BEAD Program: A Framework to Allocate Funding for Broadband Availability

National Overview

February 2, 2023

ACA CONNECTS

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VERSION 2.0

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A Letter from Grant Spellmeyer, President and CEO, ACA Connects

Dear State Broadband Leaders,

The Broadband Equity, Access, and Deployment (BEAD) program holds out tremendous opportunity to close the broadband availability and adoption gaps, and ACA Connects and its Members are eager to support you in achieving those objectives. Building on the positive efforts of the National Telecommunications and Information Administration and our previous release of the BEAD Program Framework, Cartesian and ACA Connects have developed an updated Framework (v2.0) for how you might spend your allocation of BEAD funds on deployment projects. This version uses the FCC's new location-specific Broadband Maps released in November 2022 to determine the unserved/underserved locations in your State/Territory, applies the funding allocation formula in the BEAD statute, and then runs scenarios on spending your funds to bring service to all eligible locations, first using fiber, as the Notice of Funding Opportunity (NOFO) requires, and then with other broadband network technologies. After you have reviewed our analysis, please let ACA Connects or its Members (who are identified in this presentation) know if you have any questions or require further information.

Thank you.

Grant Spellmeyer

Source: Cartesian

Overview | A Framework to Allocate and Award BEAD Funding for Broadband Availability

The goal of the BEAD Program is universal broadband availability

- To close the availability gap, BEAD Program provides States/Territories with $42B

States/Territories can gain insight today on available funds and expected deployment costs to prepare their Action Plans and funding proposals

- Using the FCC National Broadband Map, we can estimate the amount of funding each State/Territory will receive, the provider match, and the cost to deploy to eligible locations
- We estimate that when funds are allocated, approximately 13.1M locations in the U.S. will be unserved or underserved; through ongoing builds and removal of "committed" locations, this decreases to 8.0M in 2024 (when awards are made)
- For illustrative purposes, we estimate that fiber providers will be willing to match up to $3,000/location and that the overall provider match will add another $22B of funds – for a total of $64B in capital available for availability projects

Our analysis indicates that funding is sufficient to achieve the program's availability goal

- We find that $64B in funding should be sufficient to make broadband service available to all eligible locations
- Most all States/Territories should have sufficient funds to deploy fiber – the NOFO's preferred technology – to all unserved and underserved locations below a reasonable "extremely high-cost threshold" and use other technologies to serve the remaining "higher cost" locations, with the majority of States/Territories expected to have funds left over for affordability and other eligible programs
- States/Territories also may choose to achieve "maximum fiber" availability by using additional funds

Source: Cartesian

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BEAD Allocation and Fiber Deployment Analysis | Version 2.0 Key Changes

We have updated our methodology for Version 2.0 to accommodate new data

	BEAD Funding Framework: V1.0 *Released September 28, 2022*	BEAD Funding Framework: V2.0 *Released February 2, 2023*
Serviceability Data Source	FCC Form 477 (June 2021) serviceability data overlaid with household and business premise estimates	FCC National Broadband Maps data (June 2022 released in November 2022) with FCC location estimates
Partially Served Location Estimate	Applied state-specific partially served multiplier to estimate unserved locations	*Not Applicable*
Proprietary Cost Model – Network Distances	Cartesian geospatial cost model using minimum spanning tree routing to optimally connect locations using 2010 CB boundaries	Updated cost model using 2020 CB boundaries
Proprietary Cost Model – Cost Inputs	Cartesian-identified cost benchmarks	Updated cost benchmarks to reflect market changes and inflation
Unit Cost Estimate	Modeled at household/business premise-level	Updated to be modeled at location-level

Source: Cartesian

Our National-Level Approach | Estimate Funding & Model Availability Impact

1 Estimate Eligible Locations

How many unserved, under-served and high-cost locations are in each State/Territory?

We use the November 2022 FCC National Broadband Map as the basis for allocating BEAD Funding to States/ Territories. We then estimate eligible unserved/underserved locations for project awards as follows:

- **Areas Funded by Other Support Programs:** We remove estimated "committed" locations covered by the FCC's RDOF and ROR programs
- **Incremental Builds:** We estimate and include additional, post-June 2022 private sector and government deployments, based on the national run-rate from 2020 to 2021

2 Calculate BEAD Funding

How much funding is each State/Territory estimated to receive?

