less competition (i.e., 1 less provider) for 3.3M locations
  - At the other end, a 41% drop in investment would result in 7.5M locations with 1 less additional competitor

Consumer Harm

Rate regulation would have unintended negative consequences for consumers

- Fewer competitors would leave consumers with less choice
- Less investment and less competition to spur innovation would fail to drive service quality improvements for consumers
- Consumers would likely experience higher prices elsewhere in the market, as providers seek to cover their costs

Note: Modeled scenario of $30 fixed broadband ARPU for low-income subscriber base, no change to fixed broadband ARPU for remaining subscriber base; see Impact Assessment Overview (slide 25) for further details
Source: Cartesian

Executive Summary | Report Overview

This report examines the impact of broadband rate regulation on investment and competition

Context & Objectives

CONTEXT

New York state has adopted rate regulation on fixed broadband, and several other states are considering similar policies

If introduced, rate regulation is expected to impact investment decisions – and therefore competition – in the broadband market

OBJECTIVE

This study aims to understand the economic impact of broadband rate regulation on investment and competition

Approach

This study explores:

1. The state of the broadband market today
2. The nature of rate regulation and where it's used
3. The impact of rate regulation on broadband

We model the impact of rate regulation on fixed broadband by:

- Constructing a business case for an ISP network expansion[1]
- Estimating build costs for locations with existing fixed wireline providers across the US at the census tract level
- Modeling which census tracts would have viable business cases under normal revenue assumptions (i.e., base case)
- Comparing the base case results against the outputs of the model under a range of broadband rate regulation scenarios
- Assessing the aggregate impact on investment and competition

1: Business case modeled for a fiber overbuilder; however, findings can generally be viewed through broader lens of investment in the broadband market

Source: Cartesian

Contents

Broadband Market | Market Overview

The broadband market is complex, with service providers offering a diverse range of services using competing technologies across multiple overlapping network footprints

Market Structure

Geography and service determine competition

- Broadband access and competition is geography-based
- Customers choose the service available at their location that best fits their needs

Services vary by technology

- Providers compete against each other within their footprints using a range of technologies
- Each technology has its own infrastructure, speed, and performance considerations that factor into service

Competitive Technologies

Technology	Key Attributes	Competitive Advantage
Cable	• Utilizes existing HFC connections; widely accessible throughout US • Currently offers downstream speeds up to ~1-2 Gbps • Low latency and reliable performance • Deployed by national MSOs and regional cable operators	▶ DOCSIS upgrades can reach similar downstream speeds to fiber ▶ Great value for bundled services
Fiber	• Fastest, symmetric speeds available (up to 10Gbps) • Best service performance (latency, jitter, uptime) and highest capacity • Primarily deployed by ILECs, overbuilders, and nontraditional providers • High initial deployment costs, especially in rural areas	▶ Fastest speeds and most reliable service ▶ Futureproof network capacity
FWA *Licensed, Unlicensed*	• Typical speeds slower than fiber/cable, 5G FWA can reach ~1 Gbps • Higher latency than cable, affected by weather/line-of-sight disruptions • Cheaper deployment than fiber/cable, well-suited for hard-to-reach areas • Deployed by national MNOs and WISPs • Ongoing capital investment to keep up with capacity demands	▶ Quicker and cheaper deployment than fiber and cable ▶ Increasingly competitive speeds
Satellite *LEO*	• Has global coverage, but local capacity can be limited • Typical speeds for LEO between 100-500 Mbps • Highest latency and jitter, affected by weather/line-of-sight disruptions • No professional installation required • High ongoing costs to replace satellites (approx. 5-year lifespan)	▶ Can serve very remote areas ▶ Well-suited for mobile connectivity needs

Source: Cartesian

Broadband Market | Competition Overview

Broadband is a competitive market that continues to yield greater consumer benefits

Competition has greatly expanded in recent years

Broadband competition has expanded rapidly since 2021, driven by investment in new technologies and expanding networks

- The nationwide rollout of 5G has driven FWA feasibility and expansion
  - FWA is now a competitive presence for almost half (48%) of all households, up from just 8% in 2021
- Fiber overbuilders are intensifying competition in areas with incumbent providers
  - Overbuilders added 3.2M new locations from Dec’23 to Dec’24, 30% of all fiber deployments during this time[1]

Smaller providers are adding competition:

- Smaller providers (<100K passings) typically overbuild incumbents – providing greater choice to customers in these areas
- These providers drive competition for 17% of households[2]

Most households have access to multiple fixed providers

According to FCC BDC filings[3]:

93% of US HHs are now serviceable by **at least 1 fixed broadband provider**

65% of US HHs are now serviceable by **2+ fixed broadband providers**

30% of US HHs are now serviceable by **3+ fixed broadband providers**

Given planned investment levels, competition is likely to keep intensifying in the coming years

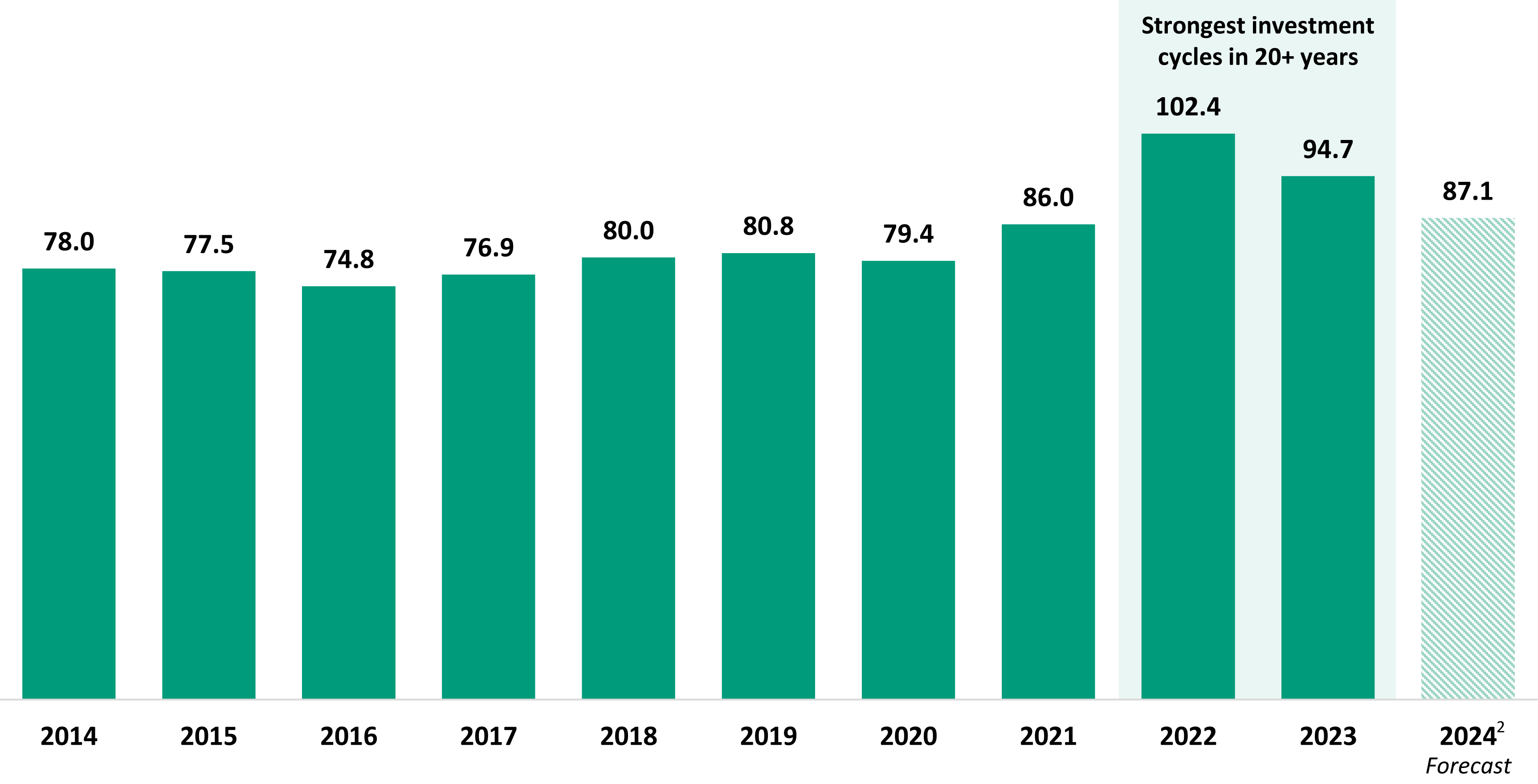
1: Based on locations passed with fiber per FCC Broadband Data Maps; 2: Share of locations served by providers with <100K total passings (smaller providers) in areas with 2+ providers, per latest FCC BDC reporting; 3: Actual presence only, includes cable, fiber, licensed FWA, per latest FCC BDC reporting

Source: FCC BDC (reported December 2024, accessed May 2025), US Census Bureau, Provider Interviews, Cartesian

Broadband Market | Capex Investment

This increase in competition has been spurred by record levels of private capex spending

Capex Investment by US Broadband Providers ($B)[1]



Recent years have experienced record levels of capex investment:

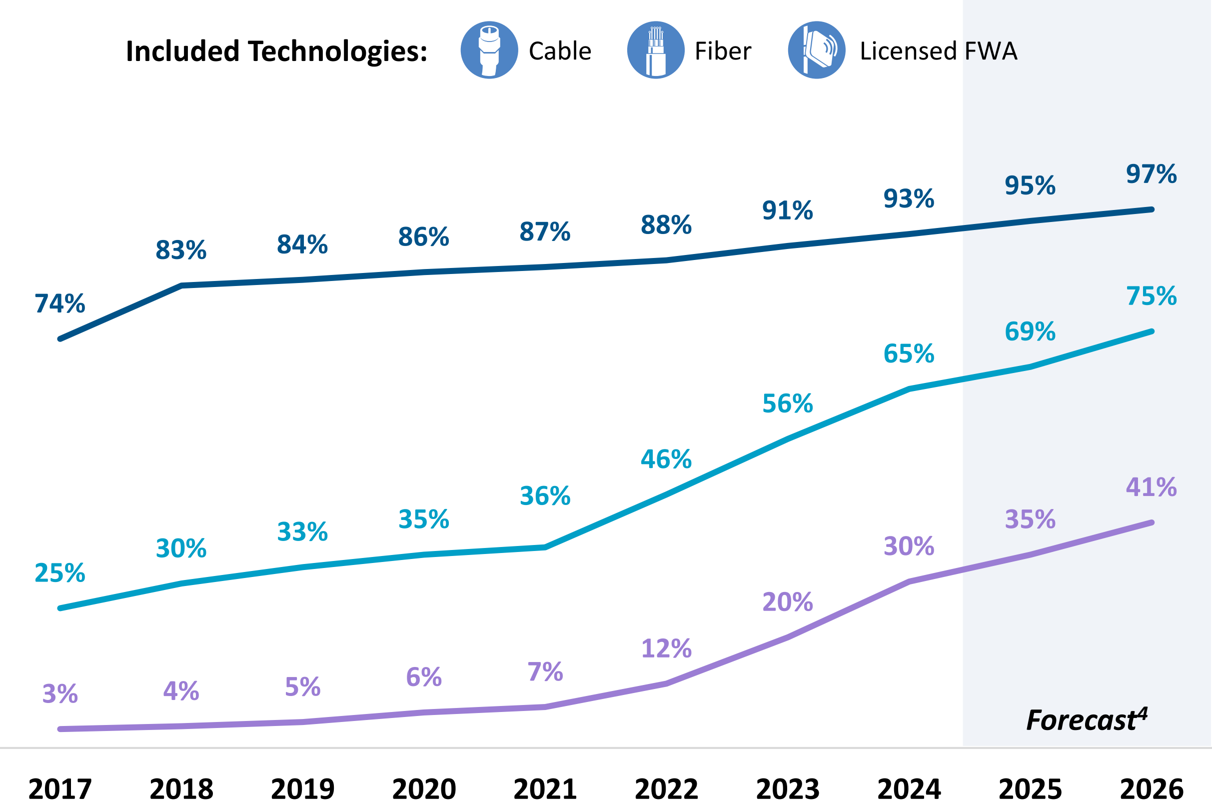
- Private companies have spent nearly **$2.2 trillion on capex since 1996**[1]
- Providers have recently invested at the highest levels in over 20 years
  - From 2014 to 2023, private capex investment grew at a CAGR of 2.2%
  - 2022 had the highest capex spend by ISPs, likely due to the completion of 5G rollout programs[3]
  - Private investment estimated at 3% annual growth till 2030[4]
- Government funding is also at historic highs and should increase through 2030
  - These programs unlock otherwise unviable investment opportunities for the private sector

1: 2023 USTelecom Broadband Capex Report; 2: Forecast by extrapolating 2023 down by 8% (in line with: Dell'Oro Group); 3: Omdia; 4: Estimate of growth from multiple sources - PWC, RVA, Deloitte
Source: USTelecom, Dell'Oro Group, Omdia, Desktop research, Cartesian

