SOLVE FOR X

It's fiber to anywhere.

CLEARFIELD

Industry Update

View of the WISP Market

January, 2018

Who We Are

CLEARFIELD

- Clearfield is a leading provider of fiber optic management and connectivity solutions
- Our patented technology significantly reduces the traditional costs associated with deploying, managing and scaling a fiber optic network
- Our products connect homes and businesses in more than 500 communities around the world
- Headquartered in Minneapolis, with a manufacturing facility in Mexico and manufacturing partnerships around the world

Forbes *Top Small Companies in America*

EUREKA

Certified by Telcordia

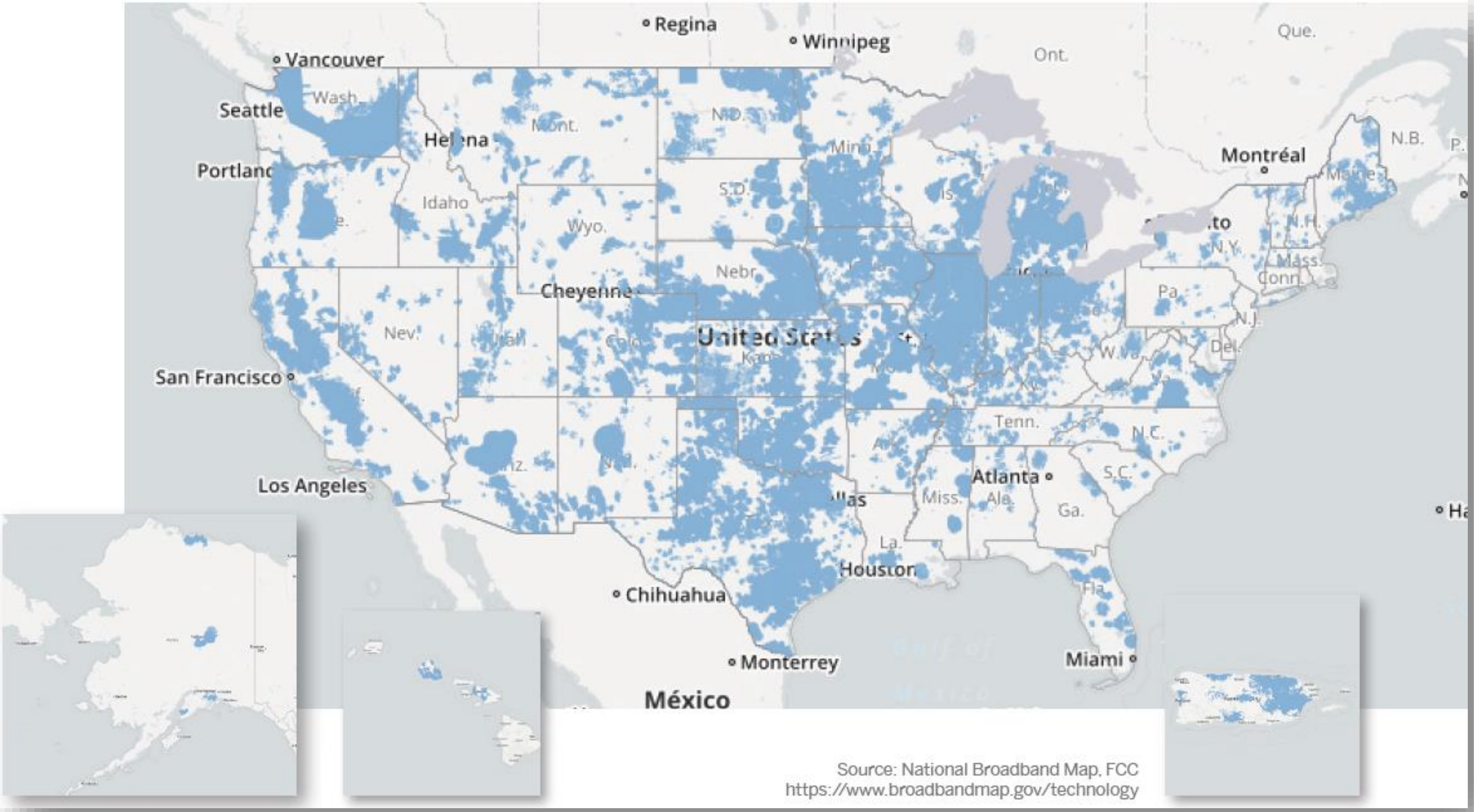
Broadband Wireless Access

WISP INDUSTRY UPDATE

Growth Drivers – Fixed Wireless

Broadband Wireless Access industry experiencing robust growth in the USA

Fixed Wireless – Where Is It Deployed?