Using the FCC location data and estimates from our deployment cost model, we calculate State/Territory-level funding specified by the BEAD statute:

- **Minimum Initial Allocation:** States/Territories receive $100M or $25M, respectively
- **High-Cost Allocation:** Funds are allocated in proportion to the estimated State/Territory's national share of high-cost unserved locations
- **Remaining Funds Allocation:** Funds are allocated to each State/Territory in proportion to their share of unserved locations

3 Develop Deployment Scenarios

How many locations can be covered with fiber and other technologies?

Using BEAD Funding + the Provider Match, we run two scenarios to estimate how many locations can receive high-speed broadband with fiber and other technologies:

Baseline Fiber: Satisfying the NOFO's fiber preference, fiber is deployed to unserved locations up to a reasonable estimate of the extremely high-cost threshold; remaining eligible locations are covered using other technologies

Maximum Fiber: Maximizing fiber availability to all eligible locations with support above the threshold; remaining eligible locations are covered using other technologies

Source: Cartesian

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1 Estimate Eligible Locations

Methodology | Eligible Locations for Funding Allocation and Project Awards

Starting with the most recent FCC serviceability data, we estimate the number of locations that will determine funding and be eligible for project awards to subgrantees

June 2022 FCC Broadband Location Availability Data[1]	We start with the availability of service to locations from the November 2022 FCC National Broadband Map. We use this to estimate BEAD Funding Allocations to States/Territories.
Locations in Existing Subsidy Funded Programs[2]	Locations in census blocks with "commitments" to receive support from FCC Rate of Return and RDOF programs are removed for the purpose of awarding funding for deployments
Incremental Builds	We estimate an ongoing reduction in unserved locations from incremental private sector and government funded builds based on the 13% rate observed in Form 477 data from Jun 20 to Jun 21
Estimated Eligible Locations[3]	Our estimate of eligible locations that will need to be addressed in project awards when BEAD funds are made available to subgrantees in 2024

1. As NTIA announced, funding allocations will be made using updated FCC map data as of June 2023. We recognize that there were significant additions to the Fabric released in December 2022, which providers will use to submit year-end 2022 data. If these additions represent a large number of unserved locations and if these are concentrated in a limited number of States, the allocations for such States will increase materially from those estimated herein
2. RDOF awards exclude Starlink and LTD locations. Other RDOF bids in default (~130K locations) and locations funded by ARPA/CARES and other "commitments" are ignored; thus, the number of eligible unserved and underserved locations are overstated by these amounts and funding should therefore go further.
3. Given the uncertainty around the magnitude of locations moving from unserved to underserved, we have not made incremental builds adjustments to underserved locations.

Source: Cartesian, FCC National Broadband Map (June 2022 data, released in November 2022)

1 Estimate Eligible Locations

National Summary | Estimated Eligible Locations for Funding Allocation and Project Awards

June 2022 FCC Broadband Locations	Unserved *(less than 25Mbps/3Mbps)*	Underserved *(less than 100Mbps/20Mbps)*
	8.0M	**5.1M**
− Subsidy Program Funded Locations[2]	2.9M	1.3M
− Incremental Build[3] (13% annual build, for 18 months)	0.9M	--
= **Jan. 2024 Estimated State and Territory Eligible Locations** (There are 0.2M Territory Locations)	**4.2M**	**3.8M**

Eligible Locations for BEAD Funding Allocation[1]

8.0M unserved locations are used to estimate the BEAD funding allocation for each State/Territory. Underserved locations are eligible for project awards but are not considered in the BEAD funding formula.

Eligible State Locations for BEAD Project Awards[4]

We estimate that 7.8M State locations will be eligible for BEAD funding:

4.0M Jan. 2024 Estimated Unserved + **3.8M** Jan. 2024 Estimated Underserved

1. Final award will be made using updated FCC map data in June 2023 following the fabric and availability challenge process
2. Locations in census blocks with "commitments" to receive support from Rate of Return and RDOF programs, excl. RDOF award locations for Starlink and LTD
3. Given the uncertainty around the magnitude of locations moving from unserved to underserved, we have not made incremental builds adjustments to underserved locations
4. Eligible location totals for BEAD Project awards are for the 50 states and Washington DC and do not include ~0.2M unserved locations within territories.