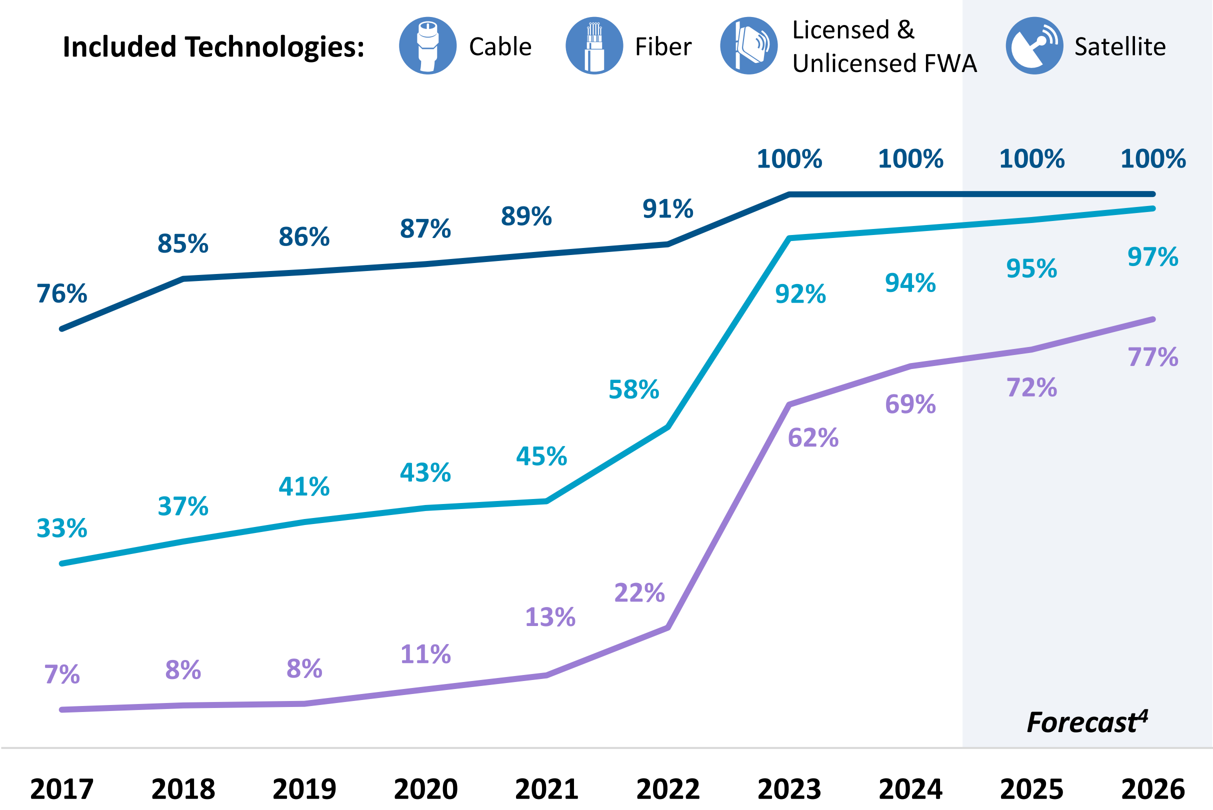
Broadband Market | Competitive Presence

65% of US households have access to 2+ terrestrial broadband providers; with satellite, the share jumps to 94%

Share of US HHs by Number of Broadband Provider Options
Wireline & Licensed FWA Technologies, 100/20Mbps+ Service[1,3,5]



Share of US HHs by Number of Broadband Provider Options
All Reported Technologies, 100/20Mbps+ Service[2,3,5]



1+ Provider 2+ Providers 3+ Providers

1: Includes cable, fiber, and licensed FWA; 2: Includes all technologies reported in the FCC BDC with 100/20Mbps+ service; 3: Competitive presence based on reported residential location passings; Years 2017–2021 use Form 477 data and years 2022-2024 use National Broadband Map; 2022 was the first year of BDC data, and thus there may be over/under counting in locations for that year; 4: Forecasts based on recent historical growth rates, and industry trends across technologies; 5: 2021 uses June Form 477 data instead of December due to data quality issues in December Form 477 data

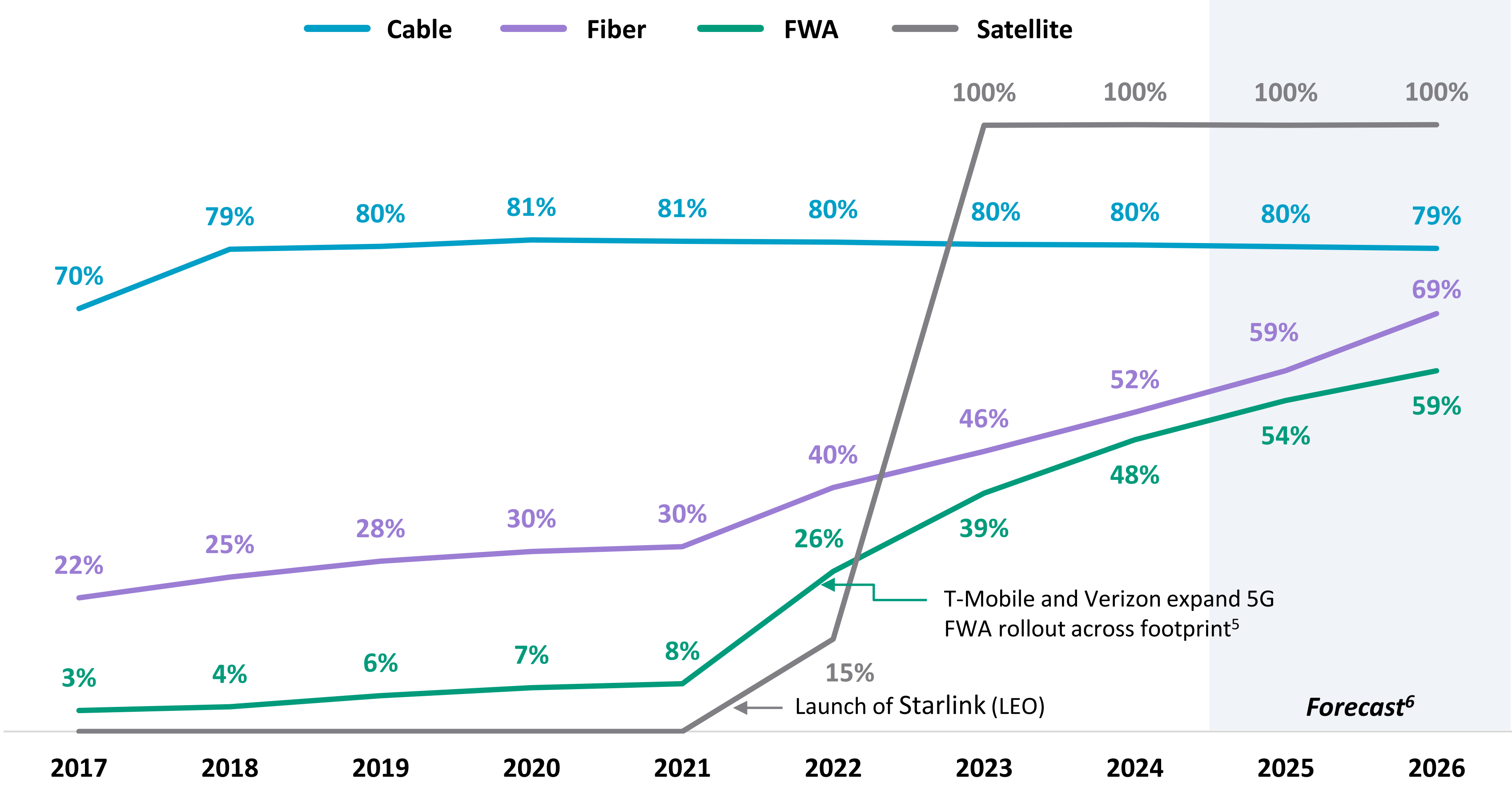
Source: FCC Form 477, FCC Broadband Data Maps, US Census Bureau, Verizon, T-Mobile, Cartesian

Broadband Market | Competition by Technology

New technologies have changed the competitive landscape in recent years, providing greater choice to consumers and prompting upgrades from incumbents

Share of US HHs with Competitive Presence by Broadband Technology[1,3,4,7]

Cable, Fiber, FWA[2], and LEO Satellite Technologies, 100/20Mbps+ Service



Consumer choice has greatly expanded in recent years:

- Most households today have access to 2+ terrestrial broadband providers
- Historically most households had an expensive cable option and low-quality DSL option
- Recent improvements in technology have created more choices and improved service quality
  - **Nationwide 5G rollout** has allowed for rapid and broad FWA deployment
  - **Fiber overbuilders** are increasingly threatening incumbents' dominance
  - **MSOs** are upgrading networks (i.e., DOCSIS 4.0) to remain competitive
  - **LEO Satellite** (i.e., Starlink) offers nationwide coverage, subject to capacity constraints

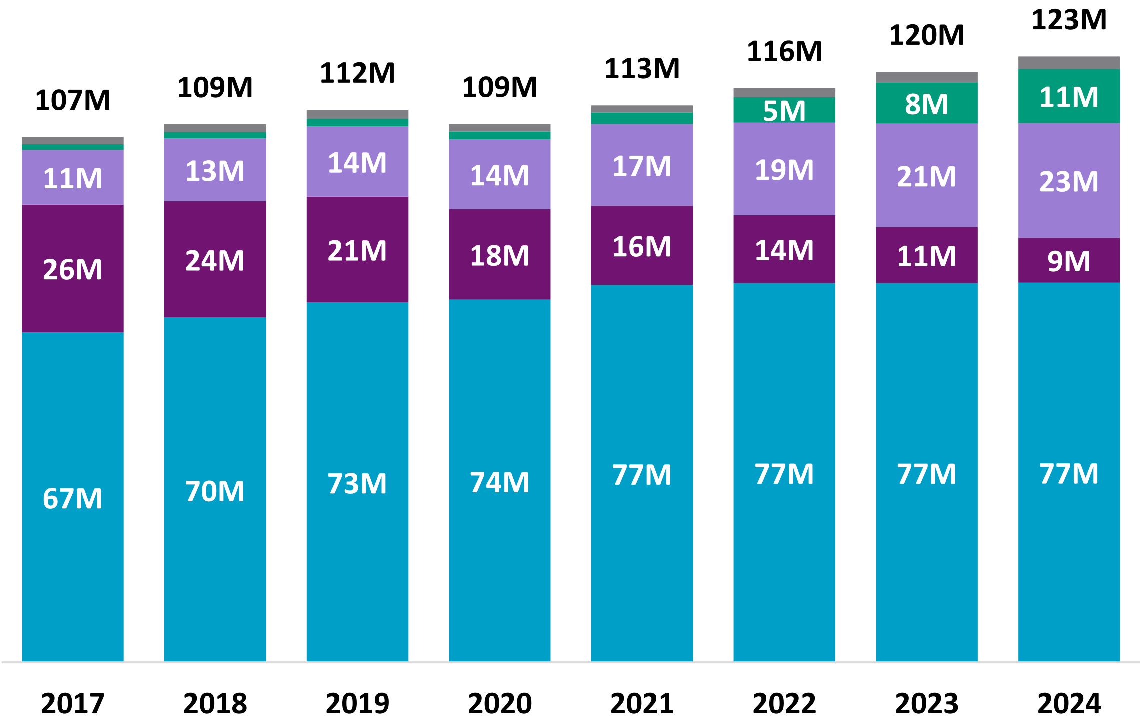
1: Years 2017–2021 use Form 477 data and years 2022-2024 use National Broadband Map; 2022 was the first year of BDC data, and thus there may be over/under counting in locations for that year; 2: FWA includes both licensed FWA and unlicensed FWA; 3: 2021 share of cable is the average between 2020 and 2022, adjusted due to likely reporting discrepancies between BDC and Form 477; 4: Copper excluded from view of US HHs above 100/20 speeds, ~5% coverage; 5: T-Mobile, Light Reading; 6: Forecasts based on recent historical growth rates, and industry trends across technologies; 7: 2021 uses June Form 477 data instead of December due to data quality issues in December Form 477 data

Source: FCC Form 477, FCC Broadband Data Maps, US Census Bureau, Verizon, T-Mobile, Cartesian

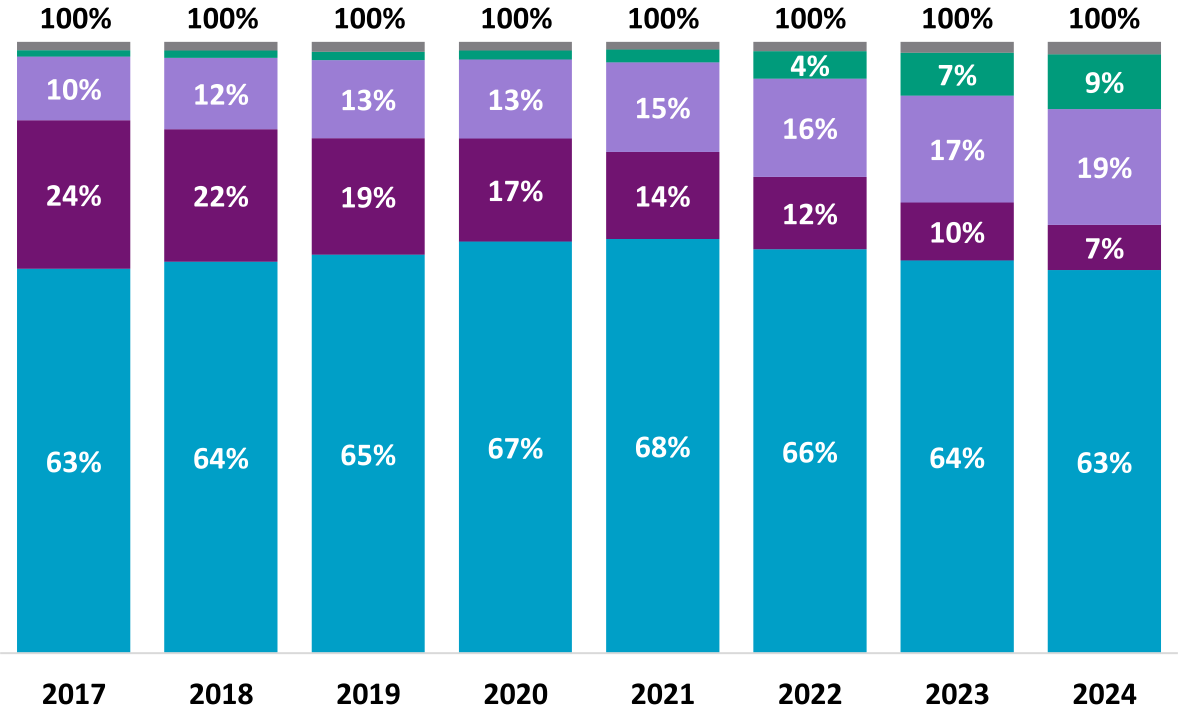
Broadband Market | Subscribers by Technology