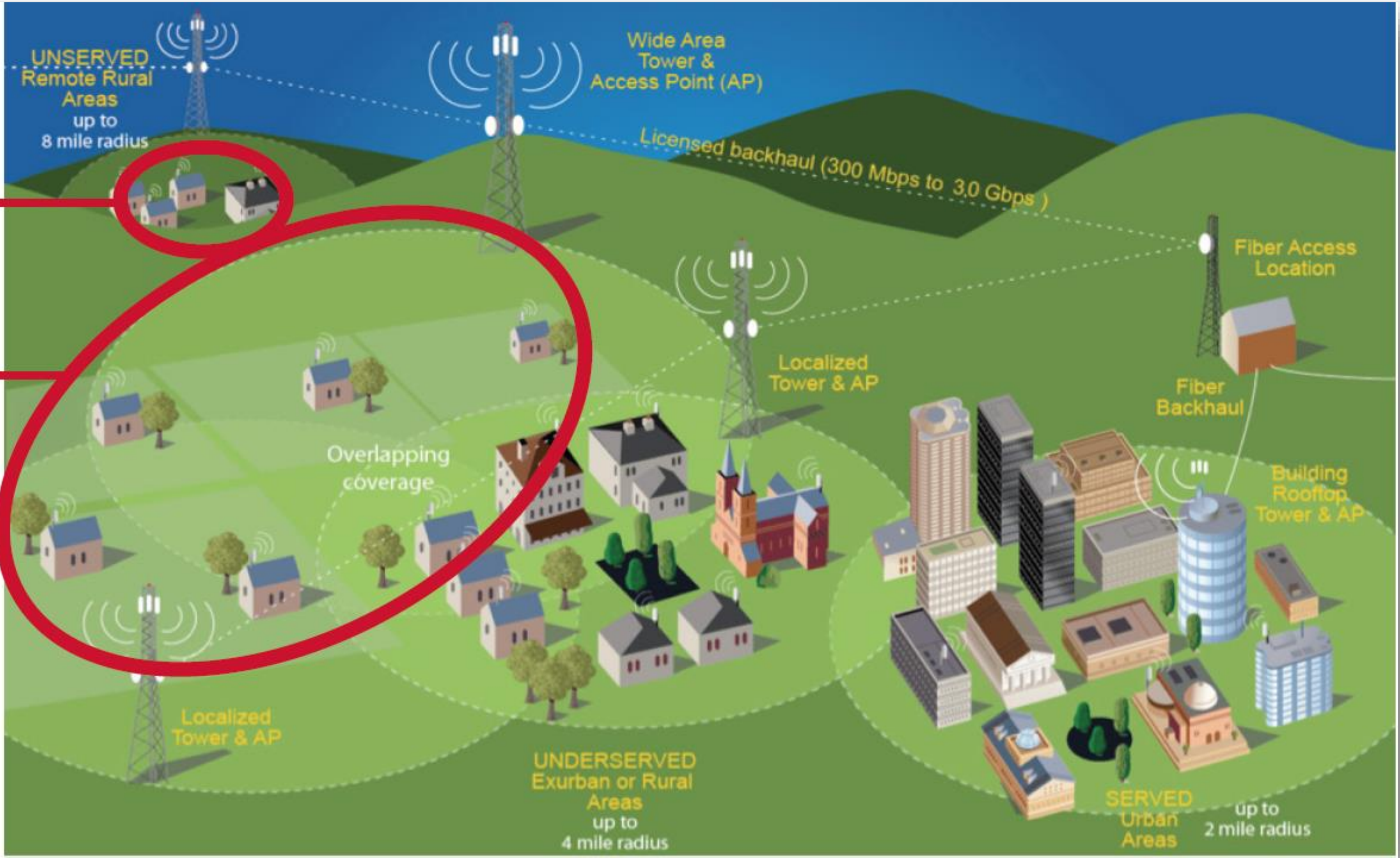
Fixed Wireless Broadband Availability

Whereas most wireless infrastructure today serves mobile consumers, BWA providers use wireless technology to serve customers in fixed locations such as residences, businesses, and community anchor institutions.

Source: Broadband Wireless Access Industry Report 2017, The Carmel Group.