Source: Cartesian, FCC National Broadband Map (June 2022 data, released in November 2022)

2 Calculate BEAD Funding

National Summary | BEAD Funding Allocation Formula

Statutory Requirements

1 **Funding Allocation:**

State/Territory BEAD Funding allocations will be determined using the –

(1) Minimum Allocation,

(2) High-Cost Allocation, and

(3) Remaining Funds Allocation

2 **Provider Match:**

Providers must match at least 25% of project costs, except if the location is within a high-cost area or if States/Territories choose to permit a lower match

States/Territories will share $42B in funding

Minimum Allocation: $5.3B

$100M FOR STATES OR $25M FOR TERRITORIES

+

High-Cost Allocation: $4.2B

Allocated to States/Territories based on share of high-cost, unserved locations

10% OF PROGRAM FUNDS

+

Remaining Funds Allocation: $33B

Allocated to each State/Territory based on share of unserved locations

=

Total BEAD Funds: $42B

Methodology

High-Cost Allocation:

10% of BEAD funding is reserved to reach the highest-cost households. Our proprietary cost model ranks the highest cost census tracts to serve and allocates funds to States/Territories based on their share of the high-cost households

Remaining Funds Allocation:

After deploying the minimum allocation and the high-cost allocation, the remaining funds are distributed to States/Territories based on their share of unserved locations

Source: Cartesian

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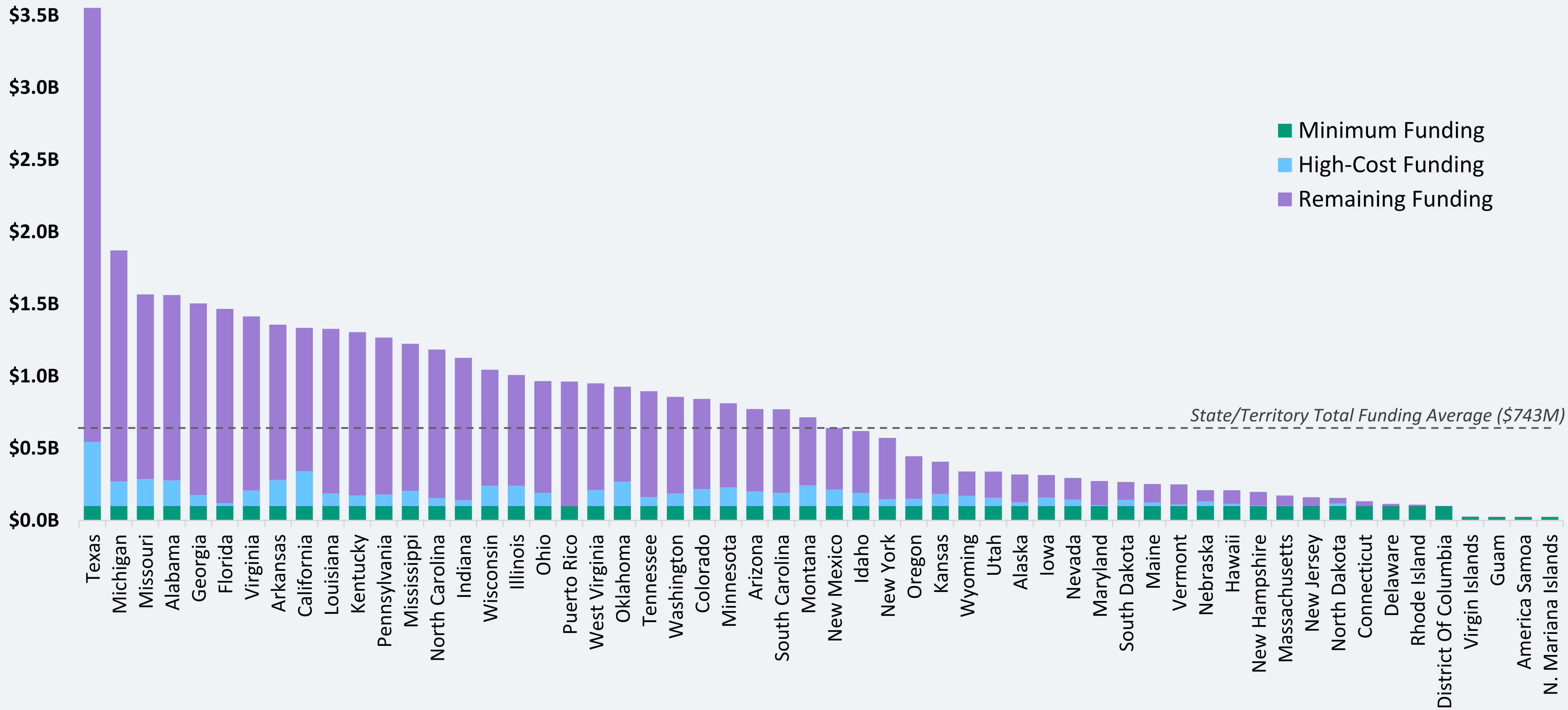
National Summary | Estimated BEAD Funding Distribution