FWA and fiber have made significant gains in market share at the expense of DSL, while cable's share has remained broadly stable

Residential Internet Subscriptions by Technology



Residential Internet Subscriptions Market Share by Technology



Cable DSL Fiber FWA Satellite

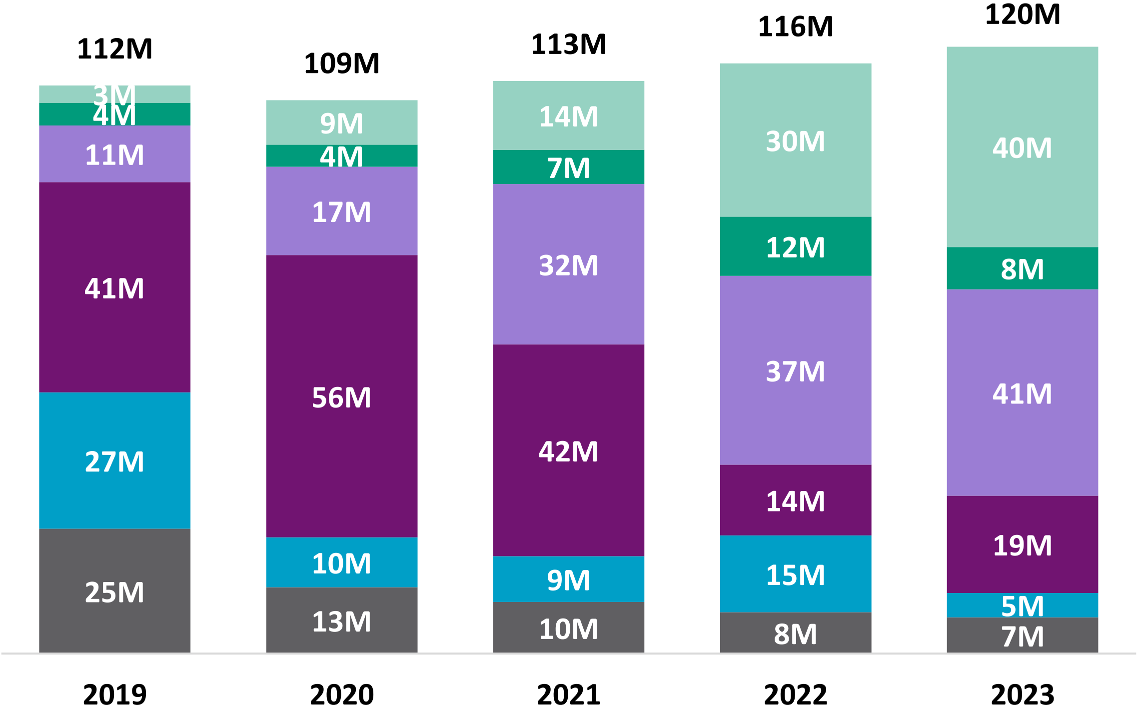
Increased competition and growing availability of FWA and Fiber has translated into higher penetration as well – more consumers are benefitting from high quality internet services as share of DSL continues to decline

Source: S&P Global, Cartesian

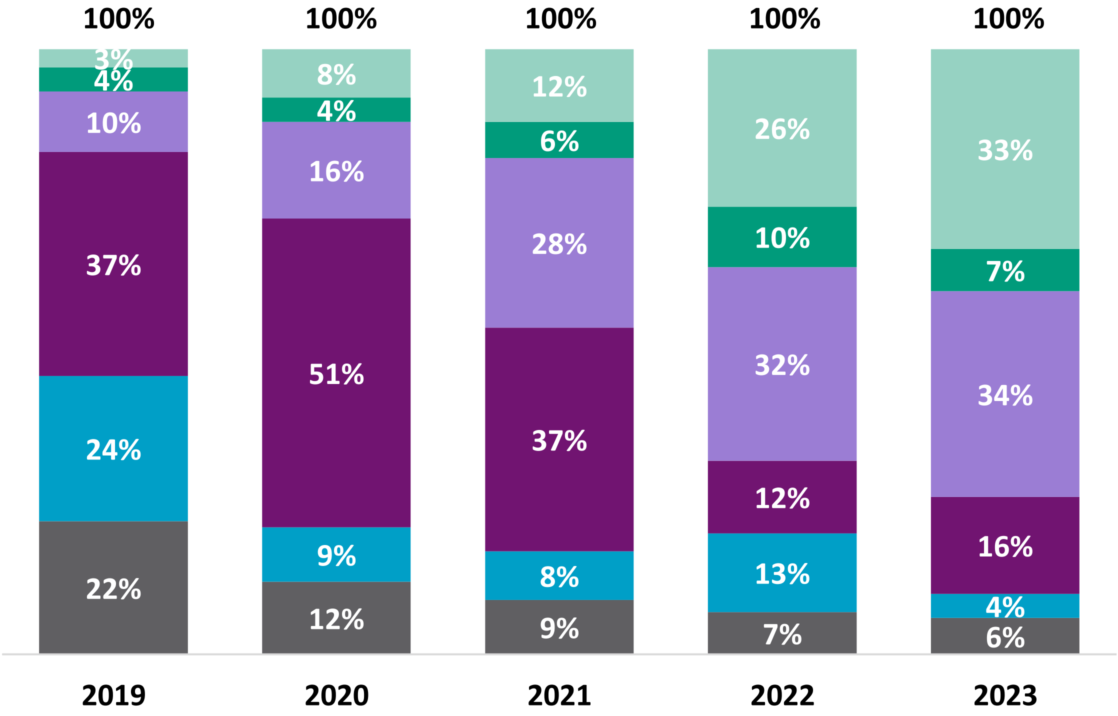
Broadband Market | Subscribers by Speed Tier

Consumers are subscribing to higher speed tiers to meet their evolving bandwidth needs

Residential Internet Subscriptions by Speed Tier



Residential Internet Subscriptions Market Share by Speed Tier



< 50 Mbps | 50 - 100 Mbps | 100 - 200 Mbps | 200 – 400 Mbps | 500 – 900 Mbps | 1 Gbps+

Investments in new technologies and network upgrades have allowed providers to offer higher speeds, meeting consumer demand

Source: S&P Global, OpenVault, Cartesian

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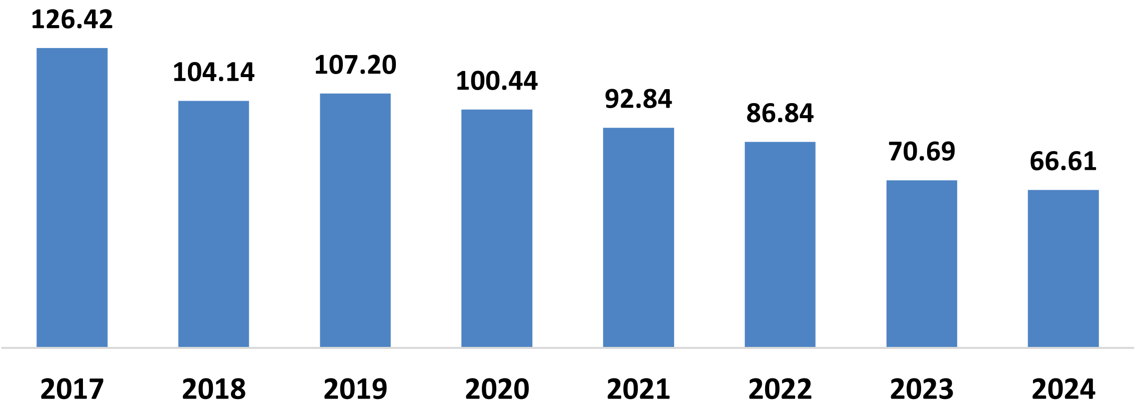
Broadband Market | Pricing

Greater competition has driven broadband prices down, benefitting all consumers

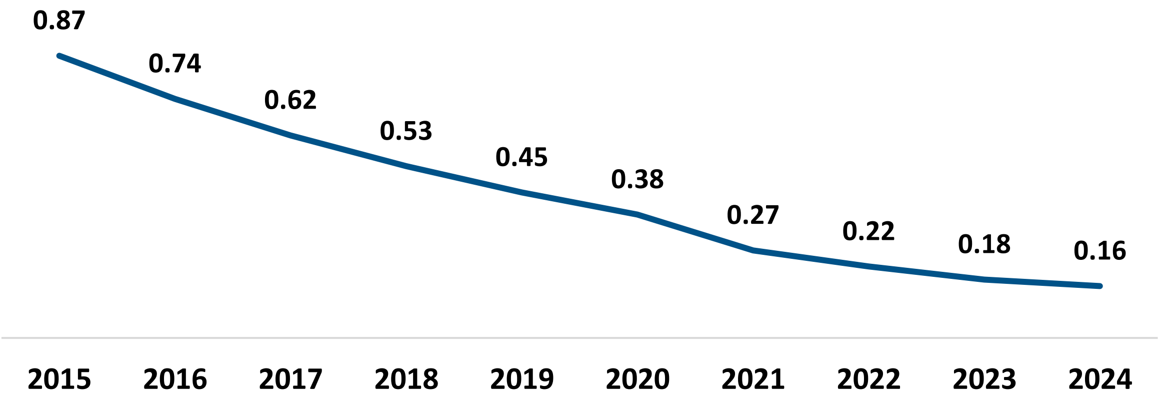
Annual Real Broadband Pricing ($)

Real Pricing Benchmark for 100/10 Mbps Services by Release Year[1,4]



Annual Real Price per Mbps ($/Mbps)[2,3]

Real Price in Mbps for Most Popular Services Selected by Consumers



Broadband is becoming increasingly affordable:

- Broadband is now more affordable than ever at a benchmark of $67/month in 2024, continuing a trend of decreasing prices YoY for almost a decade
- The monthly price for a 100 Mbps package has declined by 47% from 2017 – 2024
- Growing competition and availability of higher speeds are pushing down prices for standard service

Increasing speeds and falling prices drive greater value:

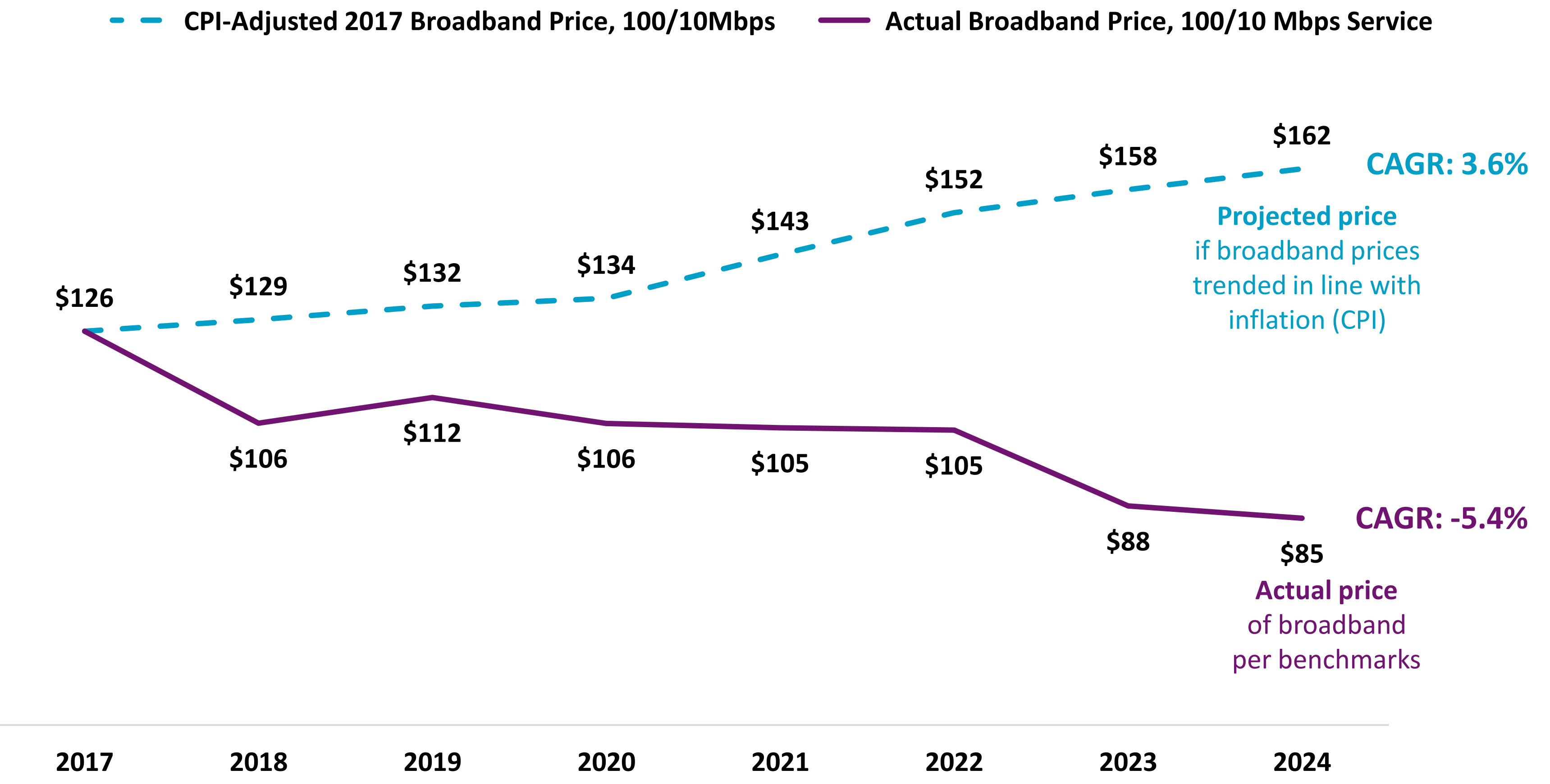
- Real price per Mbps has declined YoY since 2015; real prices dropped by 60% from 2015 – 2024
- Deployment of advanced technologies (e.g., fiber, DOCSIS 4.0) has increased capacity to deliver higher service to more consumers at more affordable rates
- As a result, consumers experience continually improving economic value