Typical Broadband Wireless Access Architecture

BWA
"SWEET SPOT"
100 - 1,500
Locations
per Square Mile



Source: Broadband Wireless Access Industry Report 2017, The Carmel Group.

U.S. BWA Growth Forecast

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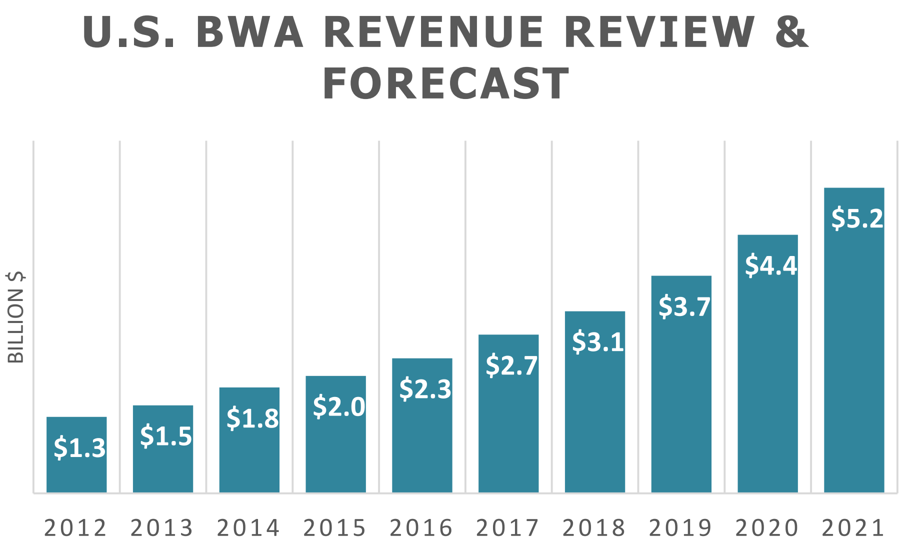
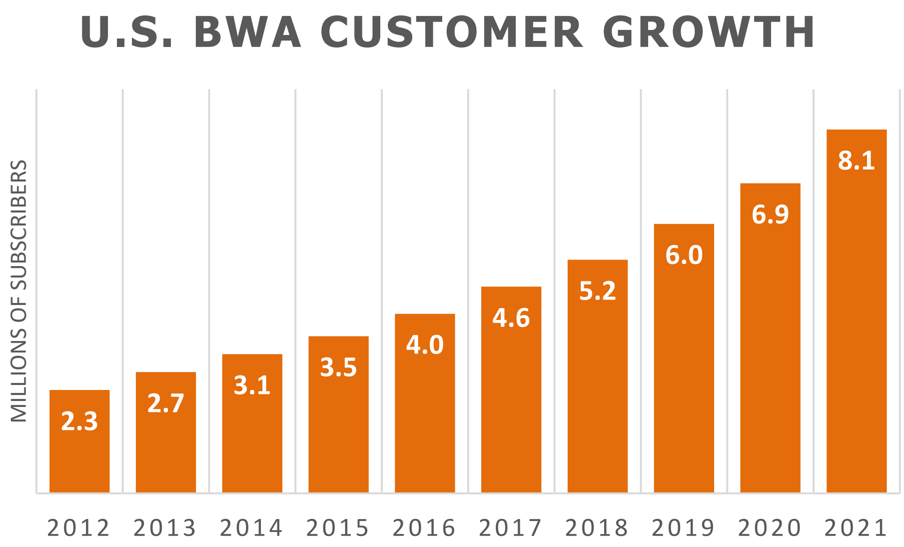
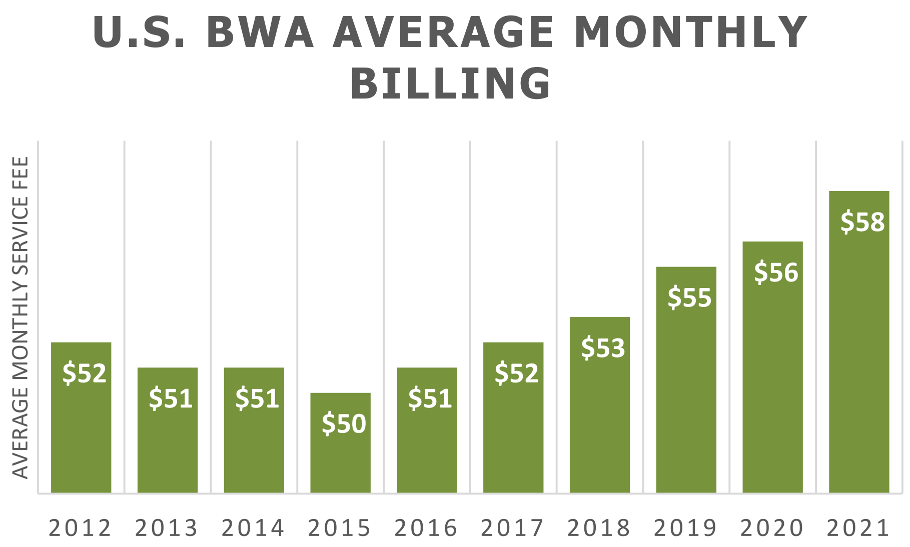




