Rural Broadband
Solving the Puzzle

14 June 2021

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https://www.connectingappalachia.org/
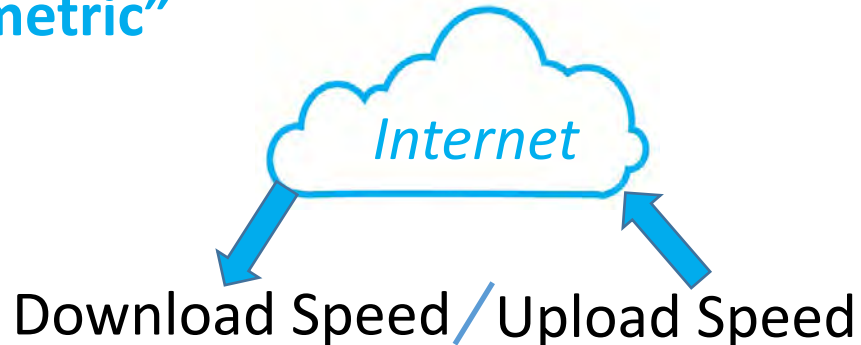
Speeds

"Asymmetric"

Download Speed / Upload Speed
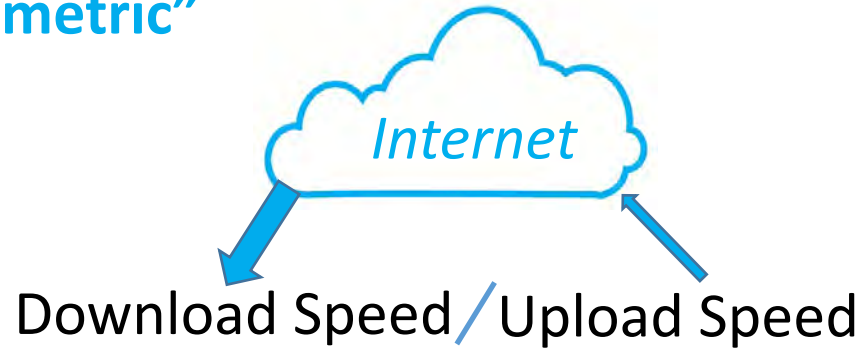
- 25/3 = 25 Mbps down/5 Mbps up
- 100/20 = 100 Mbps down/20 Mbps up
- 1000/200 = 1 Gbps down/200 Mbps up

"Symmetric"

Download Speed / Upload Speed

- 25/25 = 25 Mbps down/25 Mbps up
- 100/100 = 100 Mbps down/100 Mbps up
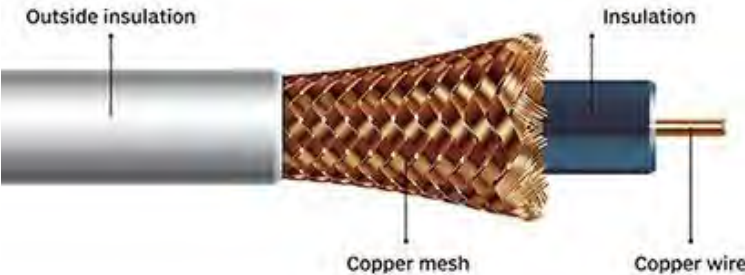- 1000/1000 = 1 Gbps down/1 Gbps up

1,000,000 (one million) bits per second = 1 Mbps
1,000,000,000 (one billion) bits per second = 1 Gbps

Underlying Infrastructure

"Fiber Optic Glass"

"Coaxial Cable Copper"

Outside insulation

Insulation

Copper mesh

Copper wire
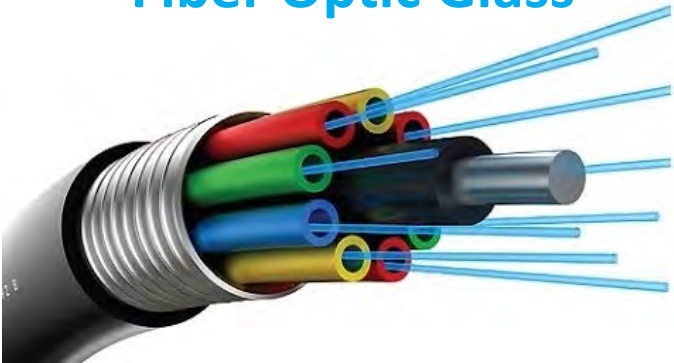
"Twisted Pair Copper"

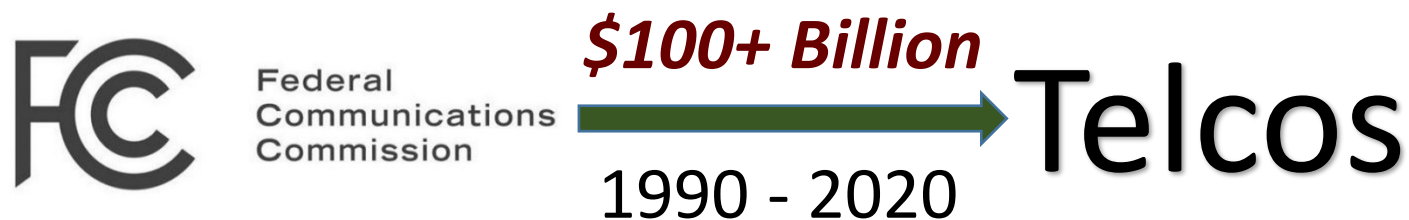# Leveling the Playing Field

U.S. Communications Act of 1934

"All people in the United States shall have access to rapid, efficient, nationwide communications service with adequate facilities at reasonable charges."

FC C Federal Communications Commission

$100+ Billion

1990 - 2020 → Telcos

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Why does rural broadband require subsidy?

	City or Area of Ohio	Households per Square Mile	Median Household Income	Density Compared to Columbus
Cities and Towns	Columbus	1,510	$49,478	100%
	Marietta	693	$35,556	46%
	Logan	604	$29,691	40%
	McConnelsville	486	$25,563	32%
Rural Expanse	Entirety of Meigs County	26	$33,407	1.7%
	Carthage Township, Athens County	17	--	1.1%
	Monroe Township, Perry County	12	--	0.8%

Congress intended the Universal Service Fund **to level the playing field**

In the digital desert...
McDonalds for Broadband Access

- A sad reality that remains prevalent
- Relegated to parking lots during the pandemic
  - Precludes remote work
  - Hobbles academic achievement
  - Blocks healthcare innovation
  - Inhibits business development

Wall Street Journal on Jan 28, 2013

The same story year after year after year

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Missing Infrastructure: $100+ Billion

Highways area a fundamental infrastructure element

- $10 million to $20 million per mile (fully loaded)
- Some waste, fraud and abuse in every project

Yet we can drive the highways!

Carriers received **$100+ billion** in Federal funding to improve rural telecom infrastructure since 1990

Yet the rural digital "highway" is missing in action, leaving rural America reliant on decrepit copper

Imperative to wisely invest public funding to revitalize rural America

Decrepit Copper

- The copper cables serving rural America are 50+ years old, well past end-of-life

- This decrepit infrastructure fails to deliver reliable landline telephone service let alone broadband

- Staffing levels so low that restoration takes multiple weeks

- **De facto abandonment** by large telcos

- **Poses life/safety risks**, particularly in areas also lacking cell service

Imagine if road maintenance ceased for a few decades
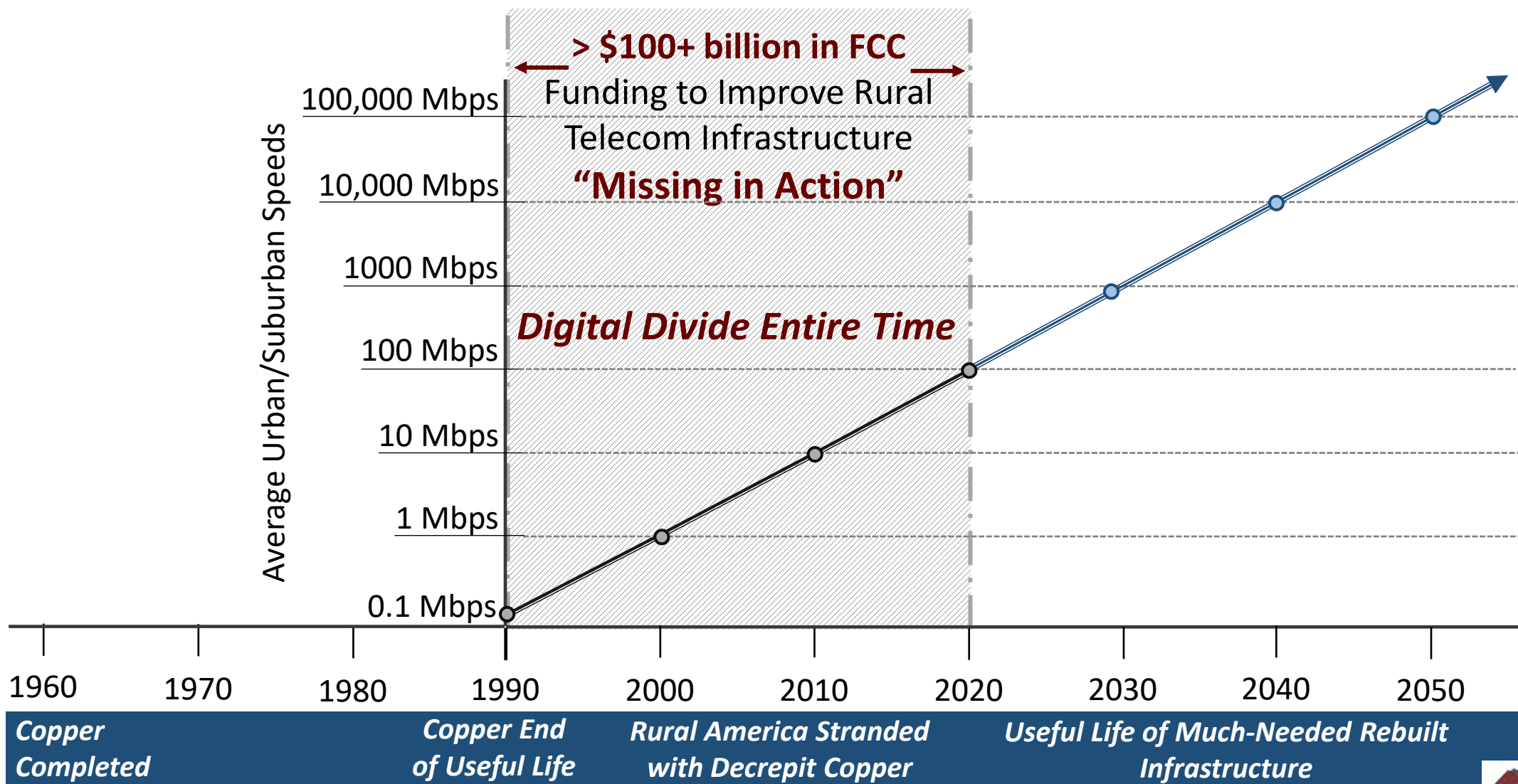
We can not haul bits ....