1: Per Urban Rate Survey Broadband Pricing Benchmark; pricing benchmarks for services offering 100 Mbps download speed, 10 Mbps upload speed and unlimited capacity have been adjusted for inflation using the December CPI value for the release year; 2: Per USTelecom BPI-Speed Index, which as of 2024 tracks pricing trends for the most popular service tiers between 100 Mbps and 940 Mbps; 3: Speed data was unavailable for 2016 to 2019; 2015-2020 CAGR was used to estimate; 4: 2024 benchmarks as per the URS are based on 2025 report which utilizes 2024 data (same for all previous years); 100/10 is used as data for 100/20 is not available in all previous years of URS reporting;
Source: FCC Form 477, FCC Broadband Data Maps, USTelecom, ITIF, Consumer Reports, Analysis Group, Cartesian

Broadband Market | Pricing vs Inflation

Broadband pricing has declined despite inflationary pressure, reflecting a healthy degree of competition

Actual Broadband Pricing vs. CPI-Adjusted Broadband Price ($)[1,2,3]
URS Benchmark Price for 100/10 Mbps Services



Broadband has become cheaper while other goods are getting more expensive:

- Broadband prices for 100/10 Mbps service have not increased with inflation, and have in fact declined at an annual rate of ~5% since 2017
- If 100/10Mbps service prices increased alongside inflation, prices would be ~30% higher today than in 2017
  - Actual prices for 100/10Mbps have decreased by 33%
- Prices trending counter to inflation is an indication of healthy competition
- In contrast, electricity and gas prices have increased around 30% since 2018, outpacing CPI (26%)[4]

1: Per Urban Rate Survey Broadband Pricing Benchmark; pricing benchmarks for services offering 100Mbps download speed, 10 Mbps upload speed and unlimited capacity; 2: CPI-Adjusted Broadband Price based on annual CPI as reported by St. Louis Fed and calculated as 2017 Broadband price * (CPI of given year / CPI year 2017); 3: 2024 benchmarks as per the URS are based on 2025 report which utilizes 2024 data (same for all previous years); 100/10 is used as data for 100/20 is not available in all previous years of URS reporting; 4: Per ACLP analysis of CPI trends 2018 – 2024, published in Broadband Expanded
Source: USTelecom, ACLP, Bureau of Labor Statistics, St. Louis Fed, Cartesian

Broadband Market | Broadband Affordability

Competitive market forces have made broadband affordable for most households; many of those who don't already have home internet cite other reasons for not being online

Broadband Affordability

- Affordability for the most financially challenged remains a major policy concern
- Further, affordability can be difficult to define
  - Income, geography, cost of living, other household expenses, and perceived value all factor into broadband affordability

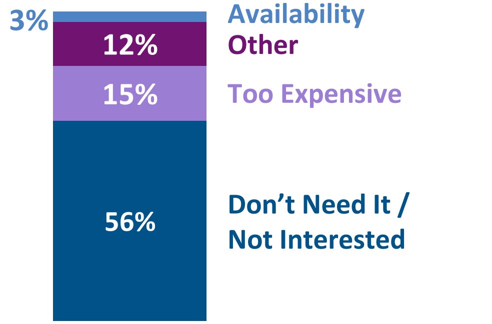
Nevertheless, several studies aim to assess the extent of affordability challenges for both unconnected households and low-income households (HHs)

Affordability for Unconnected Households

Affordability is not the top concern for households without home internet:

- 15% of HHs do not have internet at home[1]
- In NTIA's survey[1] of offline HHs, only 15% cite affordability as the main reason why they're not connected
- Over half of responses (56%) stated they are not interested in having internet at home
- In a separate study, of those who said internet was too expensive, 38% were unwilling to pay any amount[2]

Main Reason for Not Being Online at Home[3]:

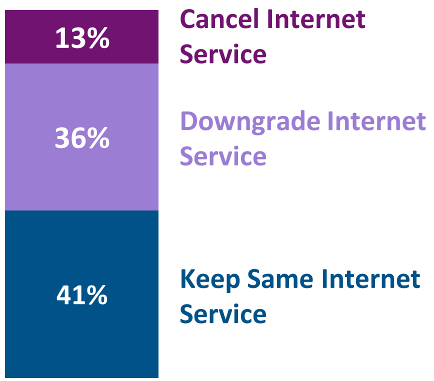


Affordability for Low-Income Households

Affordability is a concern for some low-income households that have internet:

- According to Benton's survey of low-income HHs[4]:
  - 11% said their internet bill is "very" expensive, and
  - 43% said their internet bill is "somewhat" expensive
- Of those that were enrolled in ACP, 77% said they would keep an internet subscription post ACP-benefit
  - 13% said they would have to cancel service
  - This jumps to almost 20% among those with the lowest incomes ($20K or less)

What happens for ACP HHs after ACP[5]:



Those with the lowest income levels are most at risk of not having internet due to affordability.
This has previously been addressed through direct financial assistance to target those most in need.

1: NTIA Internet Use Survey 2024 2. $0 max willingness to pay per 2021 NTIA Internet Use survey 3. NTIA Internet Use 2024 survey, published results do not add to 100% 4. Benton Institute ACP Survey 2024, low income HH defined as $50k or less 5. Benton Institute ACP 2024 survey, published results do not add to 100%

Source: Benton Institute, Pew Research, NTIA, Cartesian

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Contents

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Rate Regulation | Policy Overview

In highly developed economies like the US, rate regulation is a last-resort pricing tool, found in monopoly markets where competition is absent and fair prices and access cannot be guaranteed

Rate Regulation as a High-Intervention Tool

When is it used?	• Such policies are typically a response to market failures (i.e., monopolies) in industries providing essential goods or services • Monopolies lack competitive incentives to innovate and improve consumer outcomes • This may occur in industries with high barriers to entry, such as large economies of scale, that make it challenging for more than one firm to operate (e.g., utilities)
How does Rate Regulation occur?	• Rate regulation can take multiple forms, primarily: – **Static price cap** sets a maximum allowable charge on a good or service – **Revenue cap** sets a limit on the total amount of revenue a company can earn – **Rate of return regulation** sets an allowable rate of return that companies use to set prices based on costs incurred – **Price Increase cap** sets a limit on how much the price of a good or service can increase
Desired Outcomes of Rate Regulation	• Ensure fair pricing and access to good/services • Avoid excessive profits

Policy Intervention Spectrum

ILLUSTRATIVE

High Intervention
Market Correction Aims

- Price Controls
- Revenue/Profit Cap
- Rate-of-Return Regulation
- Price Increase Cap

Alternate Option
Affordability Aims

- Provide Subsidy to HH to Afford Service

Rate regulation is a high-touch policy tool used to intervene in failed markets to protect consumers (i.e., fair pricing)

Source: Cartesian

Rate Regulation | Broadband vs. Utilities

The competitive nature of broadband infrastructure sets it apart from utility networks

Broadband is mistakenly likened to utilities, as both are infrastructure-based household necessities

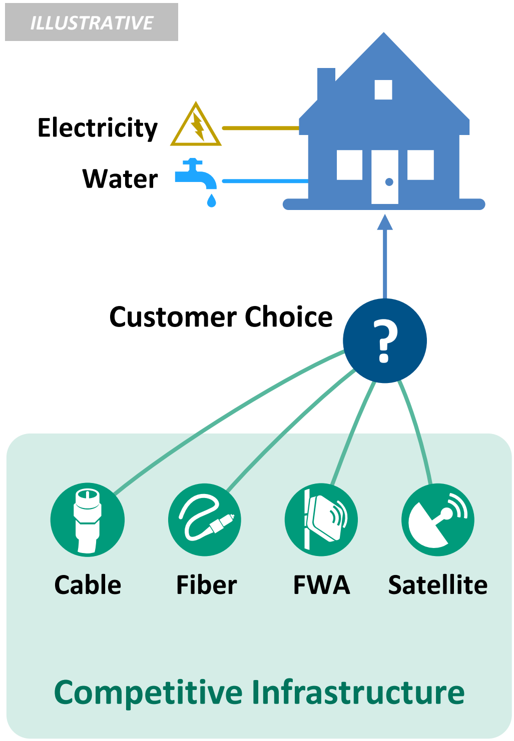
However, they have very different market structures:

	Utilities	Broadband

Market Features	• High fixed costs, uniform scaling
	• Service infrastructure is very localized and space-limited
	  – Cities cannot support multiple power grids, water plants, or sewage systems
	• Operators cannot practically run multiple sets of utility lines/water pipes to a home
	• Limited technology innovation
	• No room for new entrants
	• Economically inefficient to duplicate infrastructure
	  – Standardized delivery for utility cos
	  – High fixed costs with no added benefit or service quality gains
		• High fixed costs, variable scaling
		• Broadband infrastructure is somewhat localized and space-limited
		  – Traffic backhaul aggregated regionally, with limited physical space used
		• Multiple ISPs can connect a home with wired or wireless connections
		• Significant innovation and competing service delivery technologies (e.g., FWA, fiber, cable, satellite)
		• Static costs of duplicate infrastructure are offset by the dynamic gains of competition
		  – Higher speeds
		  – Lower prices
		  – Better service quality

Outcome	Physical limitations and cost structures make utility markets ***natural monopolies***	Infrastructure flexibility and economic viability makes broadband ***openly competitive***

Household Connections



Source: Cartesian

Broadband Rate Regulation | Existing and Proposed Laws

Several states are considering (or have introduced) policies to regulate the price of fixed broadband

State-Level Legislation[1]

In Favor of Rate Regulation

ENACTED

New York

Affordable Broadband Act (ABA)

ISPs to offer 25Mbps service at $15/month or 200Mbps service at $20/month for low-income HHs, with limits on rate changes and occurrence. NY considering reducing cap to $5/month

Exemptions:
Small ISPs (<20k subs) *Upon proving undue economic burden*

PROPOSED

California

ISPs to offer at least 100/20Mbps service at $15/month for low-income HHs

+ Exemptions for mobile providers, ISPs < 50K subs

Massachusetts

Similar requirements as New York

+ Exemptions for municipal providers

Vermont

Similar requirements as New York

+ Additional legislation being introduced may give further regulatory power over ISPs

Maryland

Similar requirements as New York

Minnesota

Similar requirements as New York

Connecticut

Would in effect mandate a low-cost low-income rate

Against Rate Regulation

ENACTED

Tennessee

SB556/HB1136

Exempts broadband providers from being classified as public utilities

Prevents local governments from imposing regulations on rates, terms, entry, or conditions of broadband services

While the current focus is on low-income affordability, some are looking to regulate rates for all service offerings

1: As of date of report publication (May 2025)
Source: State Legislatures, Cartesian

Broadband Rate Regulation | Current Approach to Broadband Pricing

Broadband pricing is complex, dynamic, and competitive, reflecting the diversity of broadband products

The broadband market is….		Therefore, broadband pricing is…	
Heterogeneous	• Offerings and performance vary by provider, location, and technology • Consumers select from a variety of packages and speeds to match their unique needs • Packages may reflect bundled products, add-ons, and other custom features	**Complex**	• Providers build networks with the expectation of selling bundled products • Products are commonly bundled together with one price • Prices can vary by region (as build costs vary by region) • The bulk model negotiates pricing with a group of buyers
Ever-Evolving	• Technological advancements are giving consumers more choices at faster speeds • Services continuously evolve to meet rapidly changing consumer demand • Competition keeps providers looking for ways to innovate with product offerings, service quality, and customer service	**Dynamic**	• Promotions are a common tool to attract new subscribers • Prices regularly change throughout the year • Prices are responsive to changing market conditions, innovations, and network improvements
Competitive	• The broadband market is openly competitive – no provider has exclusive access to any given geography • Competitive outcomes are achieved with a couple providers[1] • Competition is at an all-time high and is expected to keep intensifying	**Competitive**	• Local markets and national trends dictate pricing levels • Providers that charge above what consumers are willing to pay will lose subscribers to competitors • Hence, prices need to be reasonable and generally affordable • Providers continuously adjust pricing in response to market pressure or in attempt to capture additional market share

Pricing is a strategic tool providers use to remain competitive, cover costs, and fund investment

1: Effects of Market Structure on Broadband Quality in Local US Residential Service Markets

Source: Provider Interviews, Cartesian

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Broadband Rate Regulation | Expected Impact

Rate regulation interferes with competitive market dynamics and would result in less investment, less competition, and a reduction in consumer welfare

Rate regulation would have cascading impacts across the industry:

Less Investment

- Increased uptake unlikely to offset lost revenue from lower prices, meaning providers would face lower expected returns
- With lower returns, fewer areas would be economically viable for network expansions or upgrades
  - Rural areas would be most at risk given higher average deployment costs and often lower household incomes
- Providers will invest in fewer projects, lowering the overall amount of investment, particularly in and near areas with higher expected regulatory impact
  - Nearby states could see reduced investment as well, as providers may have to reallocate resources to handle new regulatory burdens

Less Competition

- Reduced economic space for providers to make returns would restrict the number of economically viable competitors
- Worse business cases for investment would result in fewer areas gaining additional competition
- In the absence of new entrants and with lower returns, incumbents may also be less incentivized to make upgrades they otherwise would

Slowdown in Pricing Decline

- Broadband prices are declining thanks to increasing competition and investment
- With less competition in the market, the trend towards lower prices is apt to slow down
  - Providers may have to adjust prices on non-regulated broadband service tiers/customers to cover their costs

Harm Spillover

- Consumers may also face higher prices on non-broadband services, resulting in cross-subsidization
- Fewer network expansions means less availability of other services that stem from provider networks as well, including video, voice, and business services

Source: Pew Research, Cartesian

Broadband Rate Regulation | Harm to Smaller Providers

While rate regulation would harm all ISPs, smaller providers would face disproportionate economic burdens

Characteristics of Smaller Providers Leading to Worse Economic Harm from Rate Regulation

	Lack of Geographic Diversity	More Concentrated Revenue Base	No dedicated compliance resources
Impact of Rate Regulation for Small vs. Large Providers	• **Small ISPs tend to serve a single state or region;** therefore, rate regulation would impact their entire footprint • **Large incumbents cover many states**, limiting the impact to a smaller portion of their business	• **For smaller ISPs with more limited lines of business,** rate regulation would more significantly impact total revenues • **Large ISPs often have diverse lines of business,** (e.g., content, digital advertising) which limits the impact of broadband rate regulation to a smaller share of revenue streams	• **Small ISPs do not have dedicated resources** for regulatory compliance; they would have to reallocate and reskill already tight human capital to handle compliance mechanisms/exemption filings • **Large ISPs have dedicated regulatory teams** and likely would only face incremental costs for additional regulatory burdens
Small Provider Impact Summary	Lower revenue across entire market	Lower revenue across entire revenue stream	Added costs to reallocate resources to compliance mechanisms

Broadband rate regulation could have the unintended consequence of squeezing smaller providers out of the market

Source: Cartesian

Cartesian®

Contents

Network Investment | Business Case Considerations

When service providers evaluate whether to upgrade or expand their networks, they consider the revenue of all services supported by the network

Typical Business Case Components

Expected Network Revenue

Services Offered	Product ARPU	Market Share
Broadband	*Promo Rates*	*Existing Competitors*
Video	*Rack Rates*	*Existing Technology*
Wireline	*Bundles*	*Consumer Demand*
Wholesale / Backhaul		

Expected Network Cost

Capex	Opex	WACC
CPPP	*Maintenance*	*Cost of Capital*
CPPC	*Cust. Service*	
	etc.	