- Explosive consumer demand for broadband services
- Deployment continues to Unserved & Underserved Areas
- Both Commercial and Business Demand

Source: Broadband Wireless Access Industry Report 2017, The Carmel Group.

U.S. BWA Average Monthly Billing



Consumer savings from unbundling more than offset small price increases

Combination of existing services with ancillary services increasing the average revenue per user (ARPU)

Source: Broadband Wireless Access Industry Report 2017, The Carmel Group.

Residential Consumer Broadband Comparisons

	Fiber	Cable	Satellite	Mobile	BWA
CAPEX/Sub Relative to BWA[1]	70	45	10.5	21	**10**
Speed[2]	1 Gbps	150 Mbps	12-35 Mbps	10-12 Mbps	**100 Mbps**
Upgrade Costs	MODEST Only the fiber remains the same	HIGH Complete CPE & network change	LOW/HIGH Incremental upgrades until the satellite fails	HIGH Complete device & network change	**MODEST Incremental upgrades in CPE and networks**
Broadband ARPU	$69	$42	$61	$59	**$51**
Payback Period	60 months	38 months	12 months	21 months	**11.5 months**

(1) This is a relative presentation comparing all of the technologies to BWA, which is set to an index value of 10
(2) Max speeds; most service providers are not yet offering max speed.

Source: Broadband Wireless Access Industry Report 2017, The Carmel Group.

