BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Proceeding to Consider Rules to Implement the Broadband Equity, Access, and Deployment Program.	Rulemaking 23-02-016 (Filed February 23, 2023)

COMMENTS OF THE FIBER BROADBAND ASSOCIATION

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April 17, 2023

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I. INTRODUCTION

The Fiber Broadband Association ("FBA")[1] hereby responds to the Order Instituting Rulemaking Proceeding ("OIR") issued by the California Public Utilities Commission ("CPUC") to consider rules for grant funding, eligibility, and compliance for funds distributed to California pursuant to the federal Broadband Equity, Access, and Deployment ("BEAD") Program.[2] FBA has been engaged with the National Telecommunications and Information Administration ("NTIA") and States since the BEAD Program was enacted in November, 2021. We first joined with NTCA—The Rural Broadband Association and the business consulting firm Cartesian to assist States in implementing the BEAD Program by producing the *Broadband Infrastructure*

[1] The Fiber Broadband Association represents more than 425 service providers, manufacturers, industry experts, and deployment specialists dedicated to the advancement of fiber broadband deployment and the pursuit of a world where communications are limitless, advancing quality of life and digital equity anywhere and everywhere.

[2] *Order Instituting Rulemaking Proceeding to Consider Rules to Implement the Broadband Equity, Access, and Deployment Program*, Rulemaking No. 23-02-016 (Issued Mar. 1, 2023).

Playbook, which we updated in mid-2022.[3] We also filed comments with NTIA urging it to prioritize the deployment of all-fiber infrastructure,[4] explaining:

> All-fiber networks not only support gigabit-plus, low latency direct connections to locations, but they provide the critical infrastructure for multiple use cases such as 5G, smart grid, and sensing technology networks. In effect, the market has confirmed that all-fiber is the fundamental networking technology of the 21st Century.

We are pleased that NTIA shares our views and adopted a fiber priority in the Notice of Funding Opportunity issued in May, 2022.[5] As the CPUC recognizes, the extent to which fiber will be prioritized depends on its adoption of the Extremely High Cost Per Location Threshold

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3 *Broadband Infrastructure Playbook, Implementing BEAD and other Broadband Deployment Programs*, Fiber Broadband Association, NTCA—The Rural Broadband Association, and Cartesian (July 2022) ("Our goal with this Playbook is to provide a valuable resource to the states and territories to help them accelerate the availability of funding, provide best practices from past state broadband grant programs that have worked well, and help provide some consistency in the process nationwide.") available at https://fiberbroadband.org/resources/july-release-broadband-infrastructure-playbook/

4 Comments of the Fiber Broadband Association, Infrastructure Investment and Jobs Act Implementation, Docket No. NTIA-2021-0002, RIN 0660-ZA33, NTIA-2021-0002-0374 at 2 (Feb. 4, 2022).

5 *Notice of Funding Opportunity*, Broadband Equity, Access and Deployment Program, National Telecommunications and Information Administration, at 7(May, 2022) ("the Program prioritizes projects designed to provide fiber connectivity directly to the end user") available at https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf ("NOFO"). NTIA's decision to prioritize fiber connectivity because it is the most robust, reliable, and durable network technology is well supported. Perhaps the best indication is that providers using their own capital are building fiber connectivity to approximately eight to nine million locations annually and that almost all locations in the U.S. will have fiber accessible by 2030. *See* Fiber Broadband Association, *Virtually All Households Will Have Fiber Connectivity Accessible by 2030*, (2023), attached to these comments as "Attachment B".

(the "Threshold"),[6] which NTIA expects the State to set "as high as possible to help ensure that end-to-end fiber projects are deployed wherever feasible."[7] In these comments, we respond to the CPUC's question on how to establish the Threshold.

II. ESTABLISHING THE EXTREMELY HIGH-COST PER LOCATION THRESHOLD: A RATIONAL METHODOLOGY AND REQUIRED DUE DILIGENCE

In the NOFO, NTIA directs States and Territories to expend BEAD Program funds for all-fiber deployments to the maximum extent feasible "while ensuring that the program can meet the prioritization and scoring requirements set forth in…this NOFO."[8] This means that States and Territories should ensure that all unserved and underserved locations are connected to high-performance broadband service– the ultimate goal of the program -- regardless of the technology and that fiber connectivity – the program's priority -- should be deployed to the maximum extent

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6 NOFO at 13-14 ("Priority Broadband Project—The term 'Priority Broadband Project' means a project that will provision service via end-to-end fiber-optic facilities to each end-user premises. An Eligible Entity may disqualify any project that might otherwise qualify as a Priority Broadband Project from Priority Broadband Project status, with the approval of the Assistant Secretary, on the basis that the location surpasses the Eligible Entity's Extremely High Cost Per Location Threshold (as described in Section IV.B.7 below), or for other valid reasons subject to approval by the Assistant Secretary"; "Extremely High Cost Per Location Threshold— an 'Extremely High Cost Per Location Threshold' is a BEAD subsidy cost per location to be utilized during the subgrantee selection process described in Section IV.B.7 of this NOFO above which an Eligible Entity may decline to select a proposal if use of an alternative technology meeting the BEAD Program's technical requirements would be less expensive.").

7 NOFO at 31. *See also, id*. at 38, where the NOFO makes clear that the States and Territories have discretion to breach the Threshold – "may decline to select" -- and deploy fiber connectivity to locations that costs more. States and Territories also may negotiate "with a prospective subgrantee to revise the proposal to ensure that no location requires a subsidy that exceeds the" Threshold.

8 *Id.*

consistent with that objective. Because funding allocations to States and Territories differ and because the economics of deploying fiber and other technologies vary greatly both within and among jurisdictions, no single Threshold would meet the program's goals for each State and Territory. Rather, States and Territories need to develop a credible methodology for arriving at a reasonable Threshold and then collect and apply "numbers" that providers would use to determine their fiber and other technology deployments. The key is set the Threshold high enough so that fiber deployments are maximized but not so high that providers do not apply or otherwise agree to serve eligible locations, stranding households without qualifying service.