Business Case Considerations:

Multi-service networks:
- Providers typically offer multiple services on their networks
- Products are commonly bundled into one offering/price

Interdependent revenue:
- Providers develop business cases assuming bundled offerings
- Business decisions consider all potential revenue streams

Broadband impact:
- Broadband contributes a significant share of revenue
- Therefore, changes to broadband revenue expectation will have an outsized impact on investment decisions

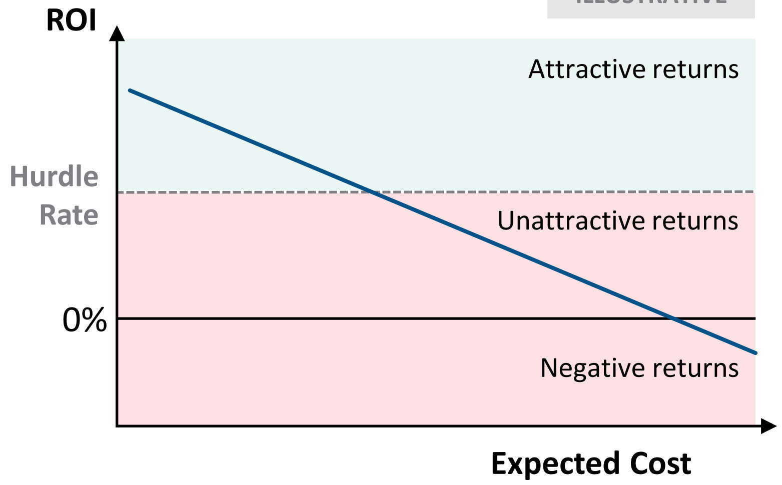
Shared costs:
- Network costs are shared across services given infrastructure is shared by all services

Interconnected build economics:
- Spreading costs yields efficiencies for multi-service providers
- More profitable segments (and geographies) effectively subsidize less profitable ones

Investment Decisioning

Investors weigh expected returns (i.e., **ROI**) against the minimum viable rate of return required to green-light an investment (i.e., **Hurdle Rate**)

ILLUSTRATIVE



Decision Points:
- **ROI** >= **Hurdle Rate** = **Viable Investment**
- **ROI** < **Hurdle Rate** = **Nonviable investment**

Note: Interviews with ACA Connects members estimate that 50% - 60% of revenue comes from residential broadband
Source: Provider Interviews, Cartesian

Network Investment | Rate Regulation Impact

Regulating consumer broadband rates impairs the business case for network investment

Impact of Broadband Rate Regulation on Network Investment

Price cap on broadband service

Revenue

Cost

	Revenue	Cost	
Regulating rates below-market price reduces ARPU	**Lower** broadband ARPU	**Higher** risk from future regulatory uncertainty	Uncertainty around future price cap decisions adds risk to business case
Broadband ARPU has material impact on overall revenue	**Lower** revenue potential	**Higher** cost of capital	Investors impose higher interest rates on debt and equity given greater investment risk

Fewer areas viable for expansion or upgrade

Lower revenues and higher costs reduce expected returns, some areas fall below threshold for viable commercial investment

Modeling Focus

See following pages

Less investment in network expansions and upgrades

Fewer viable projects leads to less network investment overall

Fewer competitors

Less investment in networks reduces the number of competitors that would otherwise exist

Regulation Impact Summary

Network Expansion:

- Providers find fewer areas with a viable business case for network expansion
- Less investment occurs
- Consumers have less choice than they would otherwise
- Other services supported by the same network infrastructure will also suffer lower reach
- The impacts will likely be greatest in rural areas that have higher average build costs and often lower household incomes

Existing Networks:

- Incumbent operators are shielded from competition in areas that are no longer viable for entrants
- Incumbents have less incentive to invest in service quality, network upgrades, and innovation

Note: Broadband and telecommunications networks have high sunk costs and relatively long payback periods; consequently, investors require regulatory certainty to commit capital to network investment

Source: Provider Interviews, Cartesian

Cartesian®

Impact Assessment | Overview

We estimated the impact of broadband rate regulation by modeling a fiber network investment case under different revenue assumptions

Modeling Approach

Overview	**Estimate the impact that fixed broadband rate regulation would have on investment and competition**
Approach	The model looks at the typical business case for a new entrant[1] across census tracts throughout the US, assuming the entrant expects to provide broadband, video, and voice. The impact of rate regulation is quantified by aggregating the outcome of project area viability assessments: **Capex** – Total cost for a fiber overbuilder to provide services in a project area, i.e., both network build costs and connection costs **Revenue** – Potential revenue generated from a project area, based on a fair share of subscribers the overbuilder acquires from competitors **Return on Capex** – Profitability of a project area, based on the capex, revenue, and viability, i.e., return on investment compared to the hurdle rate and/or WACC
Model Outcomes	**For various rate regulation scenarios and a "zero intervention" base case:** • Network Investment by new entrant in viable census tracts • Number of locations passed by new entrant in viable census tracts

Scenarios

To illustrate the impact of different regulatory environments, we focus on a subset of model sensitivities:

Scenario	Low-Income BB ARPU	General BB ARPU	Impact to Blended ARPU[2]
Base Case	$70		-
1	$30	$70 *No Change*	↓ 6%
2	$15	$70 *No Change*	↓ 8%
3	$20	$65	↓ 10%
4	$15	$60	↓ 14%

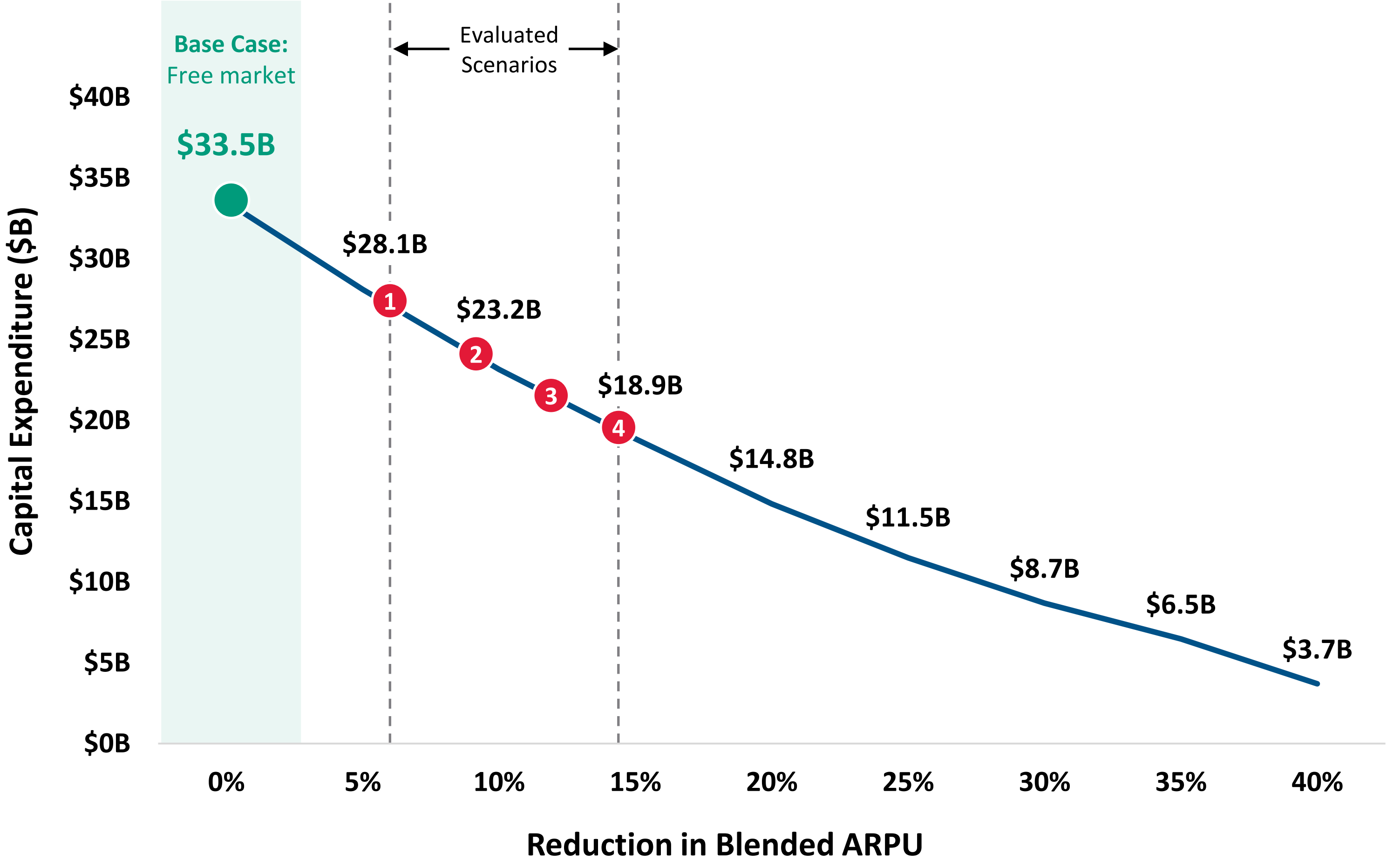
1: Model based on a fiber overbuilder business case; however, variable economics will vary by provider and technology. Due to global nature and complexity of LEO business case, LEO not considered in model;
2: Reflects broadband ARPU (Low-Income and non-income restricted plans) changes on blended ARPU across broadband, voice, video, and business services
Source: Provider Interviews, Cartesian

Contents

Impact Assessment Findings | Impact on Investment (1/2)

All scenarios show a material impact on investment in broadband networks

Modeled Nationwide Capital Expenditure for Fiber Overbuilds
By Reduction in Blended ARPU from Base Case



Impact of Regulation on Investment

Scenario	Est. Decline in Capex ($) *vs. Base Case*	Est. Decline in Capex (%) *vs. Base Case*
Base Case	-	-
1	↓ $6.2B	↓ 19%
2	↓ $8.4B	↓ 25%
3	↓ $10.5B	↓ 31%
4	↓ $13.6B	↓ 41%

Note: For the purposes of this model, we assume that the cost of capital is unchanged, which is unlikely – an increasing cost of capital will further dampen investment feasibility (see next slide)

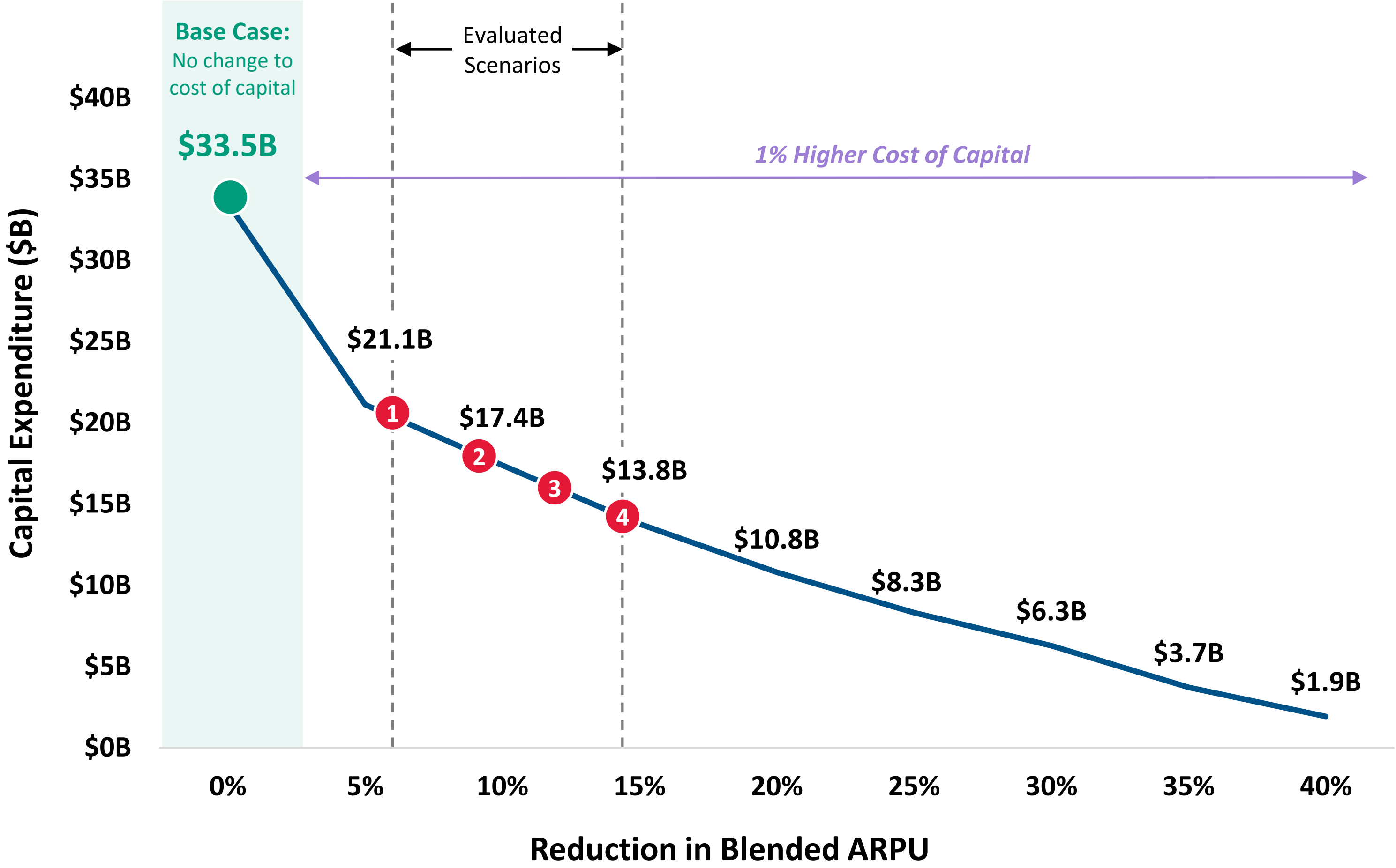
Note: Considers fiber overbuild projects based on wireline competition only (excludes FWA and satellite); Capex investment hurdle rate of 12%
Source: FCC BDC (reported December 2024, accessed May 2025), Cartesian