Fixed Wireless vs. Fiber

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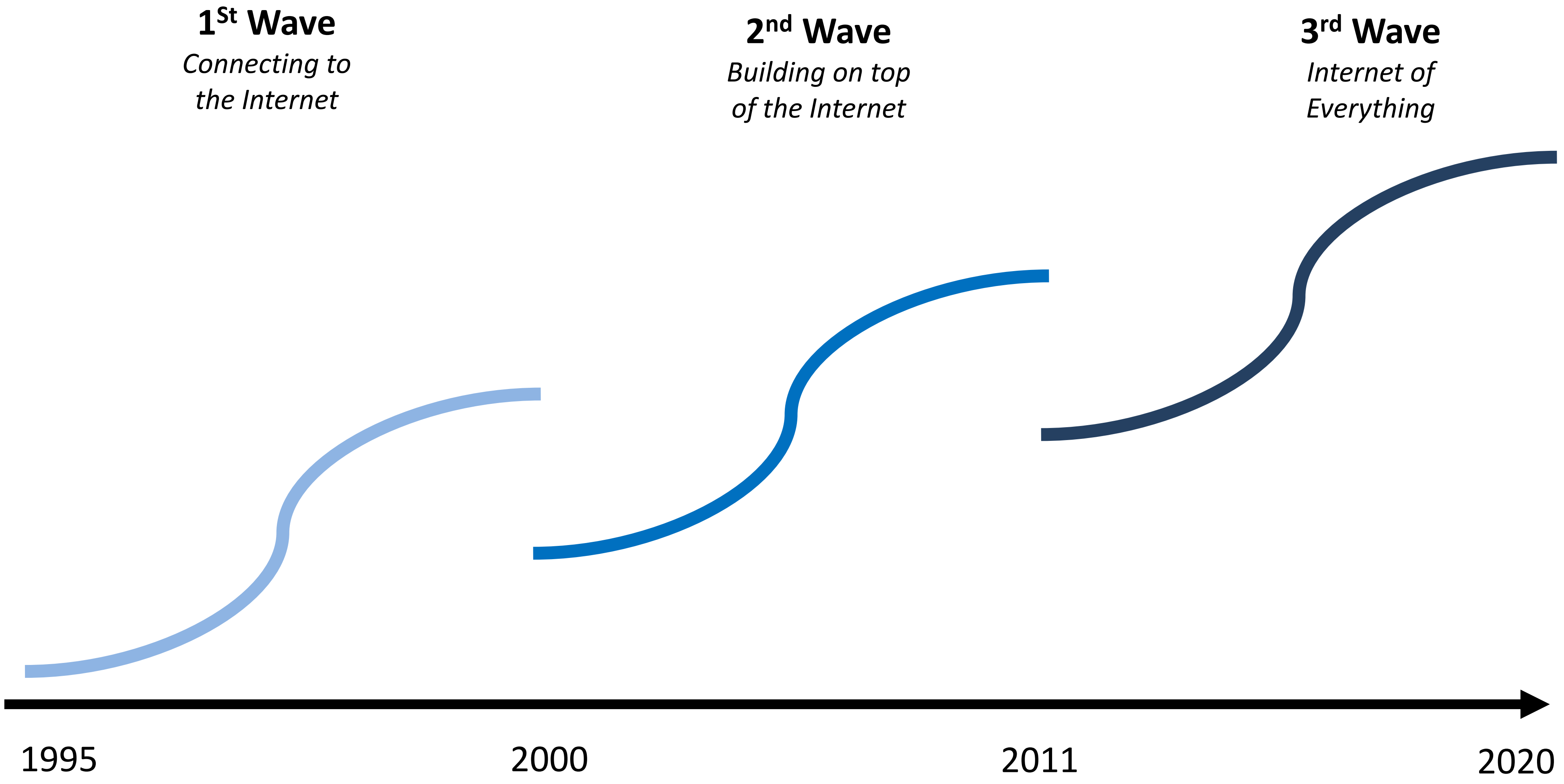
- Fiber-to-the-Home (FTTH)
  - Tends to be fiercest rival
  - Previously deployed but unused fiber provides good throughput and is cost competitive to the consumer
  - Economics of new fiber tend to limit it to higher density markets and higher traffic tower links

Source: Broadband Wireless Access Industry Report 2017, The Carmel Group.