To assist States and Territories, FBA has turned to our frequent partner Cartesian, a global leader in building economic models, to develop a credible methodology. We attach to these comments Cartesian's presentation setting forth a methodology to establish a Threshold.[9] The methodology is based on the business case a provider would use to determine whether it is economically rational – the amount it would be willing to invest -- to provide fiber connectivity to a location.[10] As Cartesian explains, to determine the amount they are willing to invest, providers weigh two main factors:

(1) The cost of the build, which includes the following factors:

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9 Cartesian, *A Rational Methodology to Set Broadband Equity, Access, and Deployment Program's Extremely High Cost Per Location Threshold* (Apr. 2023), attached to these comments as "Attachment A".

10 *See* NOFO at 36-39. The BEAD Program is focused on funding the deployment of last-mile networks, and the calculation of the Threshold should be based on these last-mile deployments. While the BEAD Program permits States and Territories to provide funds for middle-mile infrastructure, it is only when such infrastructure is required to enable "supported" last-mile networks to provide qualifying broadband services. Accordingly, States and Territories should decide whether to fund middle-mile infrastructure separately from the determination of the Threshold.

- Build Distance -- Remote premises require more fiber-optic cable and network equipment
- Terrain -- Networks in difficult terrain (e.g., mountains) are more costly to build
- Existing Infrastructure -- Using existing infrastructure (e.g., poles) can reduce labor and material costs
- Materials & Labor -- Materials and labor costs can fluctuate with supply and demand
- Regulations & Policies -- Environmental regulations, zoning laws, and economic policies can impact costs.

(2) Their own economics, including:

- Potential Revenues -- Revenues will depend on customer demographics, spend, and adoption rates, and on the existence of government support, like from the Affordable Connectivity Program
- Operational Expenditures -- Costs to operate the fiber network over time
- Payback Period and Return on Investment -- Shorter time to profitability and higher returns on investment are favored.

Finally, providers then need to account for their strategic goals, *e.g.*, funding technologies with lower life-cycle costs.

Once a provider establishes the amount it is willing to invest to reach a location, Cartesian then explains that the maximum amount a provider would be willing to invest also is the maximum amount that a provider would be willing to match to receive government support. Because the BEAD program requires at least a 25% match, the Threshold for any eligible location would be three times this amount. That is, the provider's match plus government funding will be the amount of capital required to cover the total cost of the deployment.

Developing this credible methodology, however, is only an initial step. Just as a provider also would need to factor in its overall strategic goals to any build calculation, a State or Territory would need to do the same for the BEAD program. For instance, a State or Territory

may view the BEAD Program as a one-time opportunity and not want to spend funds on less capable technologies that will need to be rebuilt in the near future. It thus would decide to spend all allocable funds on fiber connectivity so long as all eligible locations are connected.

And, because the costs to deploy fiber and other technologies and revenues from providing service vary significantly from location to location, States and Territories would need to gather data for service to eligible locations with far different cost and revenue profiles. As discussed above, deployment costs are largely driven by the distance of the build, terrain, and density of locations and whether fiber will be strung on poles or buried – and for the BEAD Program, whether a provider can craft its own service area, which will reduce costs. Revenues will depend on the potential price for service and take rate. Further, each provider has its own economics and tolerance for risk. For instance, a provider may have nearby facilities than it can leverage for the build. Additionally, a public company may have greater constraints on its investments than an entity backed by a private infrastructure fund. FBA recommends that States and Territories collect this information through discussions with providers, vendors, construction contractors, and consultants and from all-fiber deployment projects in States that have already provided grants for projects.[11] California in fact should be able to draw on a wealth of

[11] States and Territories may consider gauging the reasonableness of potential Thresholds by comparing those amounts to the per location grant amounts for all-fiber projects from the Rural Utilities Service ReConnect program. For instance, in the 2020 round, the per location grant amounts for all-fiber projects varied considerably, with those in the least dense areas exceeding $15,000 per location. These may be considered comparable to the cost to serve locations that are eligible for support from the BEAD Program. *See U.S. Department of Agriculture, Broadband ReConnect Program, Fiscal Year 2020, Funding Opportunity Announcement Awards Report* (July, 2021) available at https://www.rd.usda.gov/sites/default/files/foa_2_awards_report_508c.pdf. Other ReConnect program announcements are available at https://www.usda.gov/reconnect/announcements.

information from the California Advanced Services Fund Broadband Infrastructure Account, which has made numerous awards over the past seven years,[12] and from its 2020 California Broadband Cost Model, which estimates the capital cost to build all-fiber infrastructure.[13]

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[12] For a list of approved projects, *see CASF Infrastructure Approved Projects*, available at https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-infrastructure-grant/casf-infrastructure-approved-projects. This information also can be used to gauge the reasonable of potential Thresholds.

[13] *See* Comments of the California Public Utilities Commission, Docket No. 220105-0002; NTIA-2021-0002, RIN 0660-ZA33 NTIA-2021-0002-0163 at 7 (Feb. 4, 2022) ("The CPUC published the California Broadband Cost Model (CBCM) in late 2020 as part of the California Broadband Council's Action Plan. The CBCM document supports state decision makers in framing budgets for broadband infrastructure development and the geographic targeting of funds. The state cost model allows California officials to see the high-cost and extremely high-cost factors which define the budget requirements for ubiquitous statewide broadband deployment.") ("CPUC BEAD Comments"). *See also* CostQuest Associates, Inc., *California Broadband Cost Model (CBCM)*. (2020) ("The CBCM has as its purpose the estimation of investment to build broadband network infrastructure to given locations on a one-time capital cost basis. The cost elements comprising CBCM are based on network design and engineering methods, to model, as closely as possible, estimated network deployment costs of a fiber to the premises network capable of meeting current and future consumer bandwidth demand requirements."), available at https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-broadband-cost-model ("*CBCM Report*"), https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/california-broadband-cost-model/california-state-broadband-cost-model_december-2020_12142020.pdf. The *CBCM Report* analyzes the cost to serve locations and on that basis develops a potential cost threshold ($9,180 cost to deploy per structure), but this threshold differs from the BEAD Program's Threshold in numerous respects, including because the Threshold also needs to account for providers' economics and State/Territory strategic goals. The Threshold and the CBCM's threshold additionally are distinguished from that the Extremely High-Cost Threshold used by the Federal Communications Commission in the Connect America Fund program ("Extremely high-cost census blocks are those census blocks that the CAM determined have an average cost-per-location that exceeds the extremely high-cost benchmark of $198.60 per location."). *See CBCM Report*, n. 13; *see also Wireline Competition Bureau Releases Preliminary List and Map of Eligible Census Blocks for the Connect America Phase II Auction*, *FCC Public Notice*, DA 16-908, WC Docket No. 10-90, n. 8 (FCC Aug. 10, 2016).