Impact Assessment Findings | Impact on Investment (2/2)

The impact on investment is higher still when accounting for the expected increase in cost of capital

Modeled Nationwide Capital Expenditure for Fiber Overbuilds

By Reduction in Blended ARPU from Base Case, with 1% Higher Cost of Capital from Base Case



Impact of Regulation on Investment

Scenario	Est. Decline in Capex ($) *vs. Base Case*	Est. Decline in Capex (%) *vs. Base Case*
Base Case	-	-
1	$13.0B	39%
2	$14.7B	44%
3	$16.2B	48%
4	$18.9B	56%

Rate regulation makes it costlier for ISPs to borrow as lenders raise interest rates in response to bearing additional risk and uncertainty

Note: Considers fiber overbuild projects based on wireline competition only (excludes FWA and satellite); Higher cost of capital has been factored into the model by increasing the hurdle rate from 12% to 13% in scenarios with rate regulation

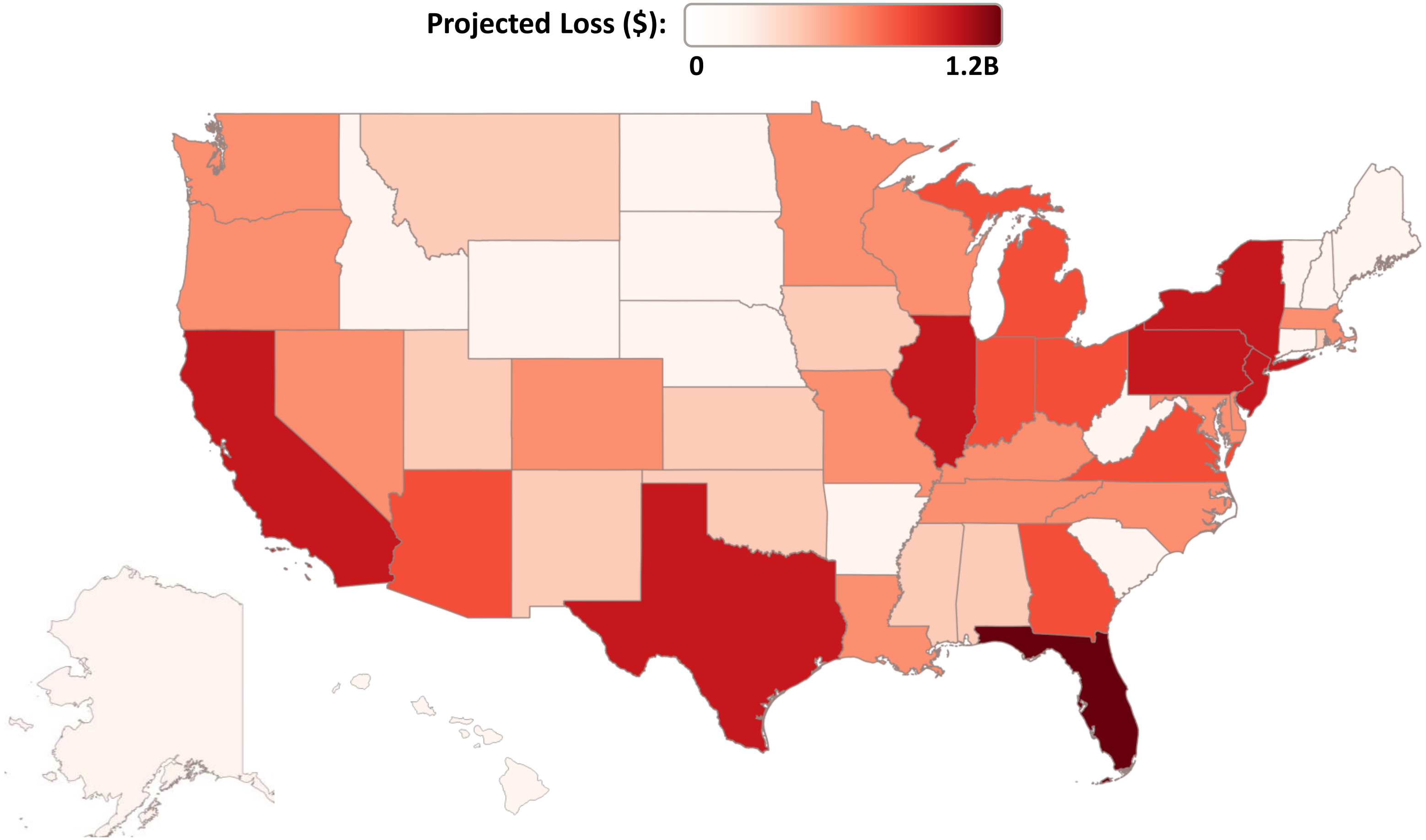
Source: FCC BDC (reported December 2024, accessed May 2025), Cartesian

Impact Assessment Findings | Investment Results by State

The impact on investment varies by state, with most losing 15% to 35% of the modeled capital expenditure

Modeled Loss in Network Investment from Rate Regulation[1]

Scenario 1 vs. Base Case



$$$ Florida, California, and Texas lose the most capital spend (in absolute dollar amount)

75% Montana, New Hampshire, and Maine lose the greatest share (over 70%) relative to baseline investment levels

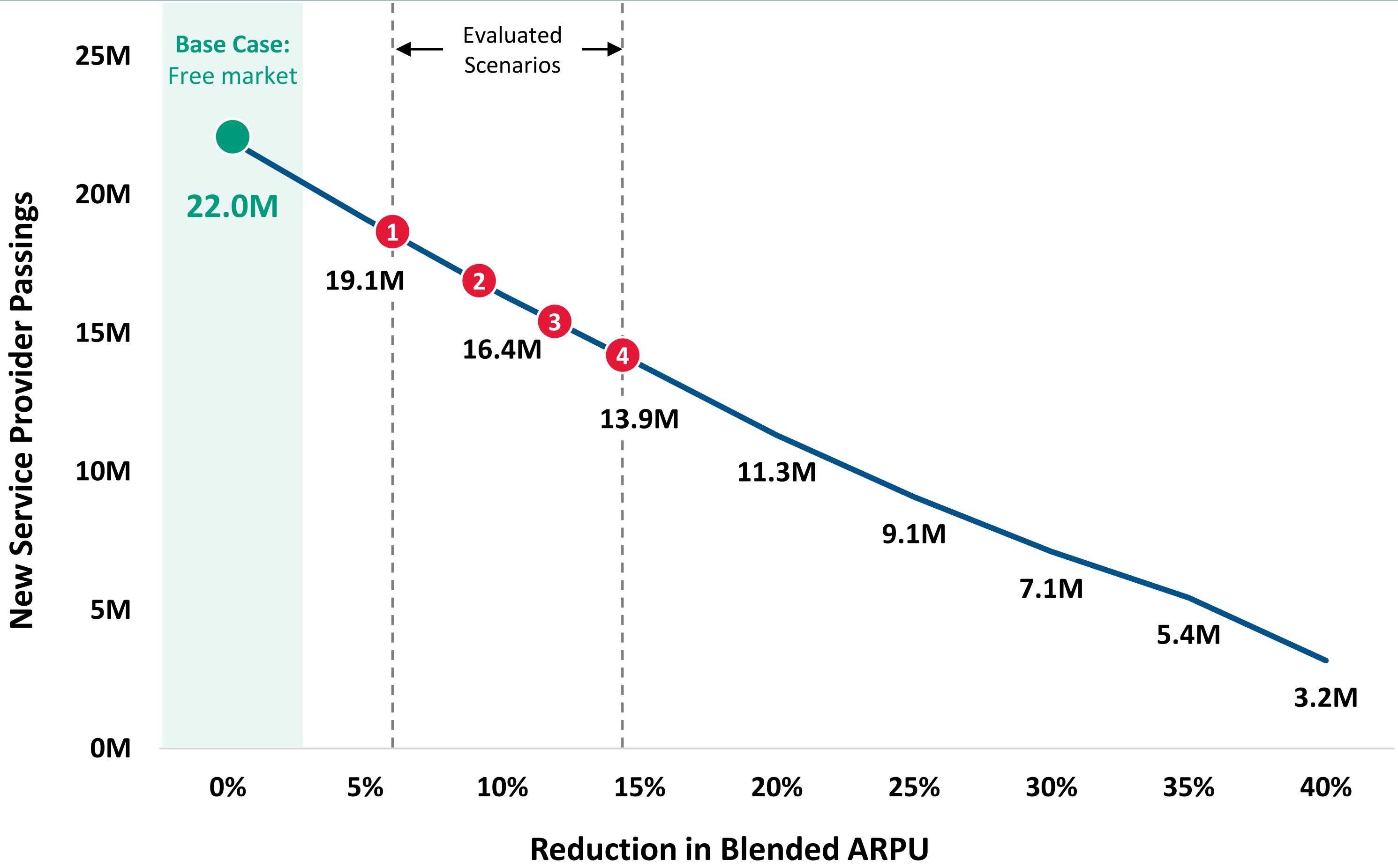
35% Most states lose between 15% to 35% of estimated network investment

Note: Considers fiber overbuild projects based on wireline competition only (excludes FWA and satellite); Capex investment hurdle rate of 12%; Reduction in investment is greater in other modeled scenarios
1: DC does not receive any new investment in this scenario
Source: FCC BDC (reported December 2024, accessed May 2025), Cartesian

Impact Assessment Findings | Impact on Competition for New Entry

Less investment will result in fewer market entrants, and hence less service provider choice for consumers

Modeled New Service Provider Passings Nationwide
By Reduction in Blended ARPU from Base Case



Est. Impact of Regulation on Competition
Locations which miss out on an additional provider

Scenario	Est. Decline in Comp. *# Locs vs. Base Case*	Est. Decline (%) *vs. Base Case*
Base Case	-	-
1	↓ 3.3M	↓ 15%
2	↓ 4.5M	↓ 21%
3	↓ 5.7M	↓ 26%
4	↓ 7.5M	↓ 34%

Note: For the purposes of this model, we assume that the cost of capital is unchanged; the likely increase in cost of capital will further reduce competition

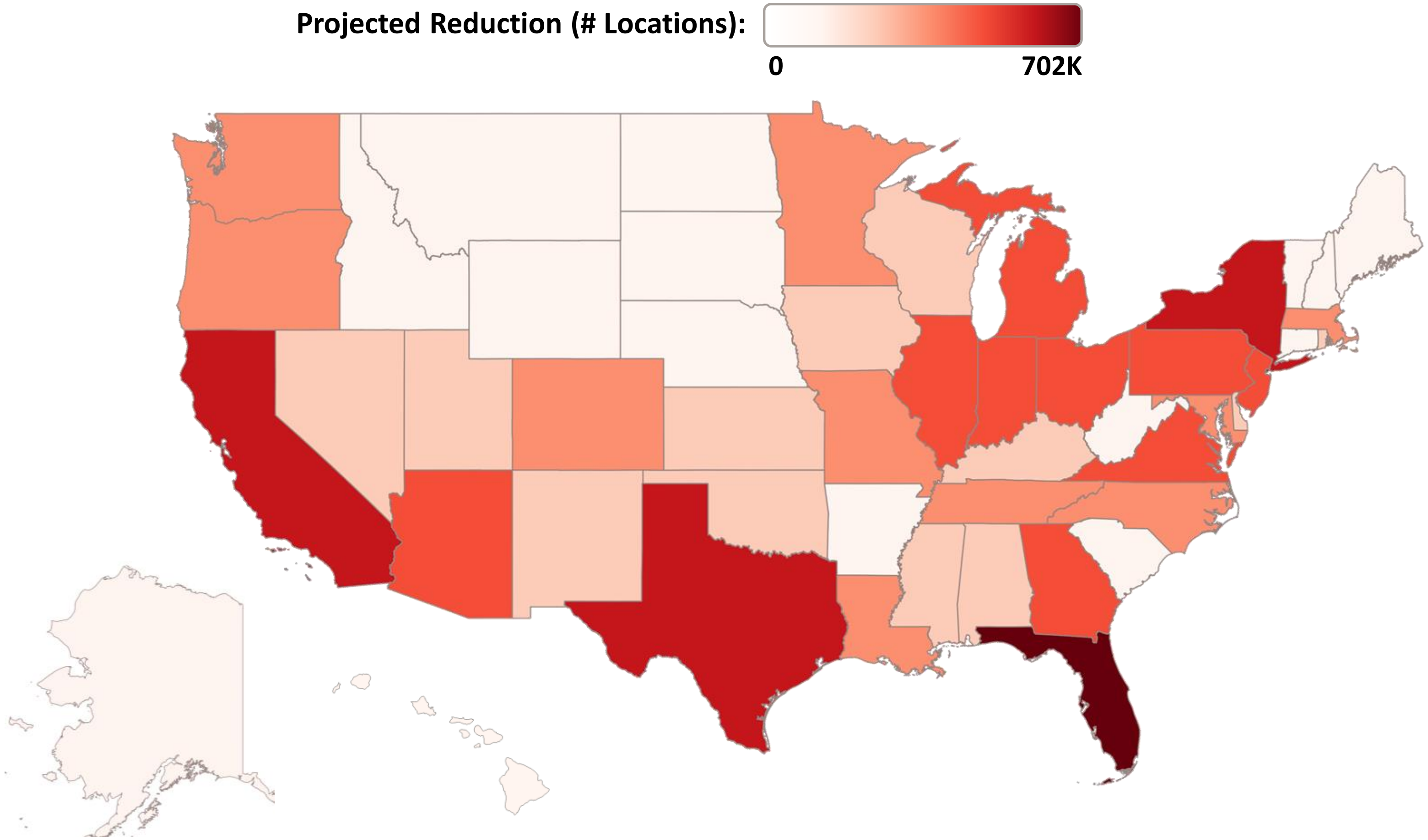
Note: Count of locations in census tracts with viable business case for fiber overbuild; Considers fiber overbuild projects based on wireline competition only (excludes FWA and satellite); Capex investment hurdle rate of 12%
Source: FCC BDC (reported December 2024, accessed May 2025), Cartesian