25/3

56 Kbps

1994 PUCO Report
Decrepit copper keeping many rural residents from achieving 56 kbps on modems

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Stranding of Rural America

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> **$100+ billion in FCC**
Funding to Improve Rural
Telecom Infrastructure
"Missing in Action"

Digital Divide Entire Time

Average Urban/Suburban Speeds

100,000 Mbps	
10,000 Mbps	
1000 Mbps	
100 Mbps	
10 Mbps	
1 Mbps	
0.1 Mbps	

1960 1970 1980 1990 2000 2010 2020 2030 2040 2050

Copper Completed   *Copper End of Useful Life*   *Rural America Stranded with Decrepit Copper*   *Useful Life of Much-Needed Rebuilt Infrastructure*
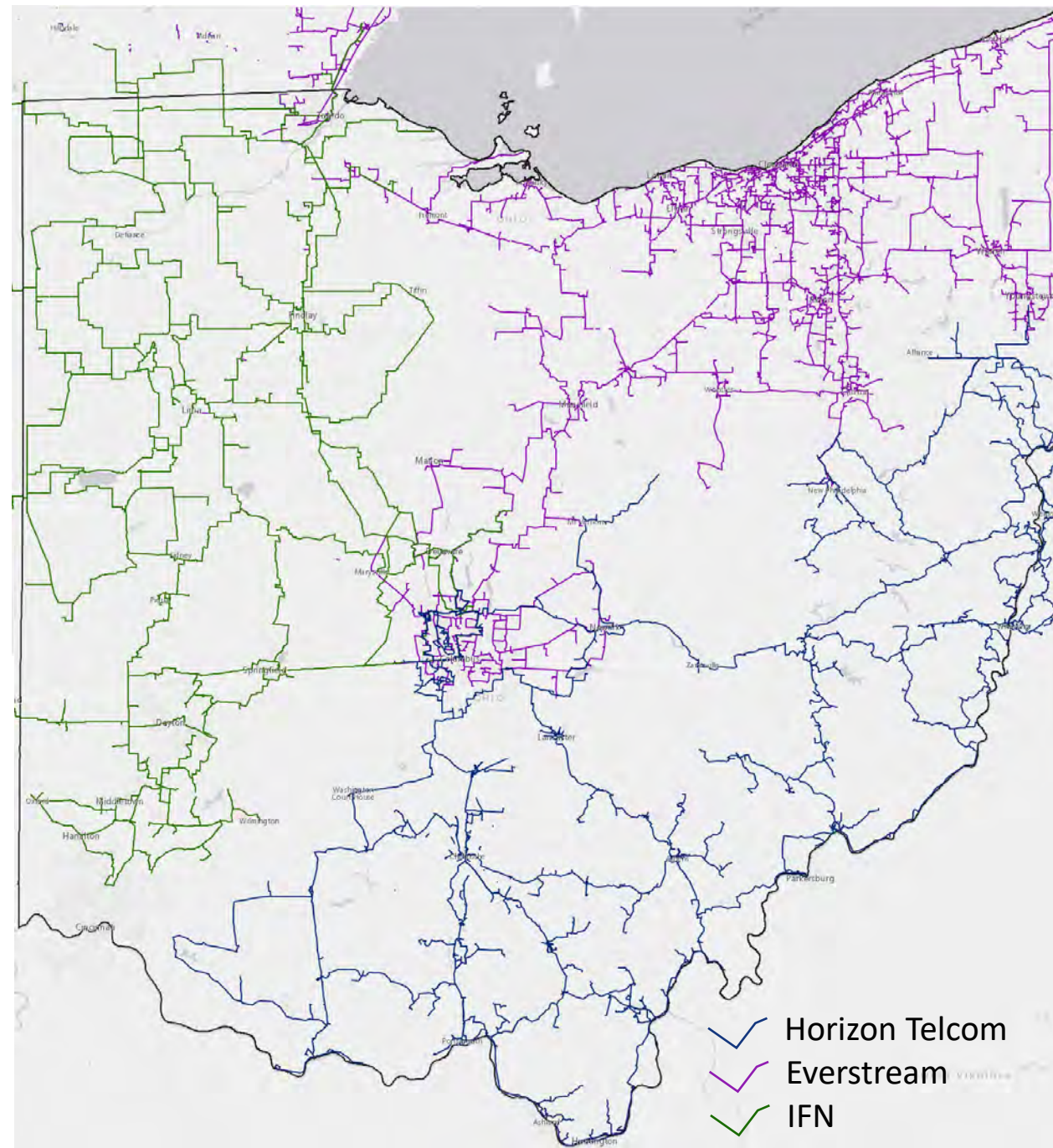
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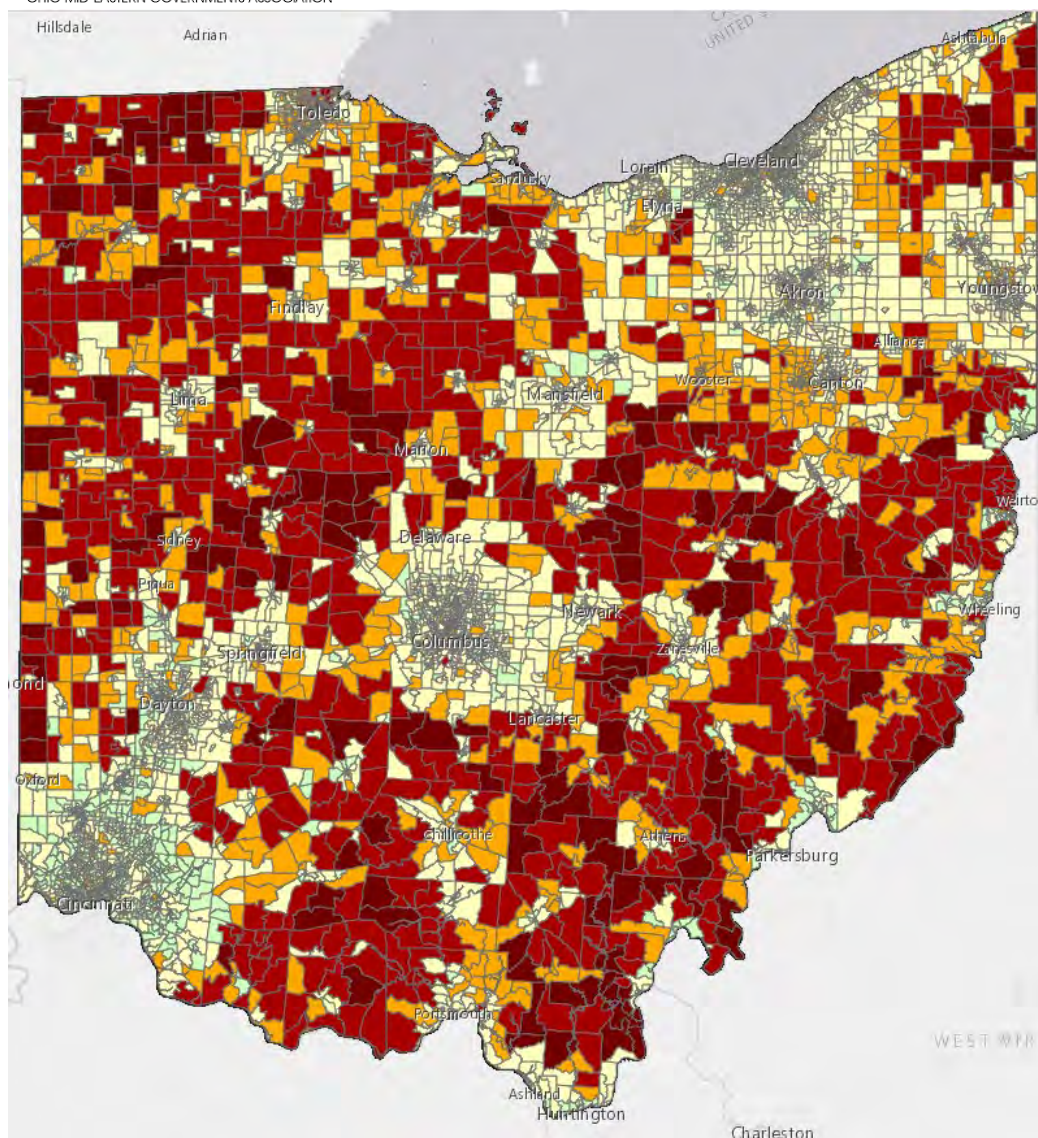
Tremendous Middle Mile Progress by Thinking Big

- 2000+ miles of fiber

- $260 million in total construction

- $160 million in Federal funding

- 6000+ anchor institutions

- Hundreds of cell towers

Ohio Middle Mile Consortium and Southern Ohio Health Care Network

Federal Communications Commission

NTIA

Horizon Telcom
Everstream
IFN

Determining On-the-Ground Truth

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OOKLA

Below 10/1

Below 25/3 >10/1

Below 50/10 >25/3

Below 100/20 >50/10

Above 100/20

- 9+ million consumer initiated tests over 15 months
- Distilled to 460,000 "locations" based on lat/long
- Clearly identifies many locations still under 10/1
- Promoting consumer initiated tests to allow for extrapolation across all census blocks