Once this information is collected, a State or Territory then should use it to develop various scenarios of Thresholds, calculating the expected fiber deployment outcomes from varying levels of the Threshold and determining the impact of Thresholds on alternative technology and overall coverage of unserved and underserved locations. The final step is to assess these scenarios and converge on a solution that will enable it to achieve optimally the overall goal of the program – the provision of qualifying broadband service to all eligible locations and maximum fiber connectivity.[14]

Cartesian and FBA stand ready to help the CPUC in establishing the Threshold, including by facilitating access to Cartesian's fiber deployment model and resources.

April 17, 2023	Respectfully Submitted,  Gary Bolton President and CEO Fiber Broadband Association 3050 K Street, Suite 400 Washington, DC 20007 Email: gbolton@fiberbroadband.org Tel.: (202) 524-9550

Attachments:

Attachment A:
Cartesian, *A Rational Methodology to Set Broadband Equity, Access, and Deployment Program's Extremely High Cost Per Location Threshold* (April 2023)

Attachment B:
Fiber Broadband Association, *Virtually All Households Will Have Fiber Connectivity Accessible by 2030* (2023).

[14] Within this overall goal, the CPUC may, for instance, seek to ensure fiber is deployed to provide reliable, resilient service "in high threat areas" and "for precision agriculture." CPUC BEAD Comments at 8, 10.

A Rational Methodology to Set the Broadband Equity, Access, and Deployment Program's Extremely High Cost Per Location Threshold

April 2023

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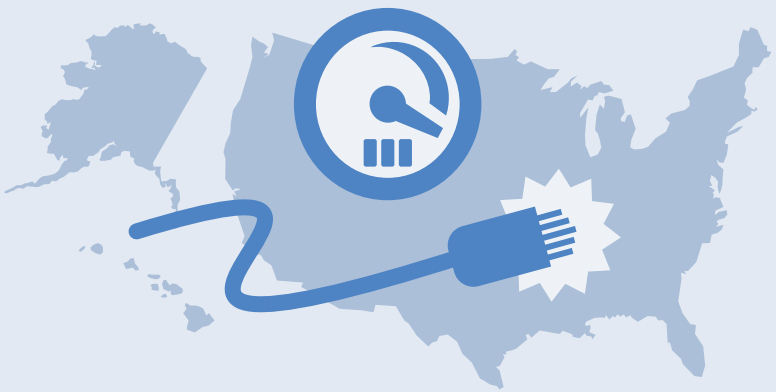
Fiber Broadband Association Comments, R.23-02-016
Attachment A, April 17, 2023

The BEAD Program | Main Objective

What is the BEAD Program seeking to achieve?



The provision of robust, reliable broadband service to all unserved and underserved locations in all States and Territories by "prioritizing fiber connectivity directly to the end user"[1]

1. BEAD NOFO, page 7
Source: Cartesian, NTIA BEAD Notice of Funding (NOFO)

The BEAD Program | Fiber Priority

What is the rationale for the BEAD Program prioritizing fiber connectivity?

"fiber-optic technology…will ensure that the network…can easily scale speeds over time to meet the evolving connectivity needs of households and businesses and support the deployment of 5G, successor wireless technologies, and other advanced services"[1]

1. BEAD NOFO, page 9
Source: Cartesian, NTIA BEAD Notice of Funding (NOFO)

Extremely High Cost Per Location Threshold | Definition & Purpose

What is the Extremely High Cost Per Location ("Threshold")?

The BEAD Program's Notice of Funding Opportunity ("NOFO") defines the Threshold as:

"a BEAD subsidy cost per location… above which an Eligible Entity may decline to select a proposal [all-fiber project] if use of an alternative technology meeting BEAD's technical requirements would be less expensive".

- **In essence, the Threshold provides a touchpoint at which a State or Territory need not prioritize fiber deployments and instead may consider whether other technologies provide an efficient means to reach the highest cost locations.**
- **The Threshold thus is the key mechanism that States/Territories will use to achieve maximum fiber deployment while ensuring all unserved and underserved locations receive robust, reliable broadband service.**

Source: Cartesian, NTIA BEAD Notice of Funding (NOFO)

Extremely High Cost Per Location Threshold | NOFO Directives

A

States/Territories need to submit a proposal to NTIA on setting their Threshold

- States/Territories (Entity) must submit a proposal on setting the Threshold when filing their **Initial Proposals** to NTIA
- The proposal can either **identify a Threshold**, or give a **detailed process** for doing so
- Each Entity is **expected to develop its own** reasonable Threshold

B

The Threshold needs to be as high as possible

- NTIA expects the Threshold to be **as high as possible** to ensure that eligible locations are not left behind and will receive the same fiber connectivity – **the most capable, reliable, durable last-mile technology** – that virtually all U.S. locations will receive
- For locations where the cost is above the threshold, States/Territories may consider selecting the **next best available technology**

C

The Threshold affects Broadband Service Provider participation[1]

- Barring special circumstances in high-cost areas, providers must contribute **at least 25% of project costs**
- The Threshold dictates the maximum provider contribution amount, **affecting their willingness to participate**