Why Fiber?


1st Wave
Connecting to the Internet
2nd Wave
Building on top of the Internet
3rd Wave
Internet of Everything
1995
2000
2011
2020

Role of Fiber in Wireless?

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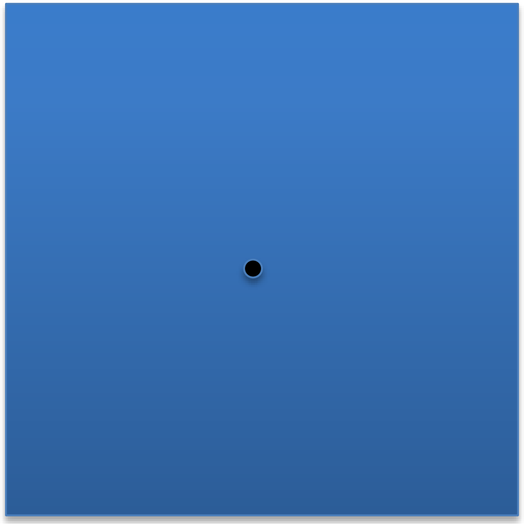
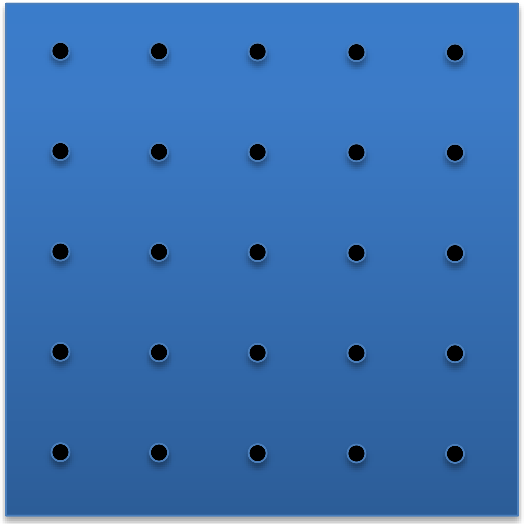
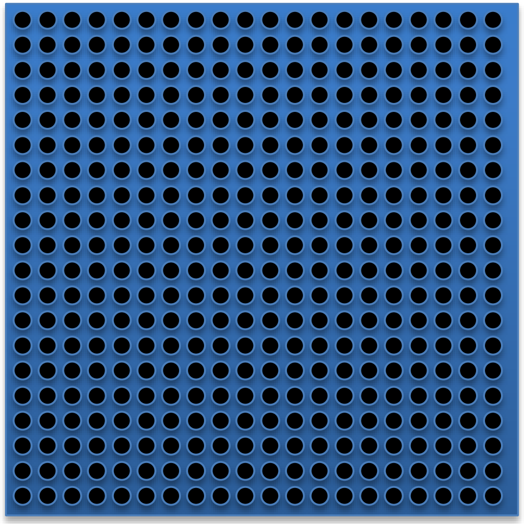
- Densification Requires Much More Fiber
- To go from 3G to 4G requires 25X more fiber
- 5G requires at least 16X more fiber