Based on Ookla® Speedtest Intelligence® data for February 2020 through April 2021 using all providers combined data

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Combined Findings – Statewide

| Unified Speed Rating		Square Miles	Share of Sq Miles	Households	Household Density
1	< 10/1	18,510	48%	353,931	19
2	>=10/1 < 25/3	5,639	17%	362,768	54
3	>=25/3 < 50/10	5,555	14%	1,046,650	188
4	>=50/10 <100/20	6,479	17%	2,153,019	332
5	>= 100/20	1,271	3%	689,966	543
Totals		38,485	100%	4,606,334	120

Average speed in well-served areas

Our analysis identifies **715,000 = 3.7x the FCC number**

Increase the threshold to 50/10 and we **add another 1,045,650** underserved households

~2,400 square miles still being analyzed in high population density areas

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Ookla-Rated Blocks +
Population Density Extrapolation
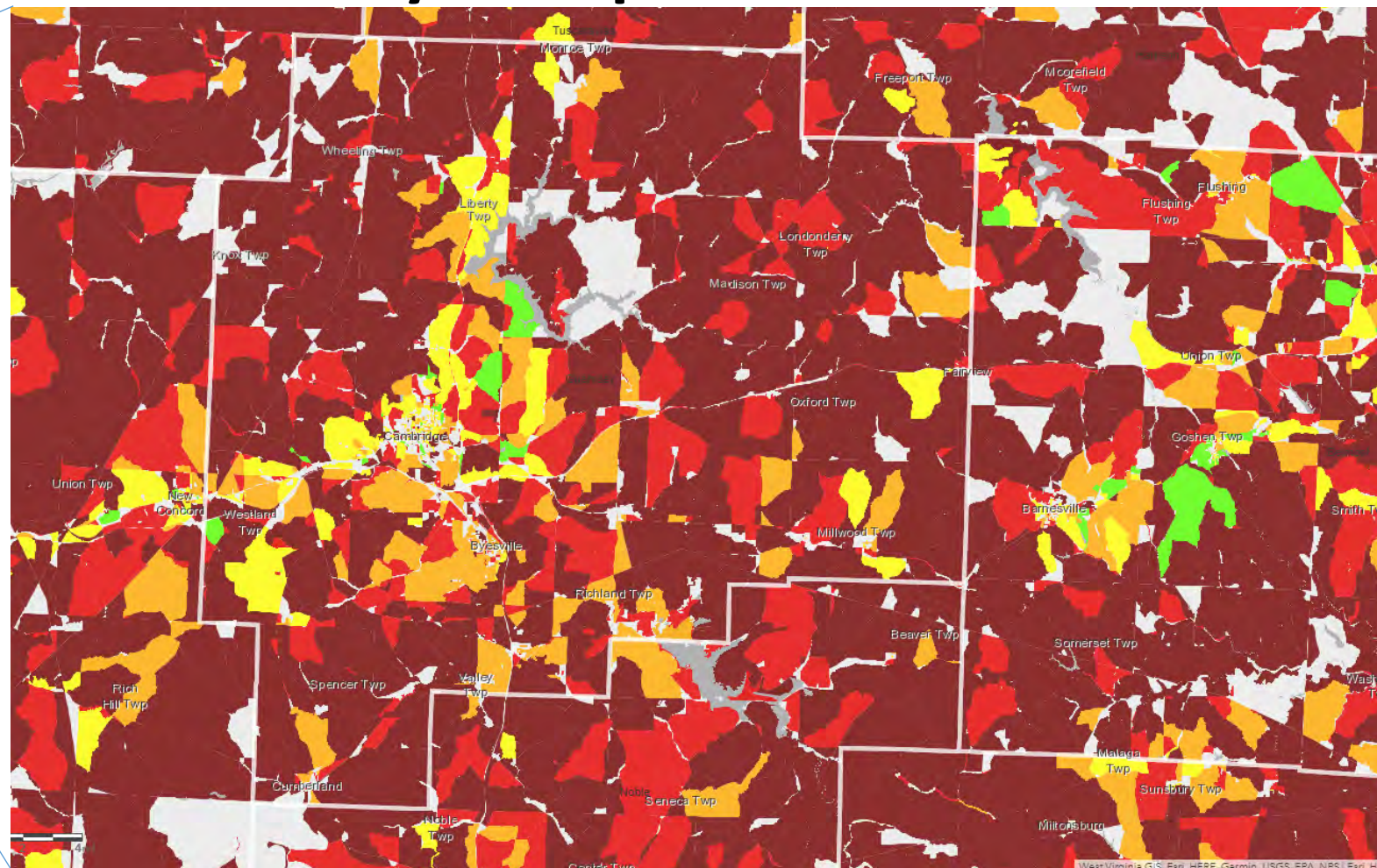
Broadband Speeds
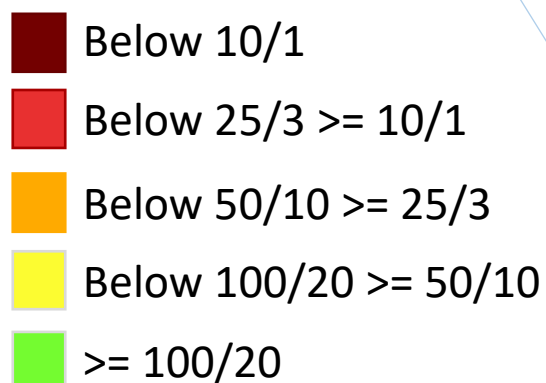
- Below 10/1
- Below 25/3 >= 10/1
- Below 50/10 >= 25/3
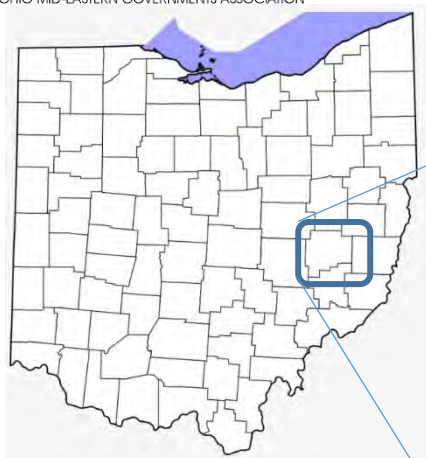- Below 100/20 >= 50/10
- >= 100/20

Based on Ookla® Speedtest Intelligence® data for February 2020 through April 2021 using all providers combined data
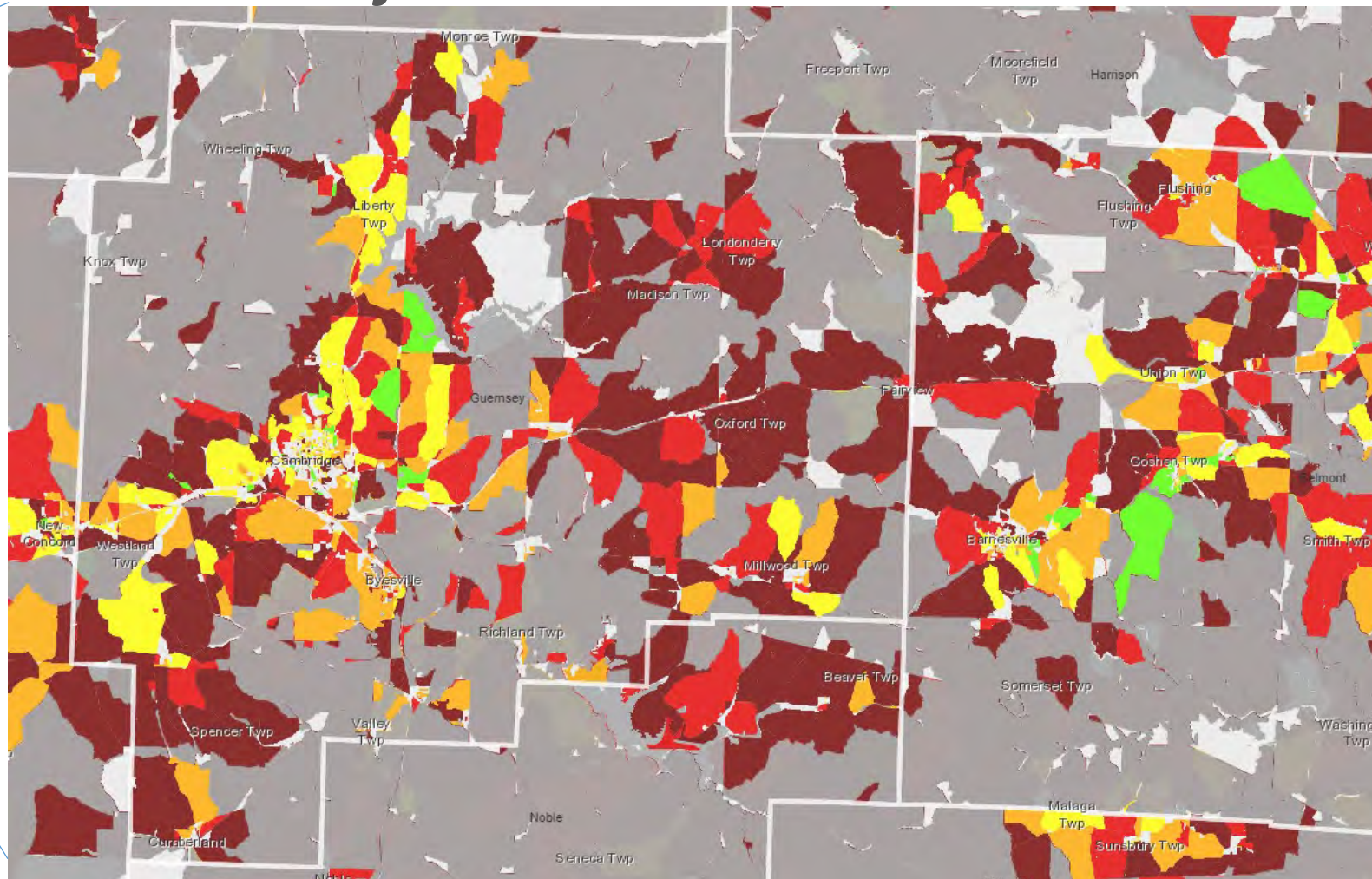
With RDOF Winners Overlay
Much left to do ....