1. Full or partial contribution waivers can be granted by the Assistant Secretary on a case-by-case basis, but no specific detail is provided on how waiver requests will be assessed or how often they will be given

Source: Cartesian, NTIA BEAD Notice of Funding (NOFO)

Fiber Broadband Association Comments, R.23-02-016
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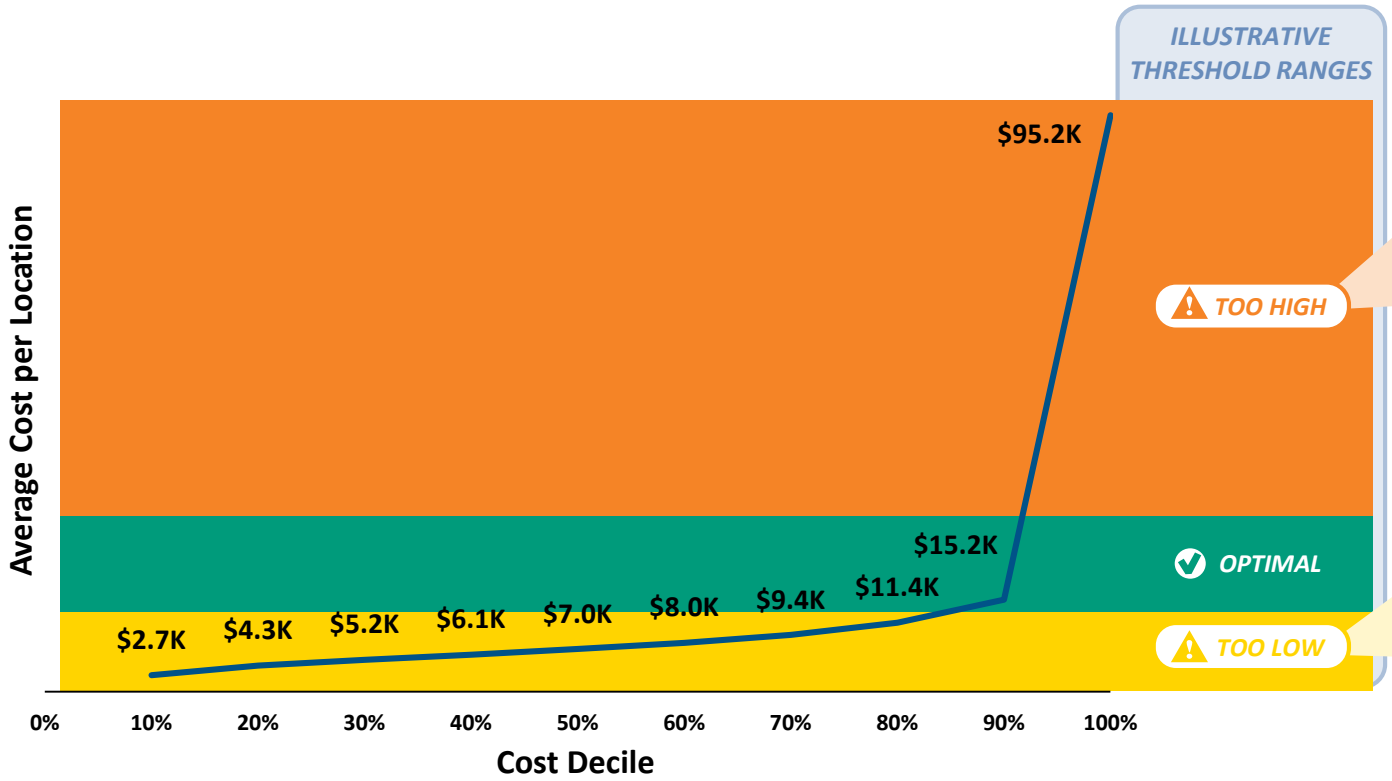
Setting An Economically Rational Threshold | Weighing the Risks

The Threshold should be set to encourage deployment of fiber over cheaper and less capable alternatives while not deterring providers from participating to build to all eligible locations – a fine line to tread

Fiber Deployment Cost per Unserved Location by Decile[1]



Risks that States/Territories may face:

THRESHOLD IS SET TOO HIGH

LACK OF BIDS OR FUNDS

Eligible locations may completely miss out on getting access through BEAD funding

Many Locations suffer:

- Left with no broadband access, especially costly locations
- Stuck with poor connectivity options

THRESHOLD IS SET TOO LOW

MISSED FIBER COVERAGE

Eligible locations that would have otherwise received fiber miss out

Affordable locations:

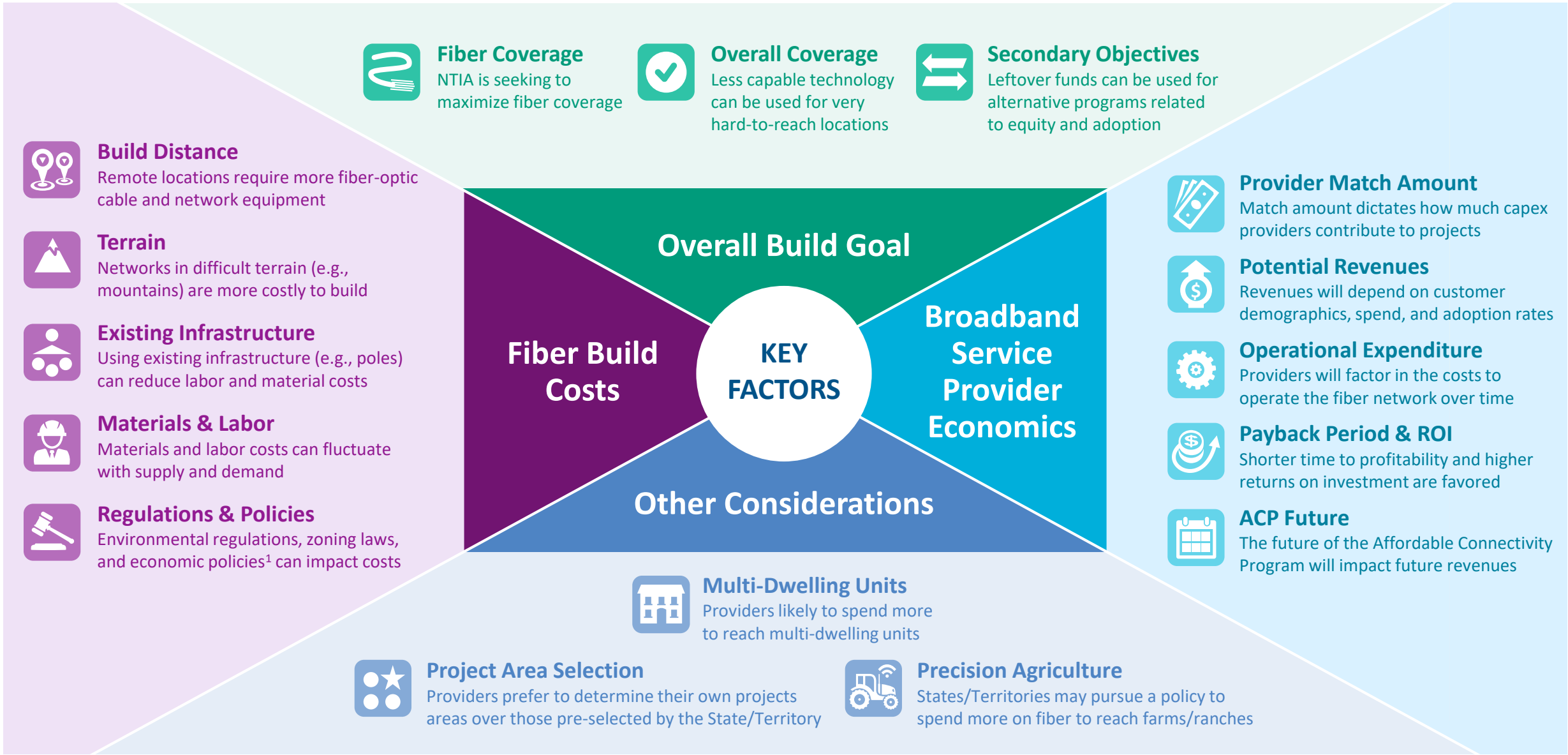
- Receive less capable technology
- Require more frequent upgrades
- Incur higher long-term costs

The Threshold signals to providers where they should bid to provide fiber rather than less capable technologies

1. Chart is for illustrative purposes – deployment costs, service provider economics, overall build goals and other considerations need to be factored in to determine the Threshold
Source: Cartesian

Fiber Broadband Association Comments, R.23-02-016
Attachment A, April 17, 2023

Setting An Economically Rational Threshold | Key Factors To Weigh



1. For example: the Build America, Buy America Act

Source: Cartesian

Setting An Economically Rational Threshold | Methodology

1 Estimate Deployment Cost

Estimate the fiber build costs per location

See page 10

- Use **location data** from the FCC Broadband Map to estimate fiber build distances
- Combine with **unit costs** for construction, cabling and equipment to estimate build costs

2 Develop Provider Business Case

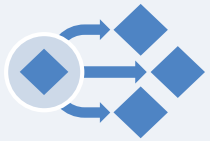
Create a realistic Broadband Provider business case

See pages 11-12

- Build a realistic business case factoring in expected **revenues**, **capex** and **opex**
- Define reasonable **payback periods** to help estimate how much providers are willing to match

3 Run Deployment Scenarios

Run deployment scenarios using different Thresholds

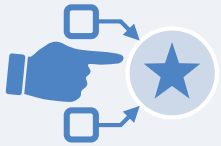


See page 13

- Calculate expected **fiber deployment outcomes** from varying levels of the Threshold
- Determine the impact of the Threshold on alternative technology and **overall coverage**

4 Set The Threshold

Choose the Threshold that meets the policy goals



See page 14

- Compare the scenario outcomes against goals for **fiber**, **coverage** and **other policies**
- Choose the Threshold that **best meets the build goals** that the Entity has set consistent with the BEAD Program Objectives