Total Estimated BEAD Funding by State/Territory



Source: Cartesian, FCC National Broadband Map (June 2022 data, released in November 2022; data will change as a result of the fabric and availability challenge process and new build)

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Provider Match Funding & Setting the High-Cost Threshold

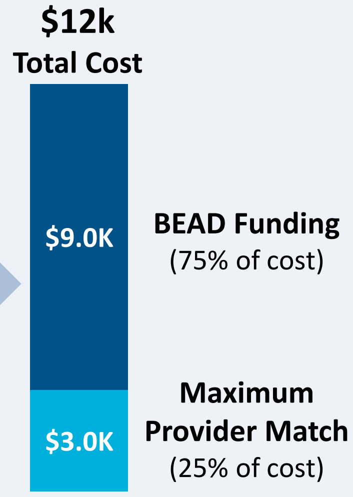
We assume a maximum provider match of $3k which supports a payback period of ~5 years; setting the extremely high-cost per location threshold at $9k is consistent with a $3k match (25% of total project cost)

Provider Economics Per Location

	Annual Customer Spend ($64/month[1])	$768
×	Adoption Rate[2]	70%
×	Average Margin[3]	90%
=	Annual Contribution per Customer	$484
	x1.2	
	Assumed Match	$3,000 (maximum)
÷	Annual Contribution per Location[4]	$581
=	Payback Period	5.2 years

Setting the Extremely High-Cost Threshold

- Each State/Territory must set an extremely high-cost per location threshold – the point at which other technologies than fiber *may* be considered if less expensive
- For our analysis, we have used a business-case based **$3k** maximum provider math which results in a **$9k** threshold (25% match requirement)
- Provider match has a maximum of 75% up to $3k:
  - At the $9k threshold, provider match is at the minimum of 25%
  - Beyond the threshold, provider match scales down and can be below 25% for locations in high-cost (unserved) areas
  - The extremely high-cost threshold is set above the point at which locations are considered "high-cost" in our analysis. Above the $12k total amount, we assume that match waivers will apply.



- For locations above the threshold, States/Territories may choose to reduce the 25% provider match and deploy fiber rather than using other technologies
- If States/Territories set the extremely high-cost threshold too low, fiber will not be adequately prioritized and communities that would otherwise have received fiber will miss out
- If States/Territories set the extremely high-cost threshold too high, providers will be unable to meet the 25% match amount for more costly locations, which will result in a lack of bids for locations in those communities