Broadband Speeds

- Below 10/1
- Below 25/3 >= 10/1
- Below 50/10 >= 25/3
- Below 100/20 >= 50/10
- >= 100/20

FCC RDOF Winners Areas

Based on Ookla® Speedtest Intelligence® data for February 2020 through April 2021 using all providers combined data

Project Planning County-by-County

Speedtest® Results
- Below 10/1
- Below 25/3
- Above 25/3

RDOF Winners
- Charter/Spectrum
- Mercury Wireless
- Connect Everyone

• Household (LBRS)

⎯⎯ Existing middle mile

⬭ Potential Project Areas

Assumption: Steered away from areas won by Charter in RDOF

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Ohio Mid-Eastern Governments Association

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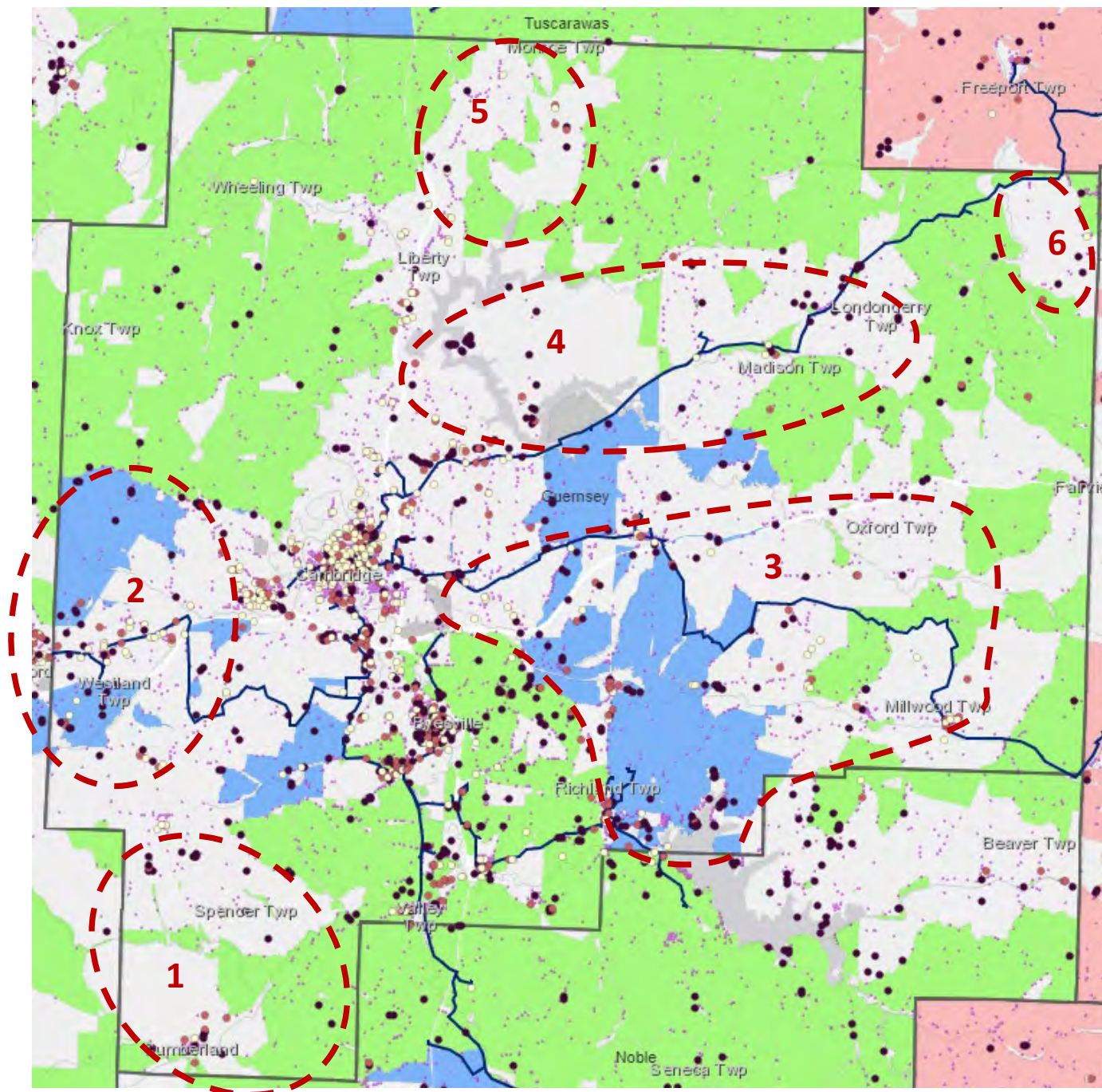
Overarching Architecture

Key Objectives

- Capacity = Meet the needs of 2055

- Longevity = Minimum of 30 years

- Coverage = 100% of households and businesses
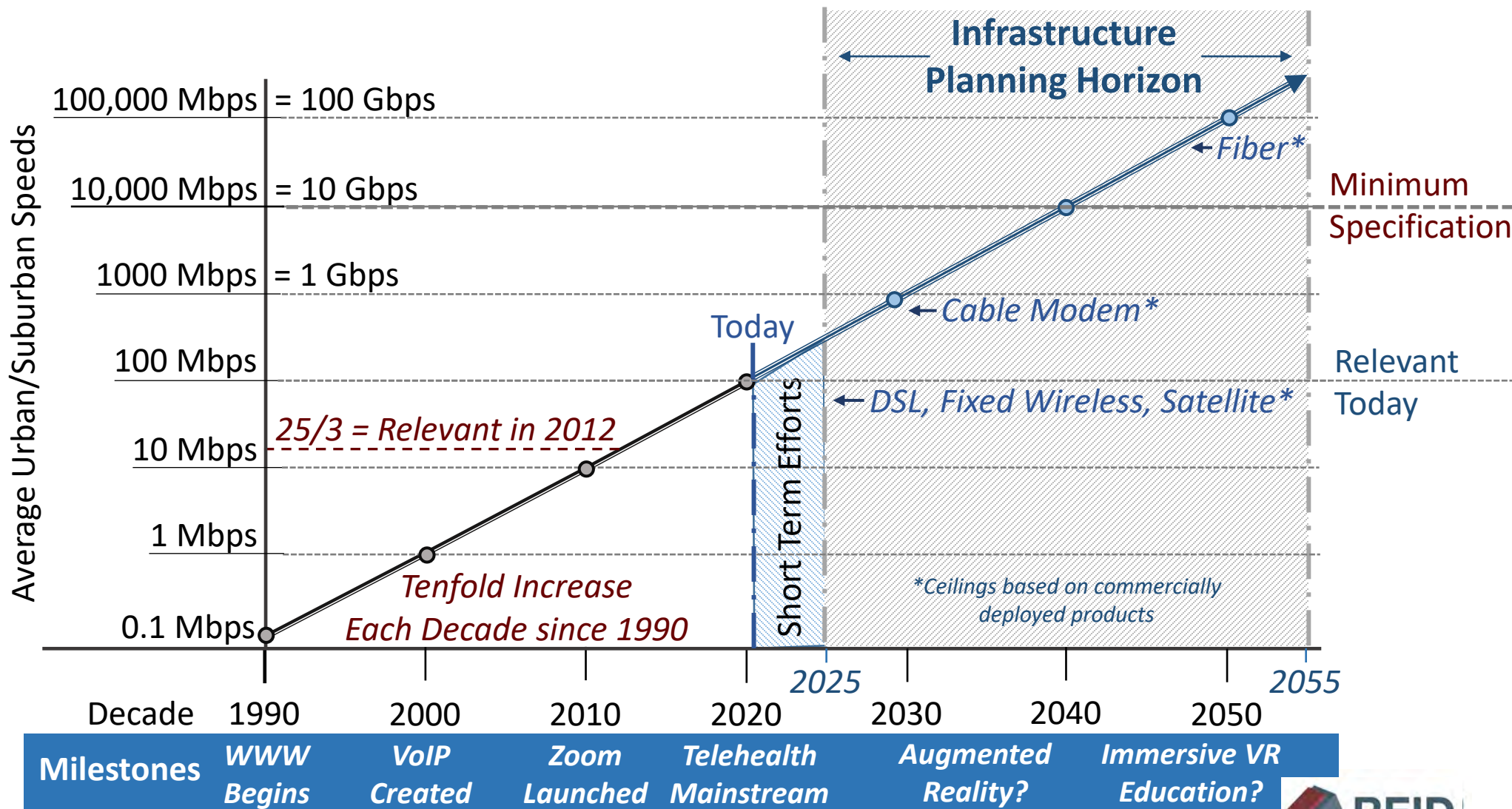
The "Big Picture" plan enables wise investments

Three Technologies to Evaluate
1. Satellite
2. Hybrid Wireless and Fiber
3. Fiber-to-the-Premise

Satellite

- Low-earth-orbit (LEO) satellites
  - Terrain and heavy foliage obstruct signal
  - Capacity insufficient for mass market
  - Requires fiber nodes for uplink/downlink

- Geosynchronous satellites
  - Suffer round-trip signal delays ("latency") that hampers two-way live services
  - Data caps and subsequent "throttling" reduce effectiveness for streaming services

Fixed Wireless

Flatlands

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Wireless signals travel unobstructed across flat farmland,
a feasible solution in these types of areas