Source: Cartesian

Fiber Broadband Association Comments, R.23-02-016
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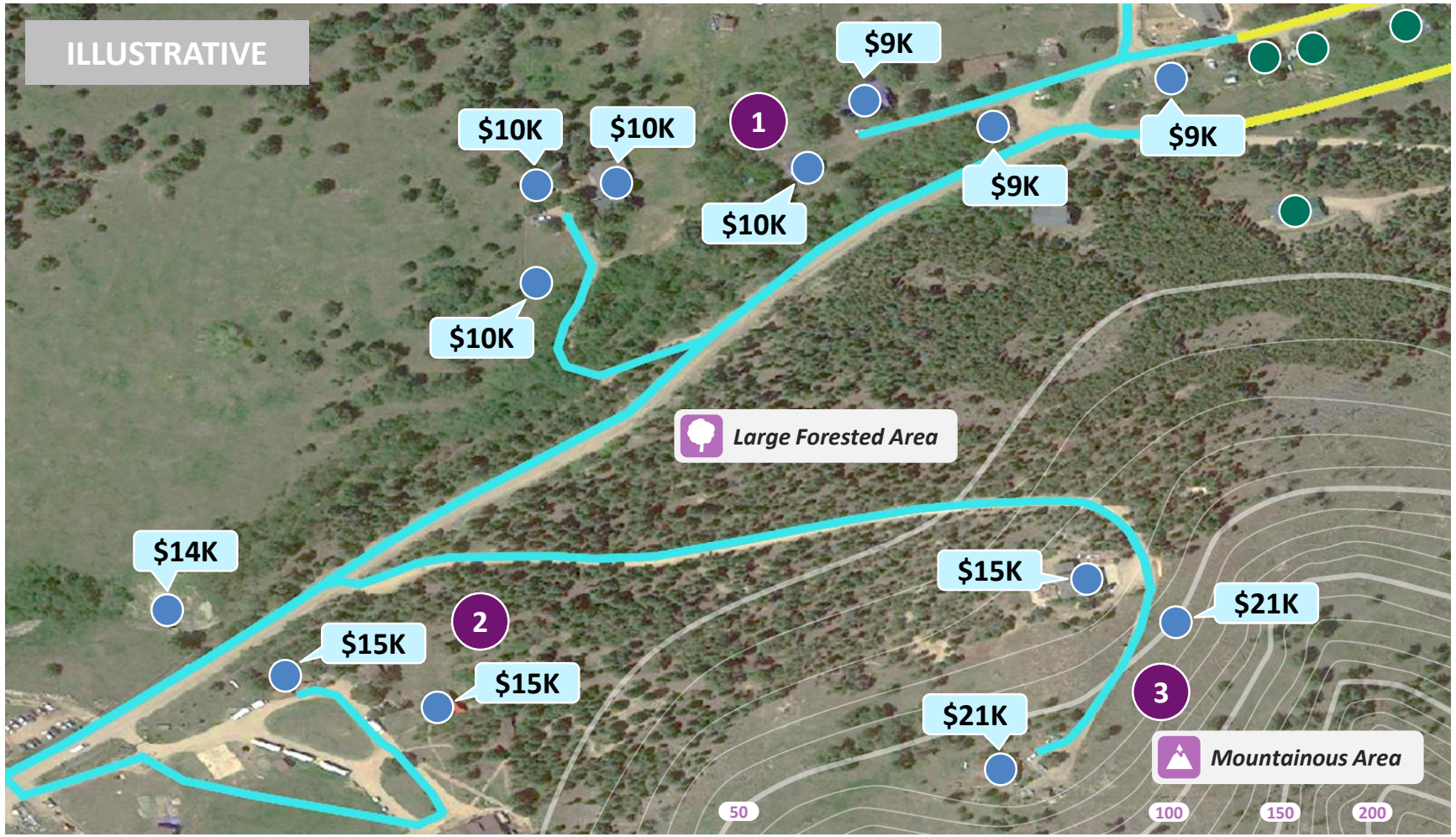
Methodology in Action | Estimate Deployment Cost

1. **Estimate Deployment Cost**
2. Develop Provider Business Case
3. Run Deployment Scenarios
4. Set The Threshold



$ Fiber Deployment Cost | Served Location | Unserved or Underserved Location | New Fiber Build | Existing Network

How Are Fiber Deployment Costs Estimated?

Geospatial Modeling to estimate the network route lengths

Geographic Analysis to estimate deployment mode (e.g., buried, aerial)

Geographic Observations:

1. Closer in proximity to existing network
2. Farther from existing network, large forested area in between
3. Farthest from existing network, large forested area in between, and on mountainous terrain

Source: Cartesian

Fiber Broadband Association Comments, R.23-02-016
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Methodology in Action | Broadband Provider Business Case Framework

1. Estimate Deployment Cost
2. **Develop Provider Business Case**
3. Run Deployment Scenarios
4. Set The Threshold

Sample Framework For Per Location Business Cases

- Annual Contribution Per Customer[1]
- × Customers In Location
- = Annual Contribution Per Location
- Provider Match
- ÷ Annual Contribution Per Location
- = Payback Period

Additional Business Case Considerations

- **Operational expenditure** to maintain the network
- **Customer acquisition costs** from marketing, promos, etc.
- **Cost of capital** to finance projects and operations

Sample Business Cases:

Location I Single Family Unit	Location II Single Family Unit	Location III Multi-Dwelling Unit	
$48K	$12K	$12K	Deployment Cost
$484	$484	$484	
1	1	4	
$484	$484	$1.9K	
$12K	$3K	$3K	At 25% Match
$484	$484	$1.9K	
25 Years	6 Years	1.5 Years	
Prohibitive 25-year payback period due to higher provider match	*Acceptable 6-year payback period due to lower provider match*	*Rapid 1.5-year payback due to lower match and multiple customers*	

Working backwards from a *reasonable payback period* can determine how much providers are willing to match per location

1. Annual Contribution Per Customer ($484) is a Cartesian assumption based on industry research. States/Territories will individually have to determine the appropriate contribution per customer.
Source: Cartesian

Fiber Broadband Association Comments, R.23-02-016
Attachment A, April 17, 2023

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Methodology in Action | Estimate Broadband Provider Business Case

1. Estimate Deployment Cost
2. **Develop Provider Business Case**
3. Run Deployment Scenarios
4. Set The Threshold

MATCH	Provider Investment at 25% Match
REVENUE	Annual Revenue Per Location
PAYBACK PERIOD	Time to Recoup Provider Investment
#	Number of Customers in Location

What Else Are Providers Thinking About?

Project Boundaries
that can include locations with a variety of costs and revenues