3G
1 site every 10 km
Cell density is 1 cell / 100 sq km



4G
1 site every 2 km
Cell density is 25 cells / 100 sq km



5G
1 site every 0.5 km
Cell density is 400 cells / 100 sq km

Source: (1) Fiber Broadband Association 2017 Annual Report

WISP Survey Summary Results

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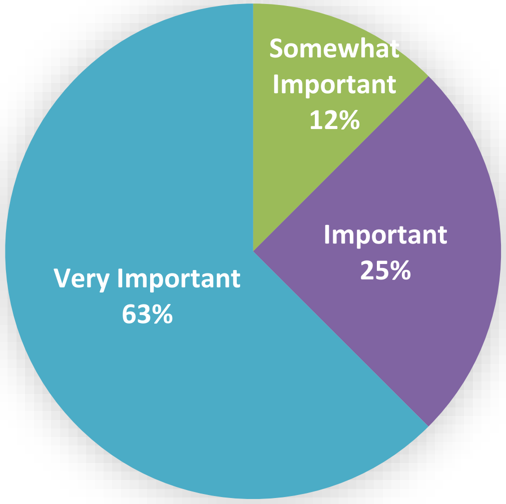
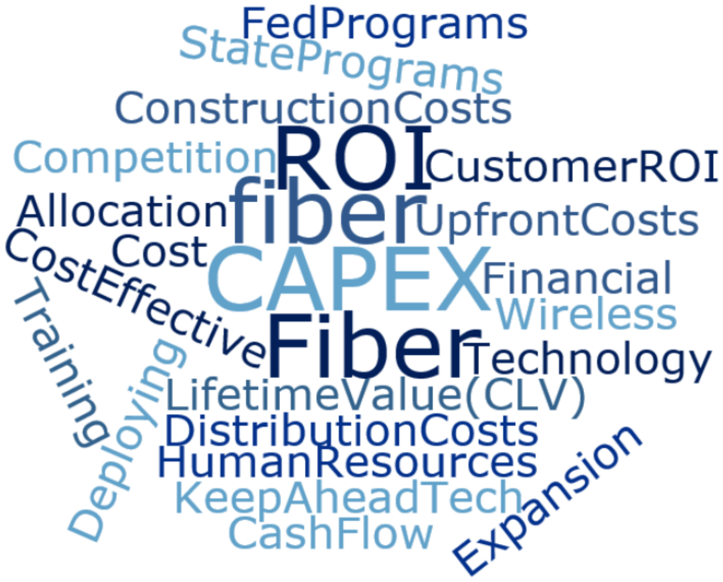
How important is fiber to expand service offerings? (1-5)



What is biggest concern in running your business today?



What is the biggest opportunity for our business today?

While initial deployment costs are higher for Fiber than for fixed wireless, FTTH can support exponentially higher data rates and has a much longer equipment lifespan

data rates and has a much longer equipment lifespan

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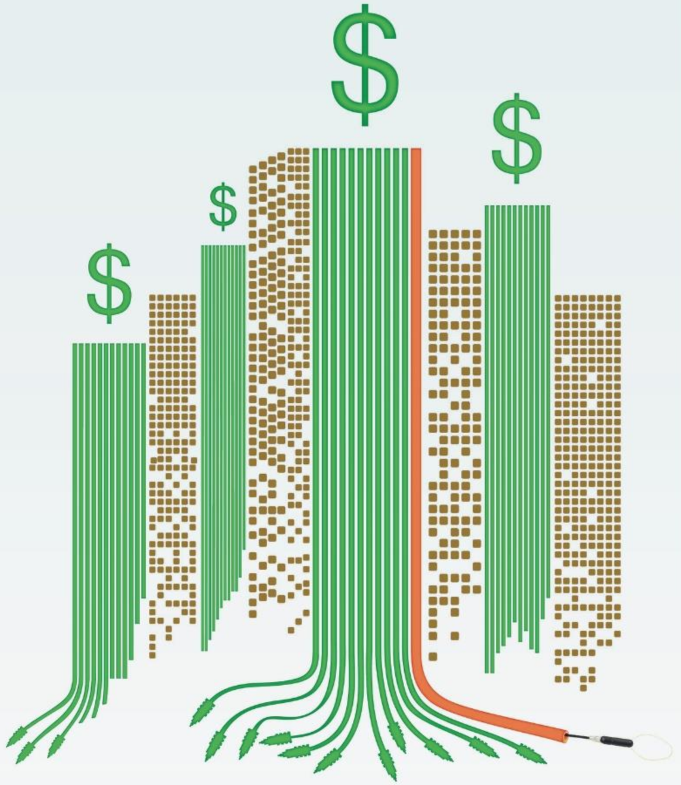
WE TURN
YOUR
BROWNFIELD
GREEN



THANK YOU