In areas with rugged terrain and heavy foliage cover
both coverage and capacity severely limited
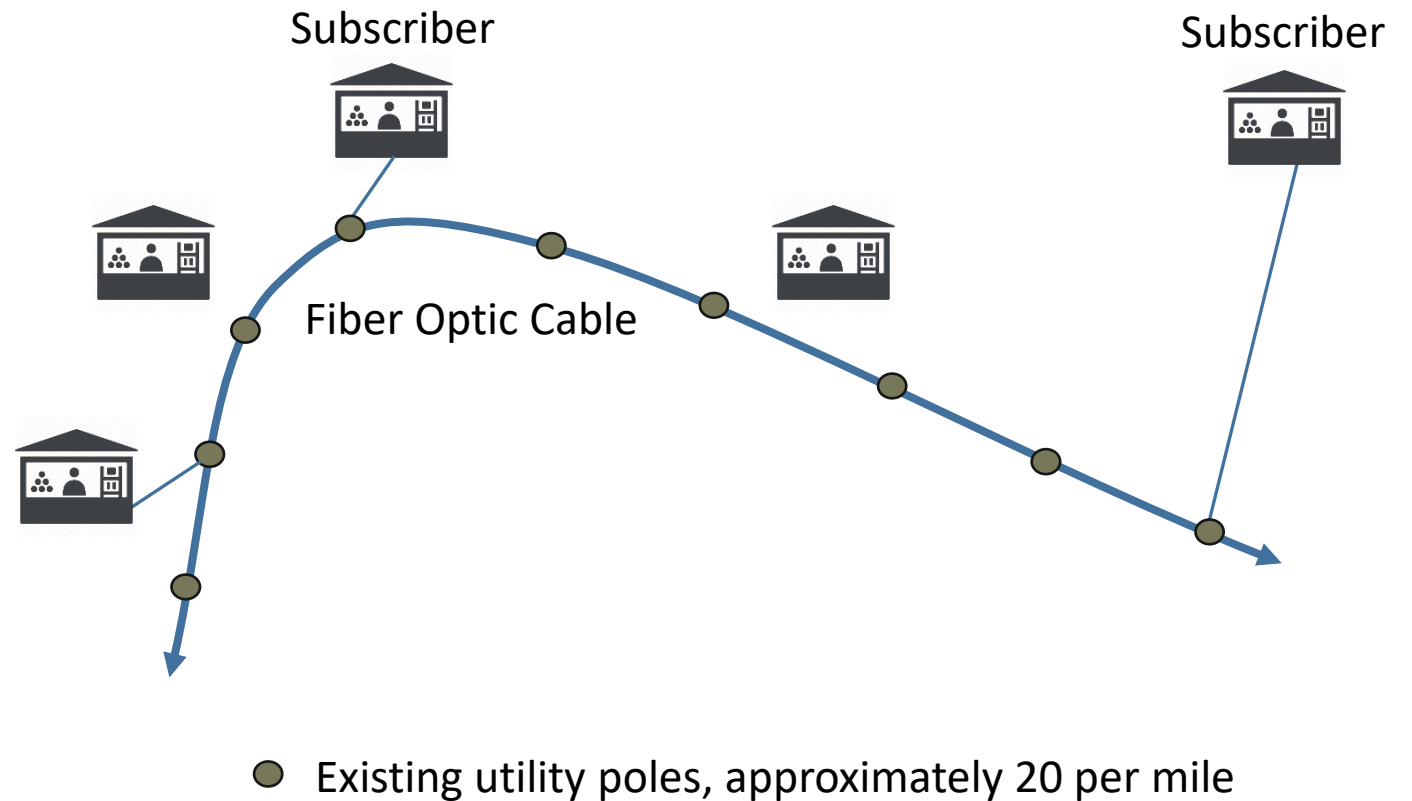
Wireless Propagation Challenges
Engineering Zone A

- 4 towers on high points, each 300' tall (3 shown)

- >$1.5 million in infrastructure for just 60 square miles

- Many locations still unreachable in rugged terrain

Same factors **limit mobile phone coverage** in region

★ Tower
• Address Point

☐ No line-of-sight
▨ Line-of-sight from one or more towers
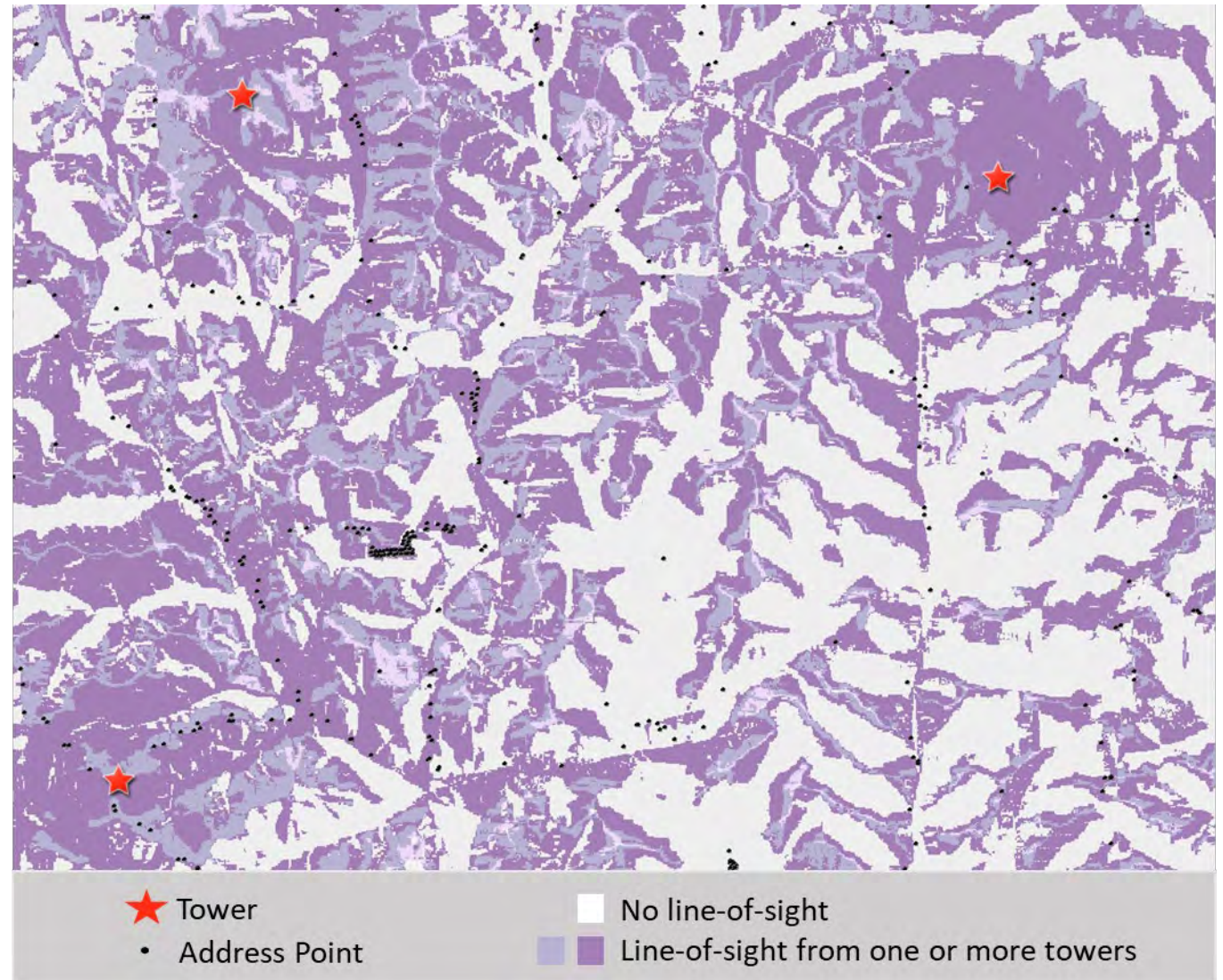
Fiber-to-the-Premise

- Tremendous capacity

- Stable services

- High capital costs, low operating costs

- 30+ year lifetime

- Foundation required for other services including mobile

- **Would leapfrog our region**

- Efficient use of investment

Subscriber

Subscriber

Fiber Optic Cable

● Existing utility poles, approximately 20 per mile

Once "cost to pass" covered, network is profitable

Grid Resiliency Issue Too

Building fiber will also result in improved resiliency of the electric gird due to required pole replacements

Unpredictable variation in "make-ready" costs
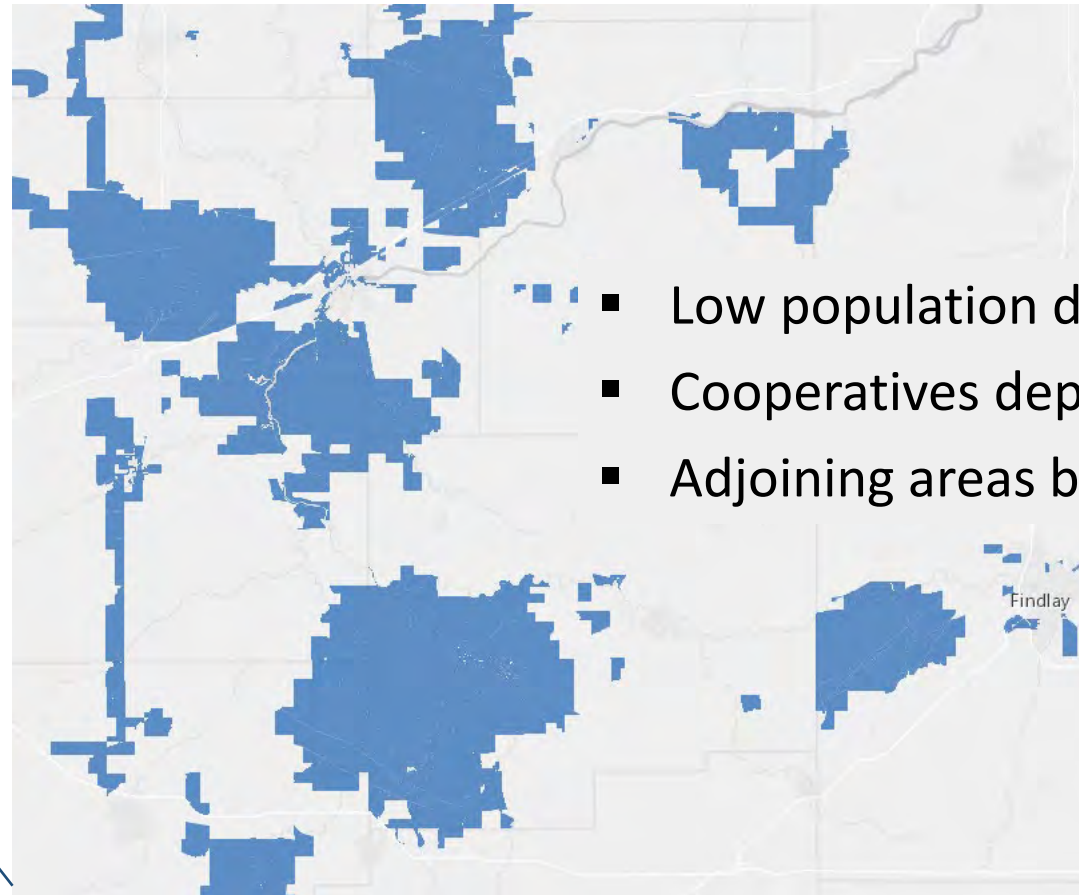@ **$15,000 to $75,000 per mile**