Market & Competition
that can impact uptake, pricing and packaging, and churn

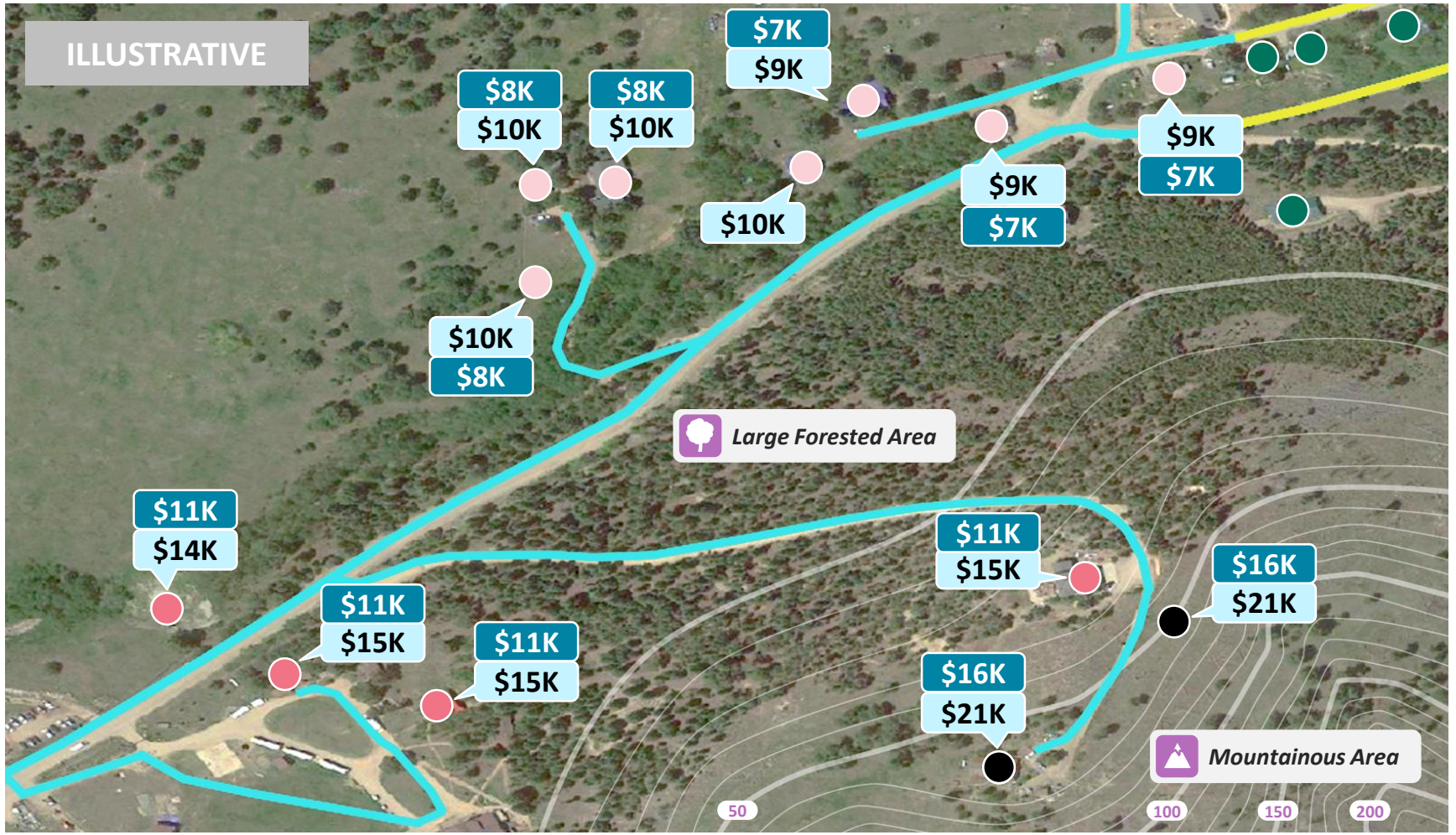
Future Costs
from operational expenditure and future upgrades

Prohibitive Payback Period | Served Location | Unserved or Underserved Location | New Fiber Build | Existing Network

Source: Cartesian

Methodology in Action | Run Deployment Scenarios

1. Estimate Deployment Cost
2. Develop Provider Business Case
3. **Run Deployment Scenarios**
4. Set The Threshold



Fiber Deployment Key:

Threshold:	Fiber is always deployed		Fiber is never deployed
A LOWER	✓	✗	✗
B HIGHER	✓	✓	✗
C HIGHEST	✓	✓	✗

Deployment Scenario Results:

A LOWER THRESHOLD: $10K

54% Fiber	46% Other Tech.	100% Coverage

B HIGHER THRESHOLD: $15K

85% Fiber	15% Other Tech.	100% Coverage

C HIGHEST THRESHOLD: $20K

85% Fiber	5% Other Tech.	90% Coverage

$ Fiber Deployment Cost | Subsidy (75% of Cost) | Served Location | New Fiber Build | Existing Network

Source: Cartesian

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Methodology in Action | Set The Threshold

1. Estimate Deployment Cost
2. Develop Provider Business Case
3. Run Deployment Scenarios
4. **Set The Threshold**

Calculate deployment scenario results → **Assess results against primary goals** → **Summarize outcomes** → **Set the Threshold**

		High Fiber Coverage	Full Coverage		
A	*LOWER THRESHOLD: $10K* — 54% Fiber; 46% Other Tech.; 100% Coverage	✗	✓	Fiber coverage is insufficient, although coverage goal is met	*Threshold does not achieve State/ Territory goals*
B	*HIGHER THRESHOLD: $15K* — 85% Fiber; 15% Other Tech.; 100% Coverage	✓	✓	High fiber coverage and full coverage goals are met	***Threshold achieves State/Territory goals***
C	*HIGHEST THRESHOLD: $20K* — 85% Fiber; 5% Other Tech.; 90% Coverage	✓	✗	High fiber coverage, but full coverage is not achieved as costly locations/ poor business cases deter provider participation	*Threshold does not achieve State/ Territory goals*

States/Territories should aim to cover all eligible locations while maximizing fiber connectivity

Source: Cartesian

Fiber Broadband Association Comments, R.23-02-016
Attachment A, April 17, 2023

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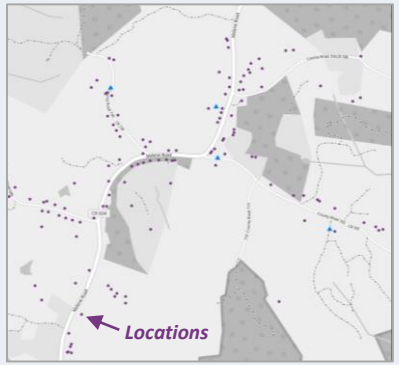
Appendix

Appendix | Fiber Cost Model

Network capex is determined using estimated network route lengths and construction unit costs

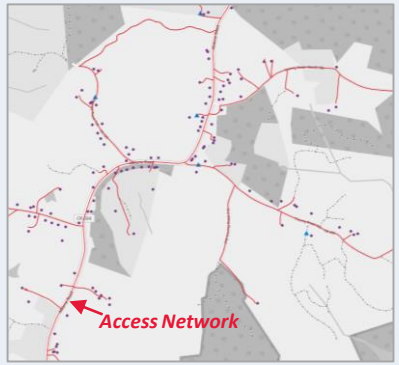
1. Estimate Deployment Cost
2. Develop Provider Business Case
3. Run Deployment Scenarios
4. Set The Threshold