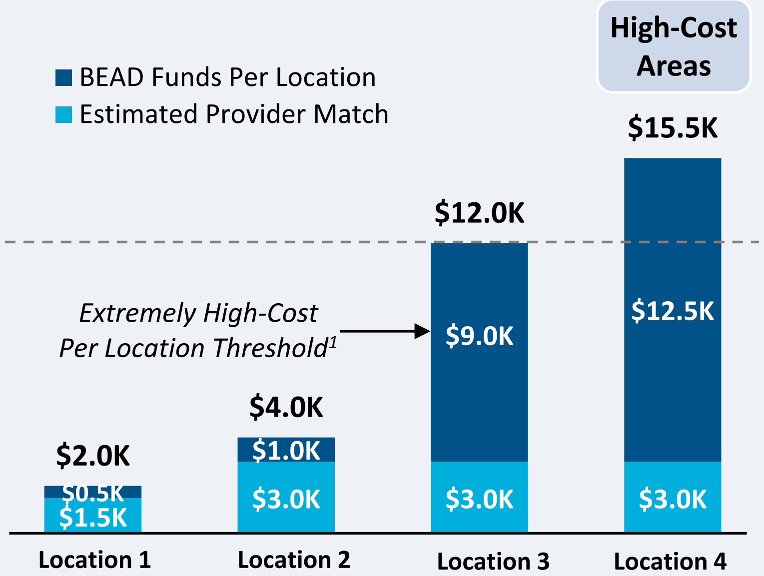
1. Blended ARPU based on $70 per month for broadband services (based on the New America 2020 report) with 15% of customers on a $30 low-cost plan
2. Since it is not likely that all locations will adopt broadband, we assume an 70% adoption rate, based on a Connected Nation 2020 study on internet adoption rates overtime
3. We assume the average margin based on 2021 NextTV Broadcasting+Cable article on broadband service margins
4. Annual contribution scaled by a factor of 1.2 to account for average no. of customers per location (derived from FCC National Broadband Map and Census data)

Source: Cartesian, New America, Connected Nation, NextTV

National Summary | Estimated BEAD Funding & Provider Match

Provider Match Examples

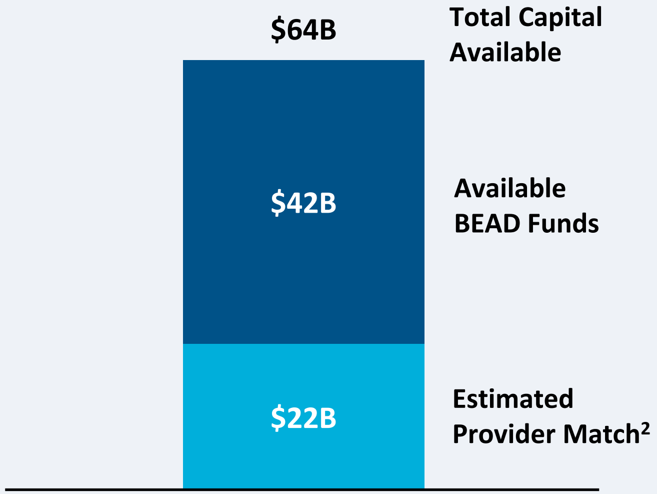
Total Deployment Cost per Location



Provider Match %			
75%	75%	25%	19%

To be conservative, we assume provider match amounts have a maximum of 75% and a minimum of 25%, except in high-cost areas

Total Capital Available - Nationally



$64B in total capital is estimated to be available to serve unserved/underserved locations (using both BEAD funding and provider match amounts)

Provider Match - Nationally

Total Estimated Provider Match: $22B

÷ **Total Estimated State Eligible Locations:** 7.8M

= **Average Provider Match:** $2,820 *PER LOCATION*

We estimate the average provider match will be $2,820 – provider matches will be 75% where cost to deploy is less than $4K

1. The model uses a $9k threshold, however, States/Territories will individually need to determine their appropriate extremely high-cost threshold
2. Assumed maximum $3K provider match also applies to locations deployed with FWA/other technologies. In reality, providers will determine the viable level of match funding for each project using a business case model. They will be willing to contribute a greater match in some locations and less in others. Locations that are hardest to serve may need to be fully funded by BEAD with no match. Competitive bidding should drive provider matches towards this level.