Impact Assessment Findings | New Entry Competition Results by State

Most states would see 15% - 35% fewer locations get an additional provider

Reduction in New Service Provider Passings[1]

Scenario 1 vs. Base Case



Florida, California, and Texas have the largest drop in number of locations with an additional provider

75% Montana, New Hampshire, and Maine have the biggest relative loss (over 70% fewer) versus the base case

35% Most states see 15% - 35% fewer locations gaining an additional provider

Note: Count of locations in census tracts with viable business case for fiber overbuild; Considers fiber overbuild projects based on wireline competition only (excludes FWA and satellite); Capex investment hurdle rate of 12%; Reduction in investment is greater in other modeled scenarios
1: DC does not have any locations with new competitors in this scenario
Source: FCC BDC (reported December 2024, accessed May 2025), Cartesian

Appendix

Research Sources

Interview Summary

Examples of Market Intervention

Model Methodology

Additional Modeling Scenarios

Appendix | Research Methods

We used a variety of primary and secondary research tools to support arguments throughout the report

	Research Sources	Usage in Report
Internal/ Primary	**Rate Regulation Impact Model**	Estimate quantitative impact of nationwide rate regulation on broadband investment and competition
	Cartesian Fiber Cost Model	Input to business case modeling with location-level estimates for cost to serve specific locations in the US with fiber
	Primary Interviews	Input to business case modeling, lend support to economic theory, underpin arguments on expected impacts
External/ Secondary	**Economic & Academic Studies**	Underpin arguments on impact of rate regulation in competitive markets, provide empirical evidence of impacts in similar industries
	FCC Broadband Data Map	Input to competition trend analysis, identifies BSL locations for Cartesian, fiber cost model, input to fair share calculation of Cartesian impact model
	Urban Rate Survey	Input to broadband pricing trend analysis

Source: Cartesian

Appendix | Primary Research Overview

We interviewed several ACA Connects member ISPs of various types, sizes and geographies

Interview Population

	ISP Type	Provider Size *Passings*	Geographies	Services Offered
ISP 1	Overbuilder	300k – 500k	Midwest	IPTV, Mobile (MVNO), Broadband
ISP 2	MSO	300k – 500k	Northeast	Cable, Broadband
ISP 3	ILEC	>1M	Across US	IPTV, Mobile (MVNO), Broadband
ISP 4	Overbuilder	> 300k	Midwest	IPTV, Broadband
ISP 5	MSO	>1M	Northeast & Mid-Atlantic	Cable, Mobile (MVNO), Broadband

Interview Topics

Business Overview & Service Offering

- Suite of services offered from network
- Participation in FCC High-cost programs (e.g., EACAM)
- Mix of revenue from services offered
- Network geography and model

Network & Service Investment Business Case

- Network expansion business case components
- Network upgrade business case components
- Typical investment decision points
- Key financial considerations
- Characteristics of market looking to enter

Impact of Rate Regulation

- Impact of rate regulation on ability to participate in FCC high-cost programs
- Impact of rate regulation on future business decisions
- Impact of rate regulation on existing markets and services
- Financing / cost of debt outcomes under rate regulation
- BEAD participation in states with rate regulation
- Impact of future regulatory uncertainty on business planning

Source: Company Websites, Provider Interviews, Cartesian

Cartesian®

Appendix | Primary Research Findings

Interview takeaways from our primary research

Key Themes	Supporting Points
Broadband is the main driver of revenue, telecom services contribute meaningful revenue	• Providers lead with broadband, few voice or video only offerings – MVNO only offered with broadband • Telecom is still a decent chunk of business, especially for commercial customers • 60% - 70% of revenue is HSD; 70% - 80% of revenue is residential • $70 - $72 broadband ARPU; pricing is already largely dictated by competitive market dynamics
Investment decisions consider all potential revenue streams and locations in a market	• Costs are primarily weighed against expected penetration, revenue, and return/payback period • Business cases are underpinned by broadband, but consider and need all services to make the investment work – providers build with the expectation of bundling services • Providers are invested in the communities they operate in and aim to build to every location, including high-cost locations
Rate regulation would deter investment in new markets	• Expansion opportunities would be the most impacted by rate regulation, especially high CPP areas • Network in-fill would be impacted too, may no longer be attractive to go back and fill in areas of the network • Worse economics would impede ability to secure funding for new builds or refinance with lenders • Some providers are not bidding on BEAD in states with rate regulation or the threat of rate regulation
Rate regulation would stagnate investment in existing markets	• The cost to comply with rate regulation (e.g., resources, upskilling, time) would eat into already competitive margins • Even a $5 hit to ARPU in mature markets would prove difficult • Network upgrades may be safer option than full market expansions • Providers would have to make the economics work in existing markets, potentially reducing local employment, raising prices elsewhere, or recoup costs in other ways

Source: Provider Interviews, Cartesian

Appendix | Historical Examples of Market Intervention

When enacted, price controls have historically not yielded intended effects

	1992 – Cable	2010s – Business Data Services (BDS)	2015 – Broadband
Background	• Various local authorities implemented quasi rate-of-return regulations through the 1970s, which were rolled back with 1984 deregulation • Cable TV prices rapidly increased through the rest of the 1980s	• Limited market entry by cable and CLECs, beginning in the 1990s • ILECs maintained market dominance • Businesses faced high prices and limited options	• FCC wanted legal authority to enforce open internet rules
Market Intervention	• **Action**: 1992 Cable Act placed price controls on the basic tier of cable service where it deemed there was no effective competition, but not on other cable services • **Goal**: Protect consumers from rapid price increases	• **Action**: FCC issued a NPRM in 2016[2] proposing to evaluate market competition and regulate rates in noncompetitive geographic areas • **Action**: FCC changed course in 2017, backed away from intervention and favored deregulation instead	• **Action**: FCC reclassified broadband as Title II service under FCC regulatory control in 2015 Open Order • **Goal**: Enact net neutrality rules and prevent ISPs from engaging in discriminatory acts
Outcome	• **Lower Prices on Regulated Tier:** Consumers saw slower price increases on basic tiers • **Cable Tier Workarounds:** Operators shifted channels from regulated to unregulated tiers and added new fees outside regulatory scope • **Higher Prices Elsewhere:** Average cable bill ***increased*** for a third of cable subs[1] • **Deregulation in 1996 Telecom Act:** FCC rolled back cable rate regulations[2]	• **Market Entry:** Providers entered competitive markets • **More competition**: FCC found there was widespread competition for BDS[3] • **Price Decline:** Ethernet prices decreased over time[3] due to increasing competition	• **No Ex-Post Regulation**: Despite the authority to regulate rates via Title II reclassification, FCC explicitly chose not to regulate broadband prices • **No Ex-Ante or Ex-Post Regulation** in the 2024 Open Internet decision

1: FCC, Duke University – *The Impact of the 1992 Cable Act on household demand and welfare*; 2: The 1996 Act eliminated any regulation of non-basic rates but permitted rate regulation of basis service rates where there was no effective competition. The FCC initially placed the burden of showing effective competition on cable operators but later shifted the burden to franchising authorities to show there wasn't effective competition. By 2019, FCC found that all markets were subject to effective competition; 3: FCC Overview on Business Data Services

Source: FCC, Desktop research, Cartesian

Appendix | Examples of Alternative Affordability Tools

Direct subsidies are a common policy tool to assist lower-income households in affording essential goods

Direct Subsidy Programs for Lower Income Households			
Sector	**Program**	**Description**	**Program Outcomes**
Housing	**Housing Choice Voucher Program (HCVP)**	Offers aid to low-income families and others to afford housing in private markets through vouchers	**2M** families have received HCVP aid, providing a subsidy to cover part of their rent
Nutrition	**Supplemental Nutrition Assistance Program (SNAP)**	Provides food-purchasing assistance to low-income families through EBT card	**10%** of Americans benefit from SNAP stamps, with providers seeing sales increments up to **14%**[3] in low-income areas
Nutrition	**Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)**	Offers special nutritional assistance to low-income pregnant woman, infants, and children up to 5	**6M** eligible individuals participate in WIC
Nutrition	**National School Lunch Program (NSLP)**	Provides free or reduced-price lunches to eligible students	**30M** students receive free or reduced-price lunches
Utilities	**Low Income Home Energy Assistance Program (LIHEAP)**	Offers financial aid to low-income HHs to help pay for heating and cooling – aid is on top of regulated rates	**~6M HHs** received assistance for heating, cooling, weatherization, etc., and provided revenue stability for providers in low-income areas
Telecom & Broadband	**Lifeline**	Provides eligible low-income families with a $9.25 monthly discount[1] on internet, phone, or bundled services	**~7M HHs** receive discounted phone (or internet) plan
Telecom & Broadband	**Affordable Connectivity Program (ACP) -** *discontinued*	Provides eligible low-income families with a $30 discount[2] for a monthly broadband plan	Up to **23M HHs** received internet via ACP benefit, including ~60%[4] of HHs who would otherwise be unconnected ; also increased broadband subscription levels by **~3%**[5] nationally

1: Up to $34.25 for tribal lands; 2: Up to $75 for tribal lands, and up to $100 towards a device; 3: NYU Wagner School of Public Service; 4: NRECA; 5: Benton Institute
Source: HUD, FCC, USDA, LIHEAP, NYU, Benton Institute, Cartesian

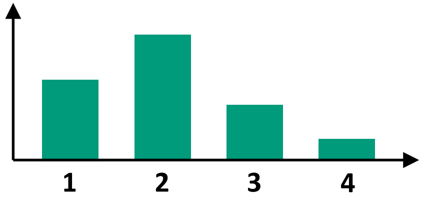
Appendix | Model Methodology

To assess the impact of broadband rate regulation, we model the return on investment for a new entrant evaluating prospective locations for a fiber overbuild; results are calculated for all US at census block granularity

1 For each census tract, estimate how many subscribers a new entrant would acquire, assuming it takes a fair share of subscribers weighted by the level of competition at each BSL

Illustrative

Count of BSLs by # Existing Networks



New Entrant Fair Share	50%	33%	25%	20%

= Census Tract Weighted Average Fair Market Share: 35%

× Census Tract BSLs × Broadband Penetration = **New Entrant Subscribers**

2 Using Cartesian's fiber network cost model, estimate the cost to pass BSLs in each tract and add connection costs for total CAPEX

Census Tract BSLs × Cost Per Premises Passed for Census Tract + New Entrant Subscribers × Cost Per Connection = **CAPEX**

3 Calculate EBIT from estimated revenue in each tract and use this to determine the census tract ROI for the new entrant

New Entrant Subscribers × Blended ARPU × EBIT Margin = EBIT ÷ CAPEX = **Annual Return on Investment**

Note: For reasons of model simplification, cashflows are not discounted, costs and revenues are held constant, and time-series effects of growing market share are ignored. Collectively, these will reduce the ROIs; however, the comparative results of modeled scenarios remain valid
Source: Cartesian

Appendix | Model Assumptions

Model inputs were sourced from industry interviews, third party research, and Cartesian's own knowledge base