Location Mapping



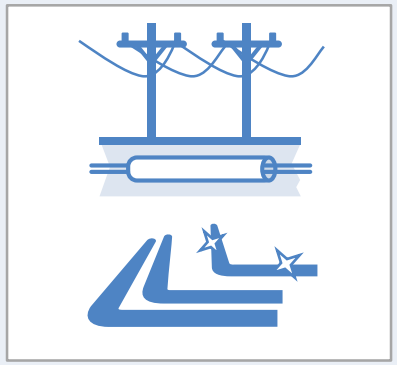
- Identify the location of broadband serviceable locations, roads and obstacles (rivers, railroads, etc.) in relevant areas

Network Routing



- Use network routing algorithms to estimate the fiber construction distances

Cost Profile



- Determine the mix of aerial, buried and underground plant, and where existing infrastructure can be reused

Deployment Cost Model

Network Route Length	Fiber deployment route lengths by geotype
× Plant Mix by Geotype	Mix of aerial, buried and underground plant by geotype
× $ Cost per Plant Type	Unit cost to deploy each plant type by geotype

Network Capex

÷ Number of Locations in Selected Area[1]

= Cost to Deploy Fiber Per Location in Selected Area

1. Selected area can be defined by geographic area (e.g., census block group, census tract, zip code, etc.) or by specific project boundaries. States/Territories or Providers will have to decide appropriate area selection.

Source: Cartesian

BOSTON

KANSAS CITY

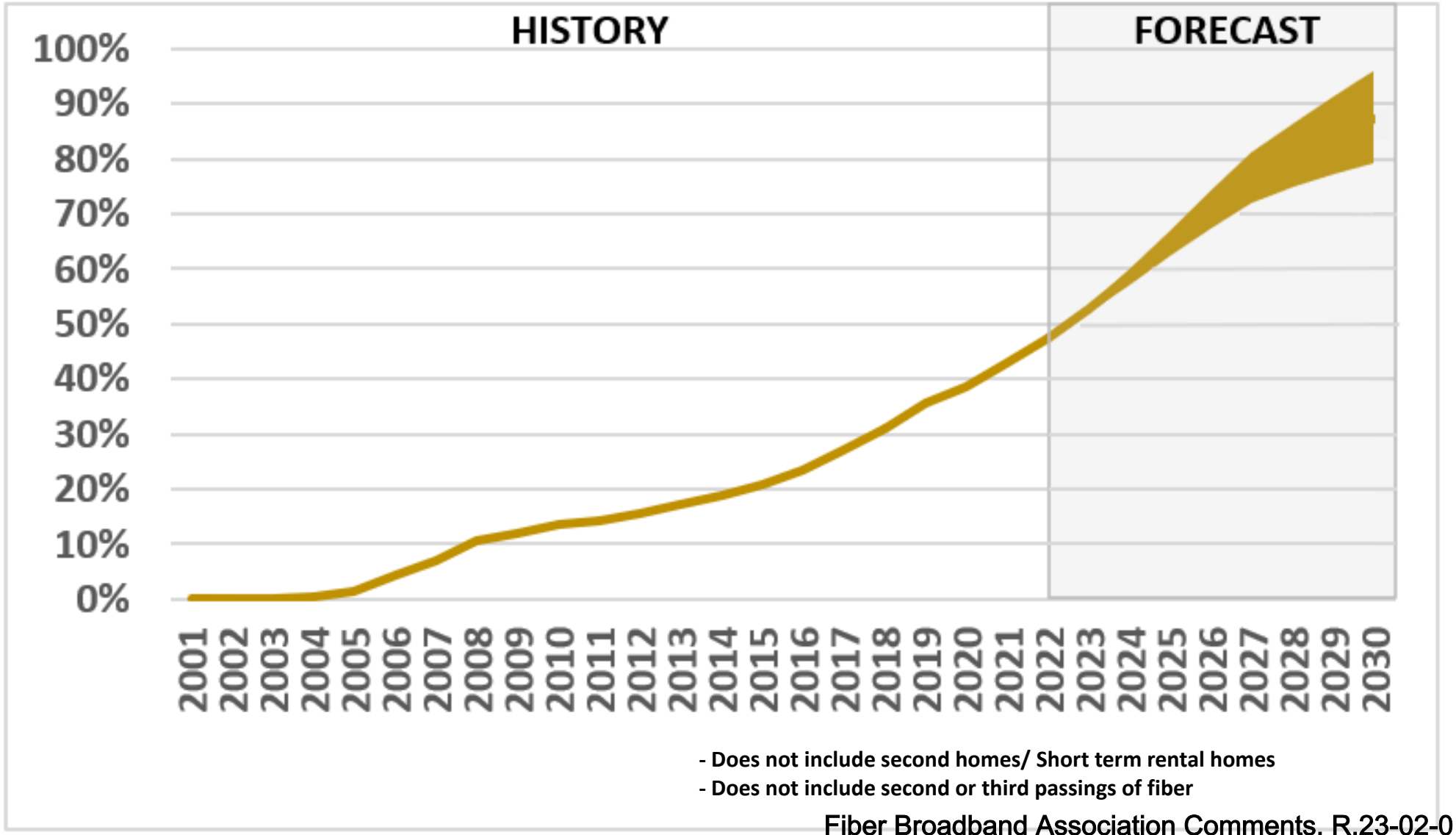
LONDON

NEW YORK

PARIS

Virtually All U.S. Households Will Have Fiber Connectivity Accessible by 2030

Percent Of Primary Households With At Least One Fiber Provider Available



- Does not include second homes/ Short term rental homes
- Does not include second or third passings of fiber

Fiber Broadband Association Comments, R.23-02-016
Attachment B, April 17, 2023