Source: Cartesian, FCC National Broadband Map (June 2022 data, released in November 2022; data will change as a result of the fabric and availability challenge process and new build)

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National Summary | Key Assumptions for Project Awards

Assumption	Description	
Fiber Cost Model	Leveraging our proprietary network cost model, we calculate network distances between locations – and equipment requirements – to estimate the average cost per location for each census tract. The model does not examine middle mile infrastructure.	
Extremely High-Cost Threshold[1]	Funding threshold for fiber per location, above which States/Territories *may* consider other technologies – or may consider applying additional funds for fiber above the threshold	**$9K** PER LOCATION
Provider Match Maximum[3,4]	Assumed maximum amount that providers will contribute per location to achieve a positive business case; this reflects the high-end cost of private build – and additional amounts to serve locations with multiple units	**$3K** PER LOCATION
Alternate Technology[2]	For locations above the extremely high-cost threshold, we assume fixed wireless will be used and apply a uniform cost per location	**$4.8K** PER LOCATION

1. The model uses a $9k threshold, however, States/Territories will individually need to determine their appropriate extremely high-cost threshold
2. We assume FWA locations to cost $4.8K per location based on a 2022 Benton study, stating a cost estimate of $4K per location in very low-density rural areas for FWA network using beamforming and massive MIMO at 5GHz with a mix of indoor and outdoor CPE to achieve 100/20 Mbps, with a 20% uplift to account for cost for each location. FWA cost scaled by a factor of 1.2 to account for average no. of customers per location (derived from FCC National Broadband Map and Census data)
3. Assumed maximum $3K provider match also applies to locations deployed with FWA/other technologies. In reality, providers will determine the viable level of match funding for each project using a business case model. They will be willing to contribute a greater match in some locations and less in others. Locations which are hardest to serve may need to be fully funded by BEAD with no match. Competitive bidding should drive provider matches towards this level.
4. BEAD grants for projects may be taxable to providers; we do not account for this in our analysis.

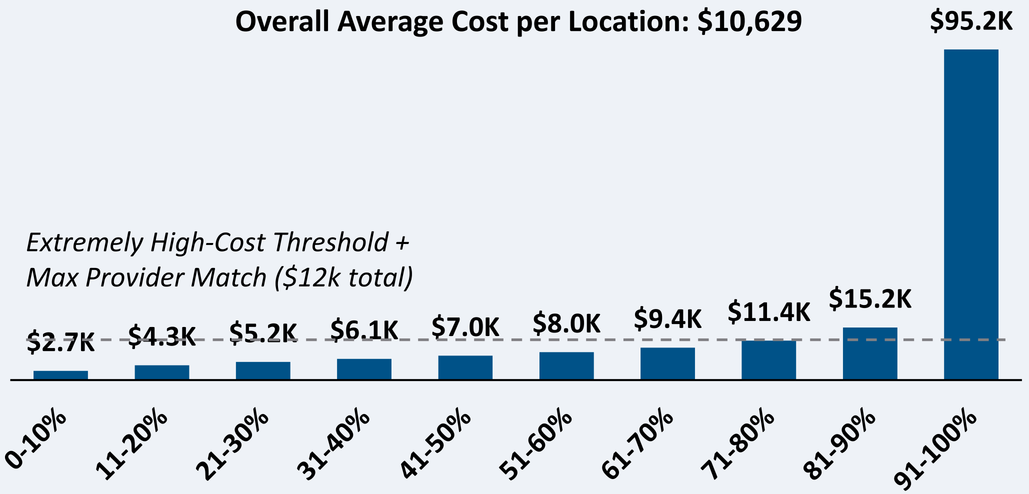
Source: Cartesian, Benton

National Summary | Cost to Deploy Fiber by Decile

CAPEX Fiber Deployment Cost per Locations Segmented by Cost Deciles[1]

Unserved Locations

Overall Average Cost per Location: $10,629

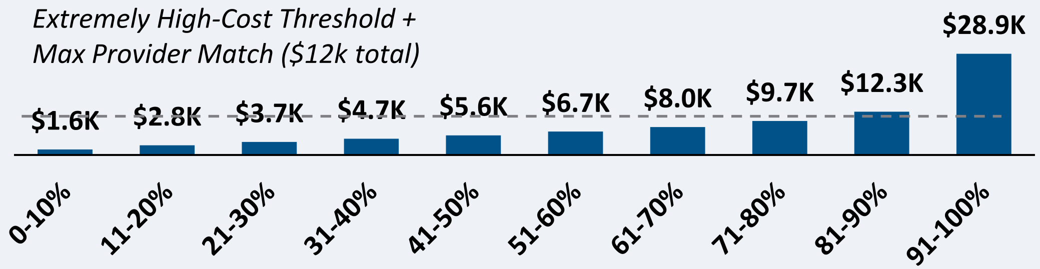


Average Tract Density *(Location per sq. Mile)*									
187	54	34	23	20	18	16	15	14	9