Rural Broadband Myths

Myth #1: *Fiber-to-the-premise in rural areas is too expensive*

Reality: Profitable fiber networks have been implemented by numerous rural telephone and electric cooperatives. Lifecycle costs for fiber are lower than a series of incremental half-measures.

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Telephone Cooperatives
Fiber-to-the-Home

- Low population density areas
- Cooperatives deployed fiber-to-the-home
- Adjoining areas begging them to expand

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Rural Broadband Myths

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Myth #1: *Fiber-to-the-premise in rural areas is too expensive*

Reality: Profitable fiber networks have been implemented by numerous rural telephone and electric cooperatives. Lifecycle costs for fiber are lower than a series of incremental half-measures.

Myth #2: *Few rural households will subscribe.*

Reality: Where broadband truly available, subscription rates quickly reach 40% and one third of subscribers opt for the top tier speed offered.

**Myth #3:** *Starlink, fixed wireless and 5G will solve the issue*

Reality: Wireless is not an equivalent substitute for wired infrastructure.

- Low-earth orbit (LEO) satellites fit an important niche but do not offer mass-market capacity and terrain obstructions limit the reach.

- Fixed wireless faces speed constraints and terrain limitations.

- 5G requires last mile fiber networks due to limited reach of small cells.

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5G Requires Ubiquitous Fiber
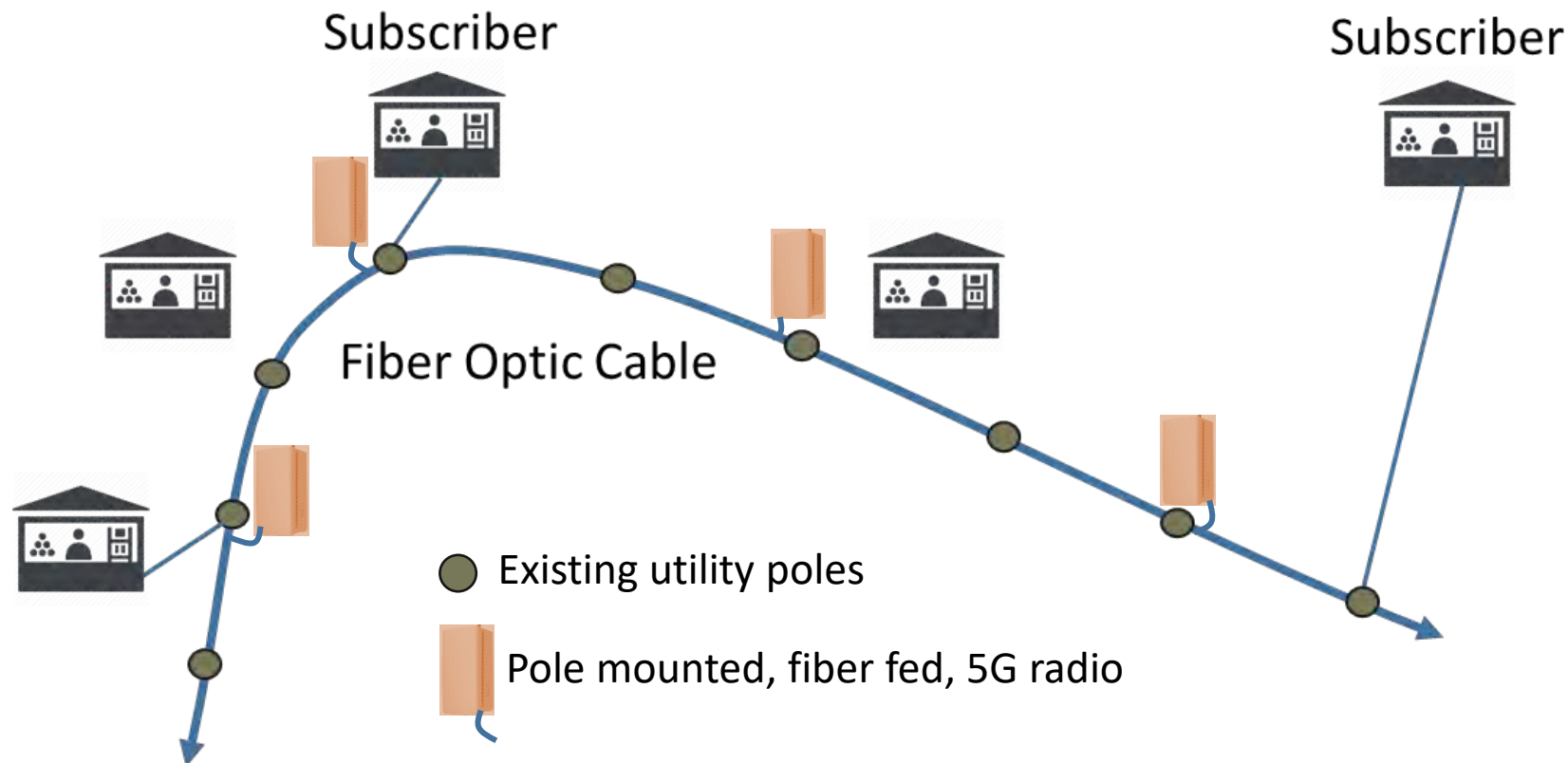
High performance fiber networks a pre-requisite for 5G
5G radios close together due to limited reach

Fiber-to-the-premise lower cost and higher performance

Decrepit Copper Like the Road Being Washed Out

Ultra-Light Compared to Wireless

So we decide NOT to fix the road, relying on ultra-lights for the otherwise stranded residents?

Both **wireless broadband** and **ultra-lights** constrained by**:**

a. **Weather**

b. **Terrain**

c. **Inherent Low Capacity**

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Rural Broadband Realities

Reality #1: *Fiber-to-the-premise in rural areas has been proven to be both cost effective and sustainable*

Reality #2: *Demand for broadband in rural areas mirrors demand in well-served areas*

Reality #3: *Fiber infrastructure offers the only solution to meet the long-term needs of rural America*
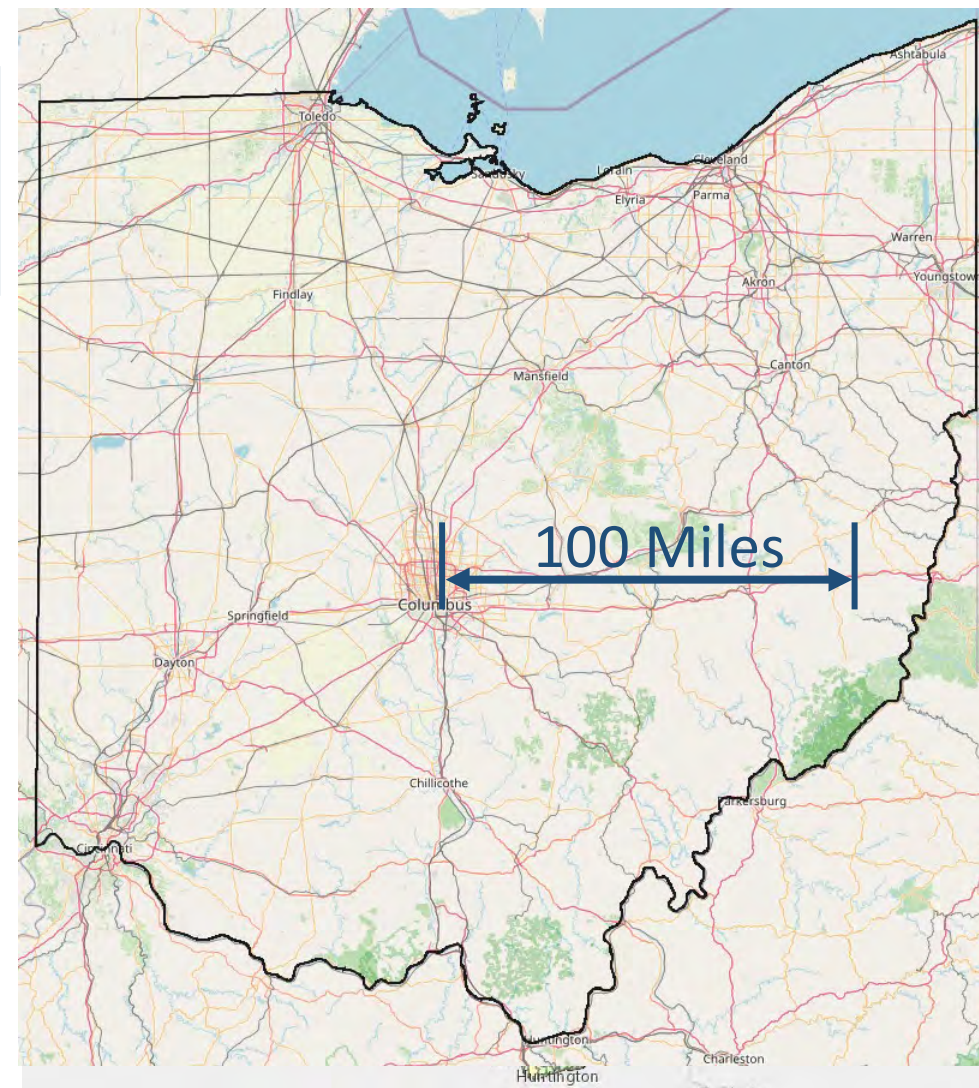
Delivering Fiber Across Rural Ohio

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Total Price Tag	$3.2 billion
One-Time Subsidy	**$2.0 billion**

One-time subsidy equivalent to
building 100 miles of highway

Comparable to Ohio's share of:

- Past $100 billion of poorly spent subsidy

- Existing and proposed Federal subsidies

Crucial to spend wisely

100 Miles

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A Fight for Our Future

What do we want rural America to look like in 20 years?