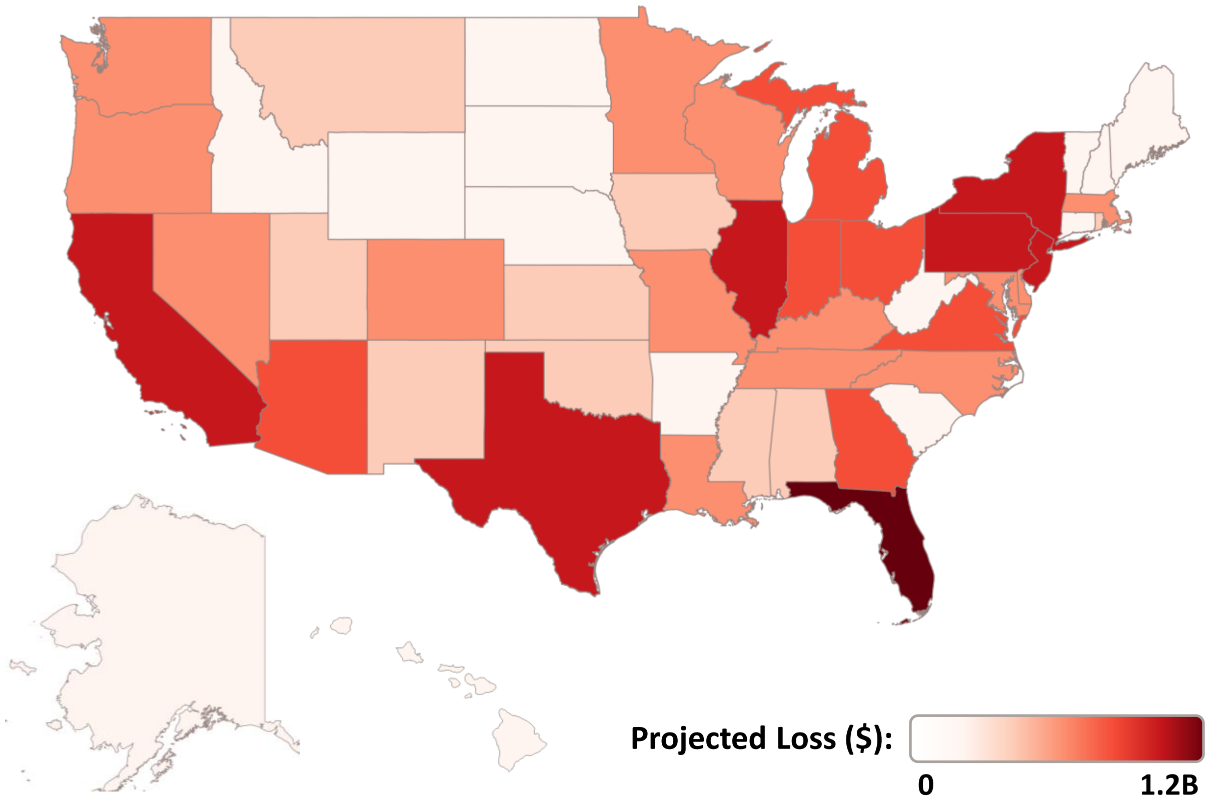
Model Segment	Assumption	Value	Source
Capex	CPPP	**Varies by Location**	Cartesian Fiber Cost Model
	CPC	**$500 / location**	FBA, Cartesian Fiber Deployment Cost Study
Revenue	Base – Residential Broadband ARPU	**$70**	ACA Connects Member Interviews, Cartesian
	Video ARPU	**$100**	
	Voice ARPU	**$30**	
	Business Services ARPU	**$100**	
	Residential Broadband Revenue Share	**56%**	
	Video Revenue Share	**16%**	
	Voice Revenue Share	**8%**	
	Business Services Revenue Share	**20%**	
	Broadband Penetration Rate	**92%**	Leichtman Research Group
Return on Investment	EBIT Margin	**75%**	Cartesian
	Hurdle Rate – Base	**12%**	
	Hurdle Rate – Higher WACC	**13%**	

Source: Cartesian

Appendix | Scenario 1 vs. Scenario 4 Capital Expenditure

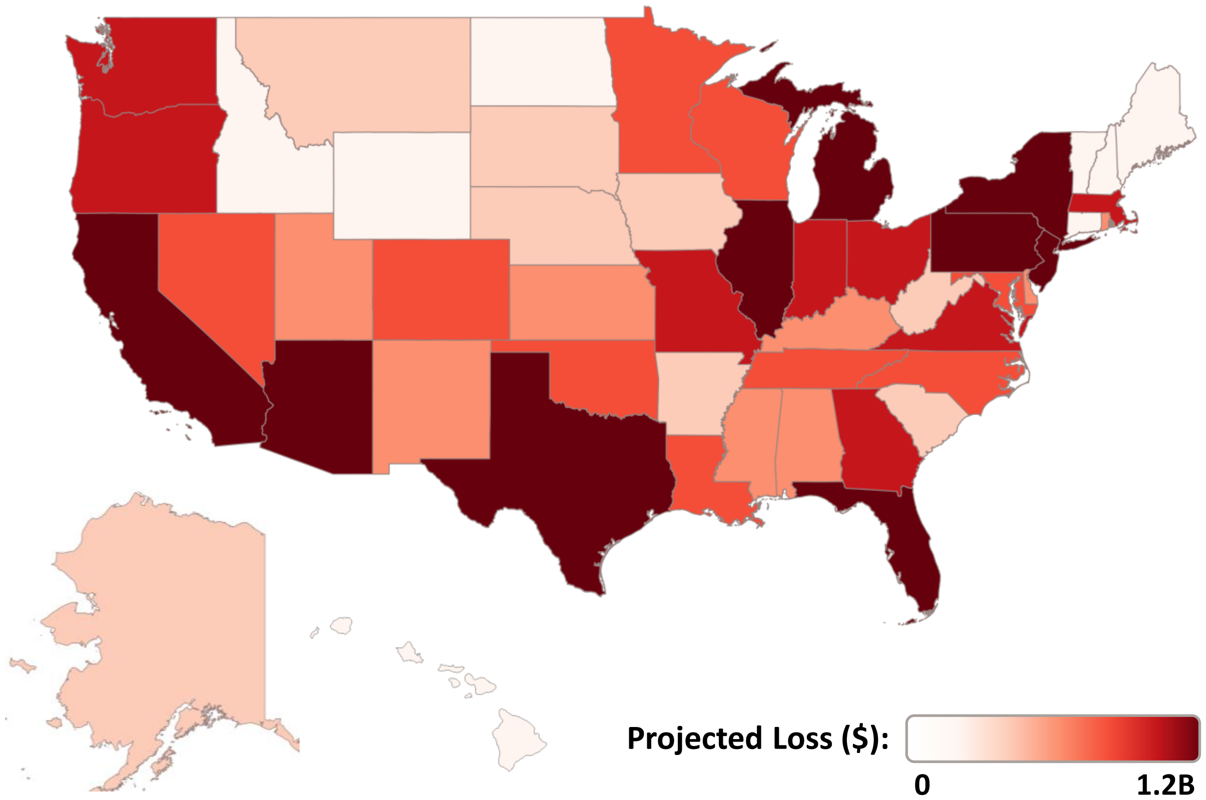
Loss in Capital Expenditure increases significantly between Scenario 1 and Scenario 4

Modeled Loss in Network Investment from Rate Regulation
Scenario 1 ($30 Low-Income Plan Only)[1] vs. Base Case (Zero Intervention)



Most states lose between **15% to 35%** of estimated network investment

Modeled Loss in Network Investment from Rate Regulation
Scenario 4 ($15 Low-Income Plan, $60 Remaining Plan)[2] vs. Base Case (Zero Intervention)



Most states lose between **45% to 65%** of estimated network investment

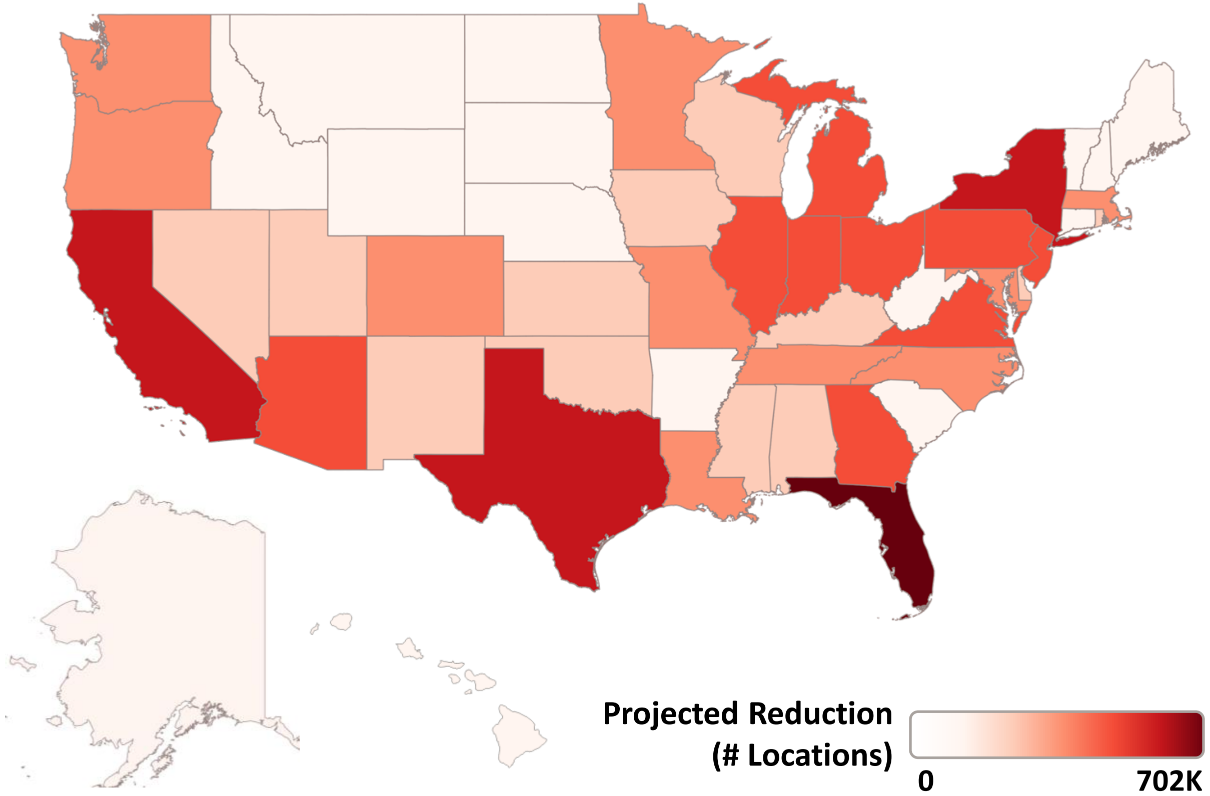
1: DC does not receive any new investment in this scenario; 2: DC and North Dakota do not receive any new investment in this scenario
Note: Considers fiber overbuild projects based on wireline competition only (excludes FWA and satellite); Capex investment hurdle rate of 12%
Source: FCC BDC (reported December 2024, accessed May 2025), Cartesian

Appendix | Scenario 1 vs. Scenario 4 Competition

Even fewer locations gain access to an additional provider in Scenario 4 as compared to Scenario 1

Reduction in New Service Provider Passings

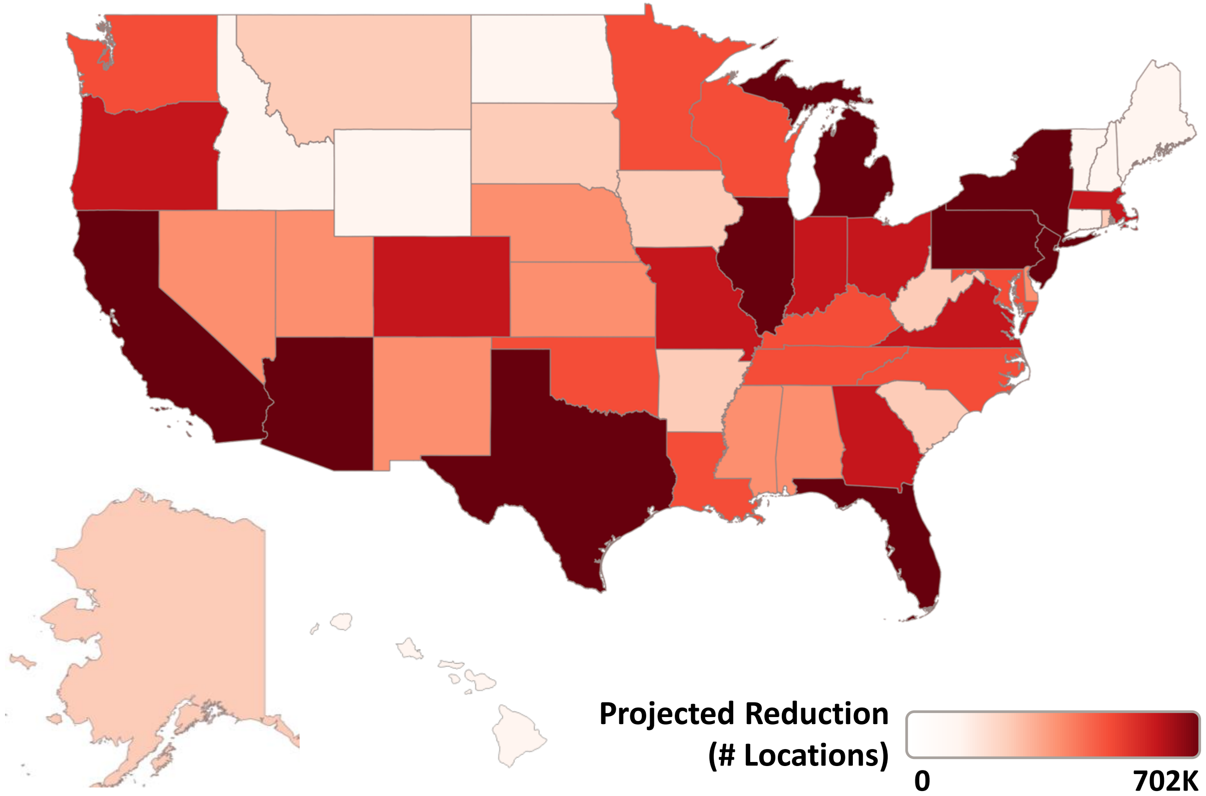
Scenario 1 ($30 Low-Income Plan Only)[1] vs. Base Case (Zero Intervention)



Most states see **15% to 35%** fewer locations gaining an additional provider

Reduction in New Service Provider Passings

Scenario 4 ($15 Low-Income Plan, $60 Remaining Plan)[2] vs. Base Case (Zero Intervention)



Most states see **45% to 65%** fewer locations gaining an additional provider

1: DC does not have any locations with new competitors in this scenario; 2: DC and North Dakota do not have any locations with new competitors in this scenario

Note: Count of locations in census tracts with viable business case for fiber overbuild; Considers fiber overbuild projects based on wireline competition only (excludes FWA and satellite); Capex investment hurdle rate of 12%

Source: FCC BDC (reported December 2024, accessed May 2025), Cartesian

BOSTON

KANSAS CITY

LONDON

NEW YORK

PARIS