4.0M Locations

Underserved Locations

Overall Average Cost per Location: $7,749



Average Tract Density *(Location per sq. Mile)*									
632	148	74	51	43	28	27	19	16	12

3.8M Locations

Over 85% of State locations are estimated to fall below the High-Cost Threshold + Provider Match

1. Chart values are average cost per location for each decile bucket

Source: Cartesian, FCC National Broadband Map (June 2022 data, released in November 2022; data will change as a result of the fabric and availability challenge process and new build)

Note: Locations within Territories are not included in cost deployment analyses; after Territory location removal there are 7.8M unserved/underserved eligible locations

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3 Develop Deployment Scenarios

National Summary | Baseline Fiber vs. Maximum Fiber

$45B - $56B CAPEX depending on States' Funding Priorities

CAPEX Deployment Costs:

- **Fiber:** Below High-Cost Threshold
- **Fiber:** Above High-Cost Threshold
- **Fixed Wireless:** Above High-Cost Threshold

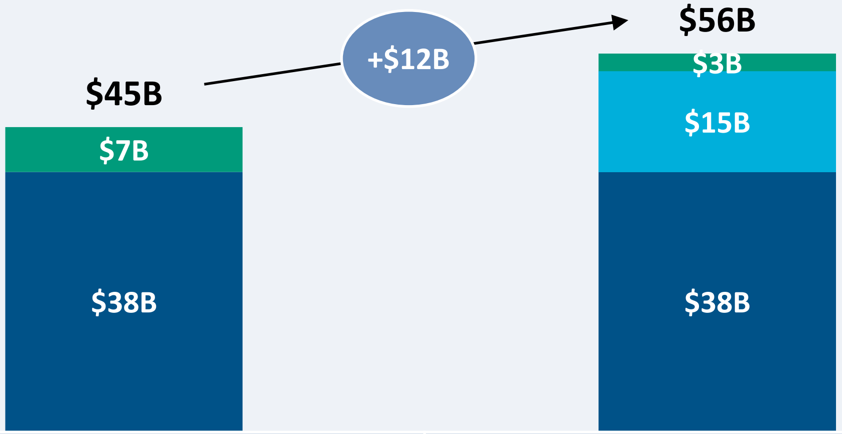
1 Baseline Fiber
Other Technology used above High-Cost Threshold

Deploy fiber to locations below high-cost threshold; then fixed wireless

2 Maximum Fiber
Fiber above High-Cost Threshold

Deploy fiber to the maximum extent above and below the high-cost threshold

Estimated Deployment Cost for 7.8M Eligible State Locations[1]:



	Baseline Fiber	Maximum Fiber
Cost per Location:	**$5,810**	**$7,560**
Low-Cost Location (*6.3M*):	$6,103	$6,103
High-Cost[2] Locations (*1.5M*):	$4,800	$16,815
% of Locations Reached with Fiber:	**81%**	**90%**

Key Takeaways

1. **High-speed broadband can be deployed to 7.8M State eligible locations for $45B:**
   - Fiber is built to 6.3M locations below the extremely high-cost threshold
   - Other technologies used to reach 1.5M
   - Nearly 100% of eligible state locations served using ~70% of the estimated capital available, with provider matches
   - States can use any remaining funds they have for affordability programs
2. **By allocating more BEAD funds to fiber, States add extra ~0.8M fiber locations:**
   - Fiber built to 7.1M locations
   - Other technologies used to reach ~0.7M
   - Nearly 100% of eligible State locations served using ~90% of the estimated capital available[3], with provider matches
   - Incremental coverage reduces funding available for other programs

1. Scenario totals on this slide are for the 50 states and Washington DC and do not include territories.
2. The extremely high-cost per location threshold is $9k, giving a total cost of $12k inclusive of match funds. For locations above this cost, we assume alternative technologies are used with a fixed cost of $4.8k per location.
3. Only $56B of the $64B total available capital is used because several states have leftover budget after reaching 100% fiber coverage

Source: Cartesian, FCC National Broadband Map (June 2022 data, released in November 2022), Benton

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