- Untapped and hollowed-out or

- **Vibrant, engaged and productive**

⬆ Productivity

⬆ Average Household Income

⬆ Increased Tax Revenues

= One-Time Fiber Subsidy Re-paid in 7 Years or Less

Urgent and bold action required!

You can help!

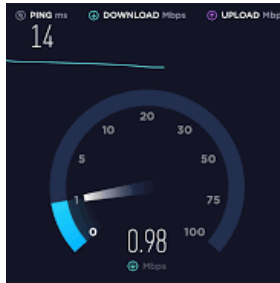1. **Take the Survey**

   Include the unserved!

2. **Perform the Speed Test**

   Whether your service is good or bad

3. **Endorse and Promote the Common Sense Solutions**

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Partners and Funders

Research and Analysis Conducted By

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Bonus Material

Focus on the

FCC Rural Digital Opportunity Fund (RDOF)



- Draws from the **Universal Service Fund (USF)** meant to upgrade rural telecommunications infrastructure
- $20 billion budget
- Two phases
- [Buckeye Hills filed research-informed recommendations to FCC](#) on the program (September 2019)
- Phase 1 awarded in December 2020

Many Households Remain Unserved

- FCC identified **190,000 unserved Ohio households** in mid-2020

- Designated to be in Phase 1 of the Rural Digital Opportunity Fund (late 2020 auction)

- At least **500,000 additional unserved** rural Ohio households

- Many more underserved rural households

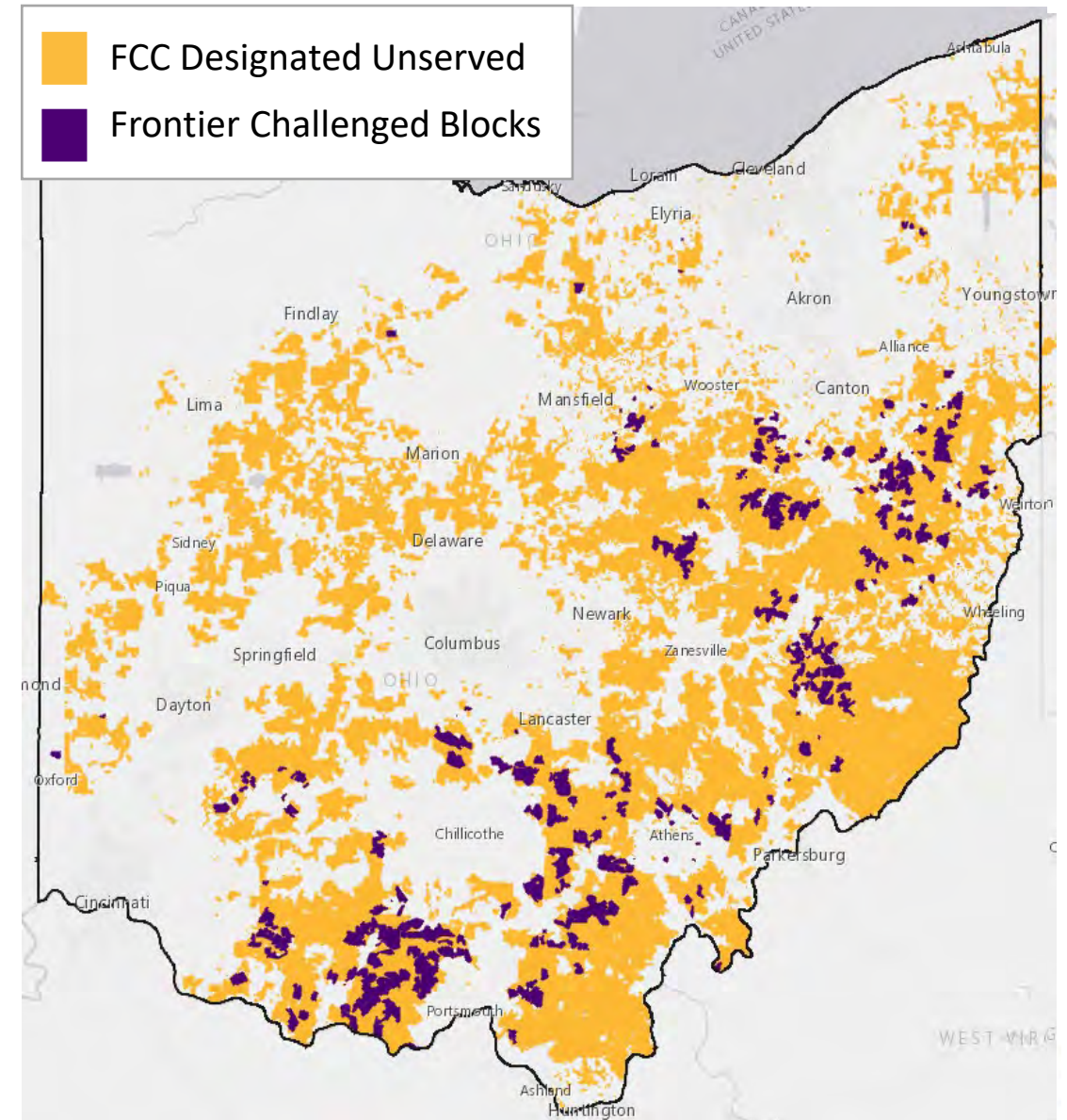- Economically distressed urban areas also unserved/underserved
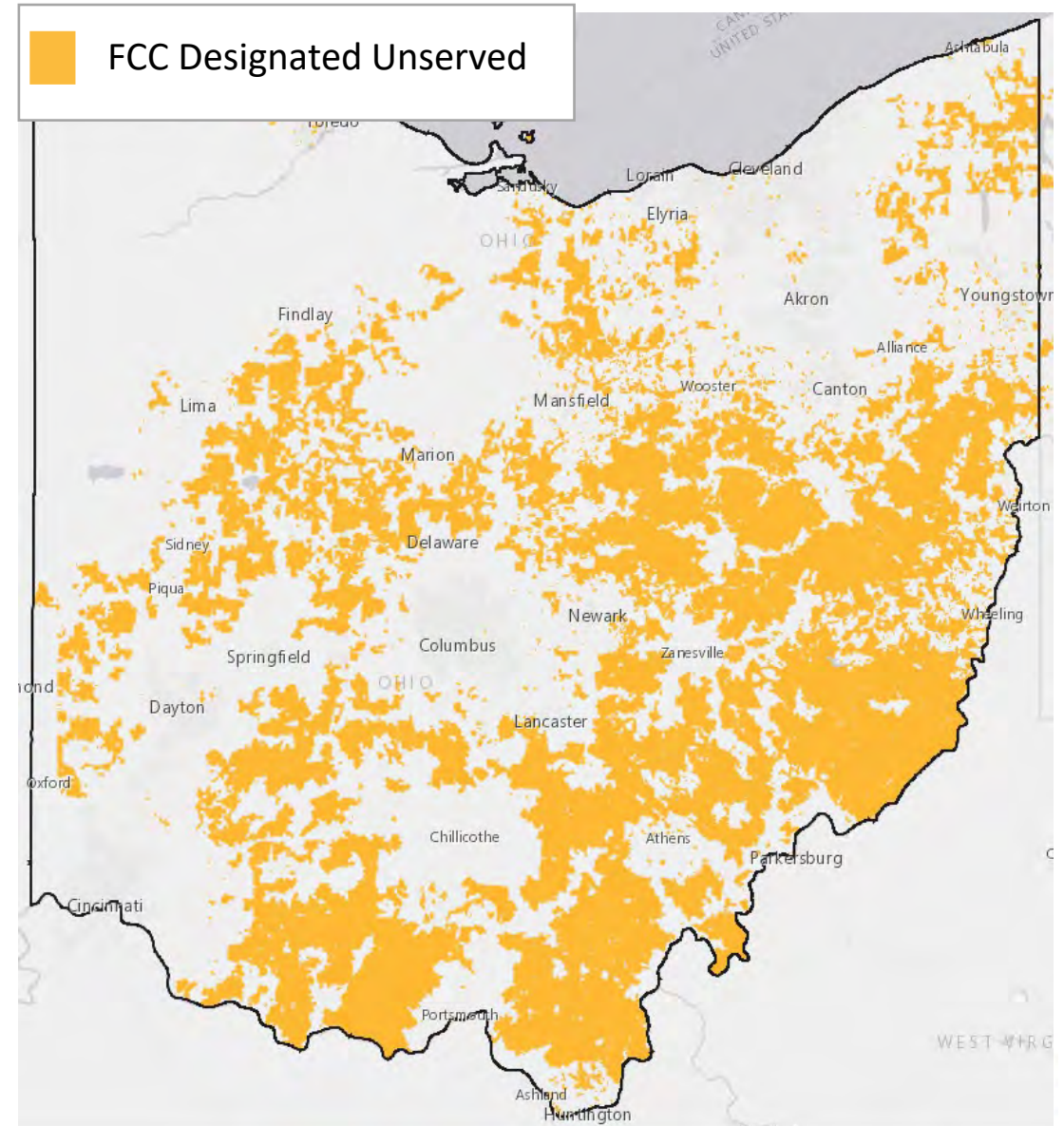
Eligibility Challenges

- Frontier challenged eligibility of the equivalent of **two entire counties**

- No change on the ground, **just a paper declaration**

- **Buckeye Hills filed a rebuttal** (May 2020)

- FCC subsequently **rejected Frontier's challenge** in Ohio**, citing our rebuttal**

- Across the country, similar tactics by telcos succeeded due to the lack of organized opposition

Reversing the burden of proof would short-circuit such egregious claims

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FCC Designated Unserved
Frontier Challenged Blocks

![OMEGA - Ohio Mid-Eastern Governments Association logo]

FCC Rural Digital Opportunity Fund
Phase 1 Auction – Nov 2020

Big Winners in Ohio

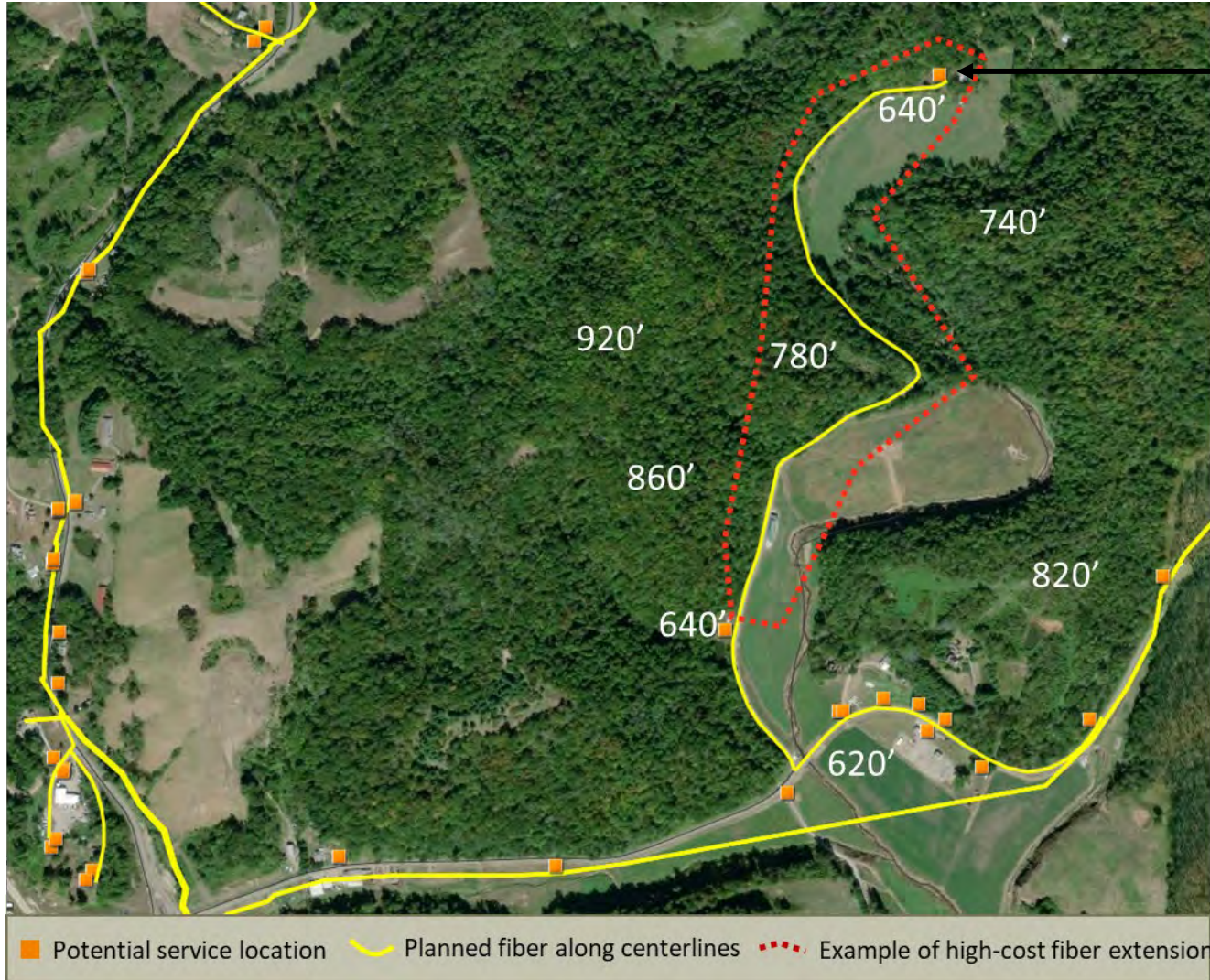|	
🟩	Charter/Spectrum: $107M
🟦	Mercury Wireless: $11M
🟥	Connect Everyone: $38M
🟪	LTD Broadband: $8M
🟪	NexTier: $1M

All Pledging Fiber-to-the-Home

[Buckeye Hills filing to FCC](#) (Feb 2021) citing:

- Incentives to abandon up to 30% of the geographic area
- Impracticality of splintered service areas
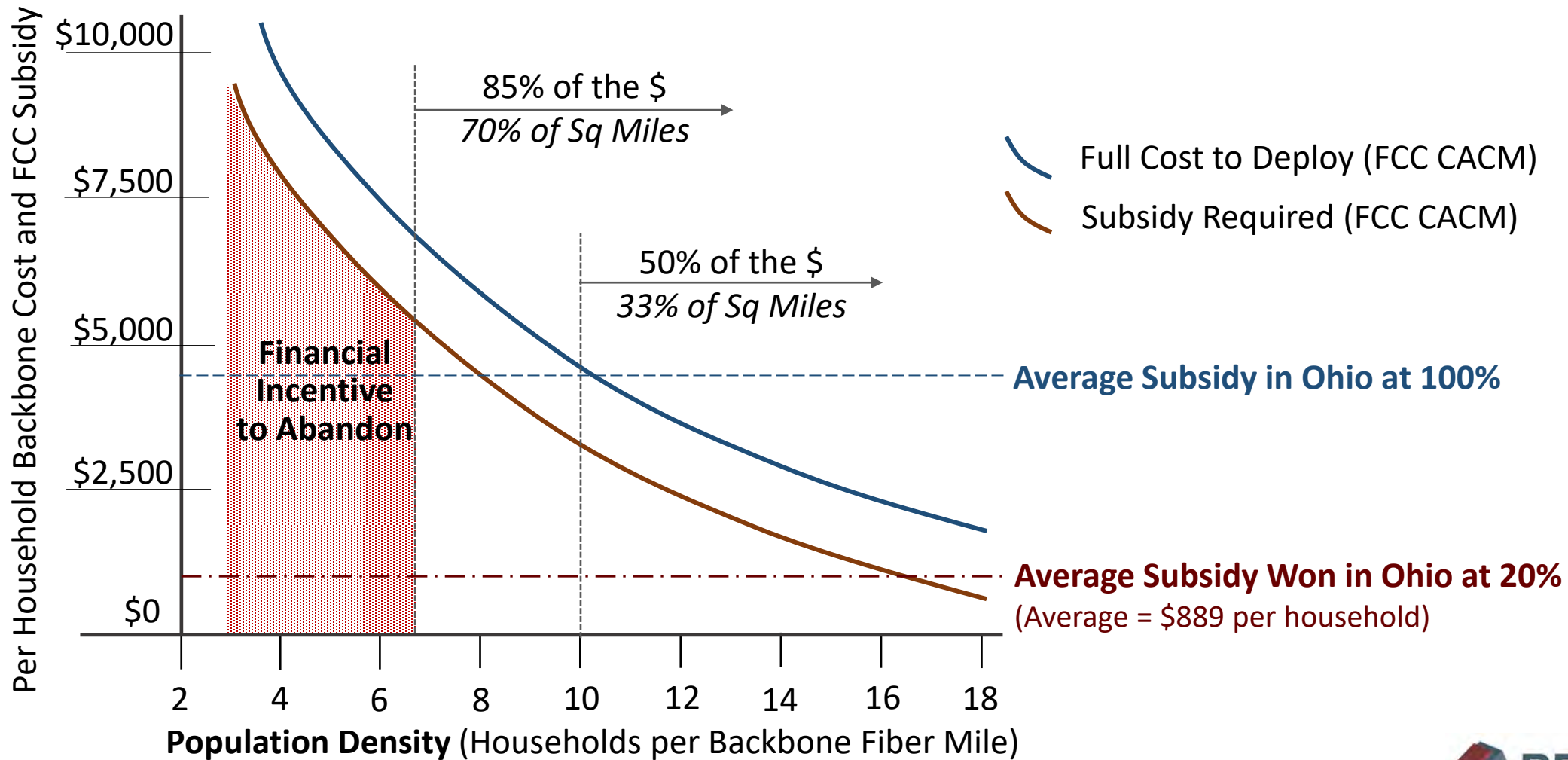- Financial viability concerns due to low subsidy levels from aggressive bidding

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Creates de facto monopolies

![REID Consulting Group logo]

Stranding the Most Remote

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- Delete the one home at far end of the road
- Save > 4,100 feet of fiber

- Reduces project cost by between **$19,400 and $38,800**

- Pay a penalty to the FCC not to exceed **$1,333**

- Given intervening terrain and foliage, no affordable wireless option exists

Essential to reach 100% of households and businesses

■ Potential service location   Planned fiber along centerlines   ▪▪▪▪ Example of high-cost fiber extension

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FCC Rural Digital Opportunity Fund
Rules Encourage Abandonment

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FCC Rural Digital Opportunity Fund
Large Capital Gap

$3,500 per Household Gap in Required Capital

Percentage of FCC "Reserve"	Average Subsidy per Unserved Household - Ohio	Description
100%	$4,389	FCC projection of required subsidy to profitably deploy fiber-to-the-home
20%	**$889**	**As awarded in Ohio, will incentivize abandonment of the most remote**

We need a durable solution, often not the least expensive

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FCC Rural Digital Opportunity Fund
Overly-Elongated Timeline

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Absence of program transparency will mask status of projects for most of the decade