



Fiber to the Premises Feasibility Study

for

The Town of Superior, CO

June 2017

Uptown Services, LLC

Dave Stockton & Neil Shaw, Principals

1. Market Analysis
 - Quantitative market research
 - DOCSIS3.1 impact
2. Technology Strategy, Design, and Capital Budget
 - Reference architecture
 - Sample designs
3. Incumbent & Proposed Fiber To The Premises (FTTP) Offerings
4. Pro Forma Financial Analysis
 - Baseline 15 year pro forma results
 - Overview of business structure options
 - Analysis of wholesale and operating partner options
 - Baseline and Tax Subsidy financial outcomes

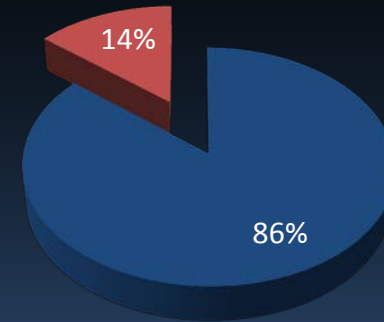
Residential Quantitative Survey
Current Broadband Services Usage

- ◆ Area of Interest: Universe of \approx 5,000 households (HHs)
 - ❖ Total sample size of 400 respondents
 - ❖ 95% Confidence Interval with \pm 4.7 sample error)
- ◆ Results weighted to reflect actual age distribution from 2010 Census data (age of householder)
- ◆ Respondents screened to ensure
 - ❖ Decision-maker for telecommunications and entertainment services in the home
 - ❖ Respondents with immediate family members employed by any of the following were excluded:
 - Town of Superior
 - CenturyLink
 - Comcast
 - Integra
 - Rise Broadband
 - Birch Communications

DEMOGRAPHICS: AGE & INCOME

- Survey results are weighted to reflect the actual age distribution (by age decile) per the 2010 Census.

Dwelling Ownership

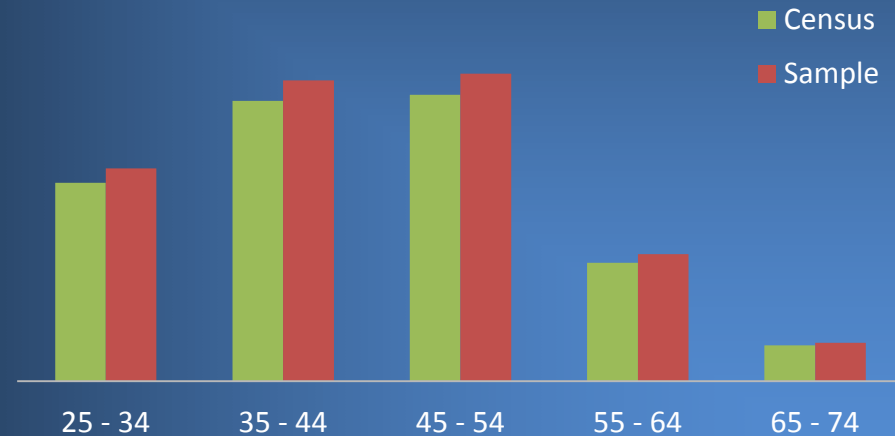


Own Rent

Household Income



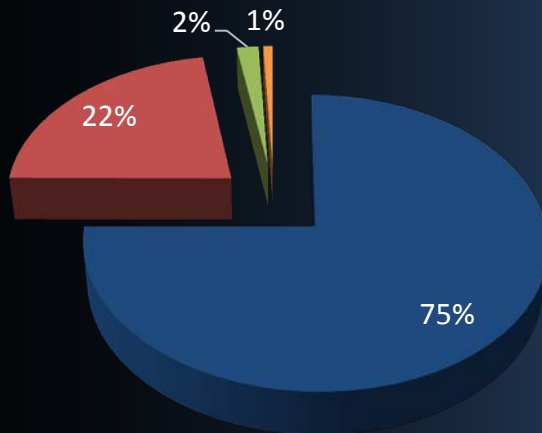
Head of Household Age



INTERNET SERVICE PURCHASING BEHAVIOR

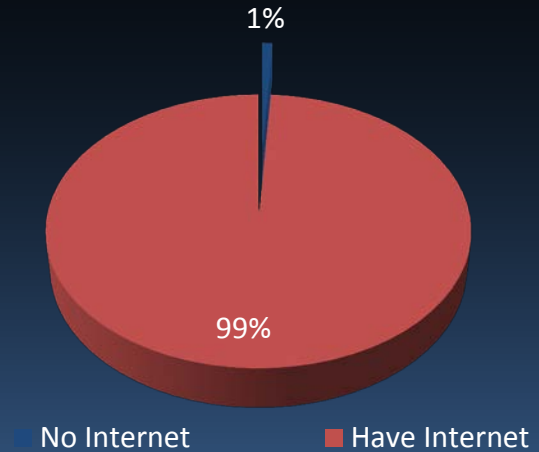
- ◆ 99% of Superior households use the Internet at home
- ◆ Cable Modem (Comcast) has the majority of market share at 75%
- ◆ All Internet households use a wireless access point

**Internet Market Share
(Households)**

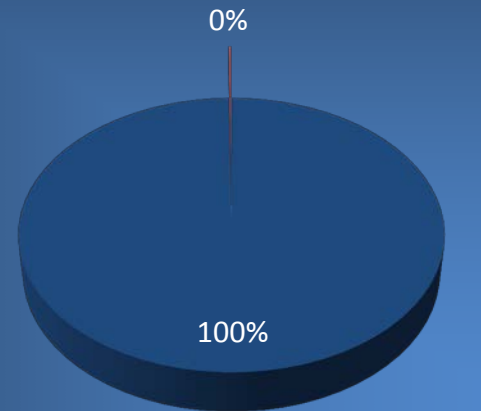


■ Cable Modem ■ DSL ■ Satellite ■ Fixed Wireless ■ Other

Incidence of Internet Households



Use of WiFi Access Point/Router

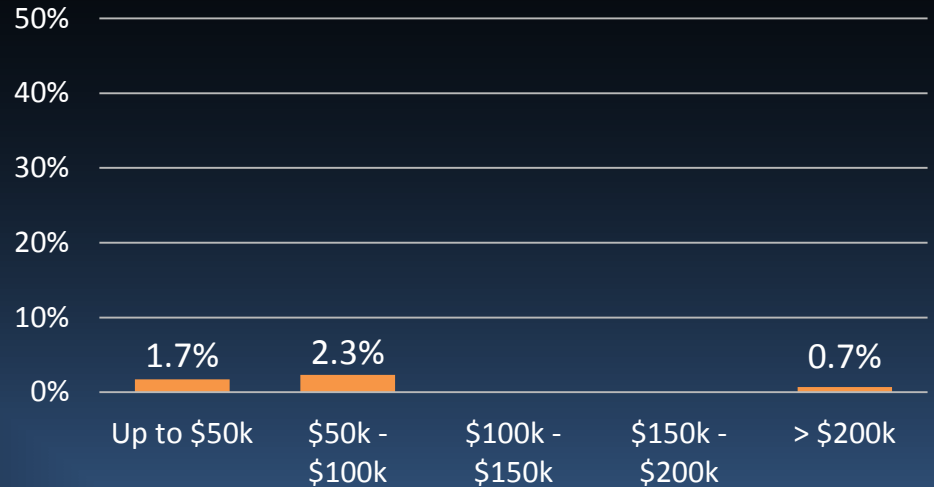


■ Use WiFi ■ Don't Know

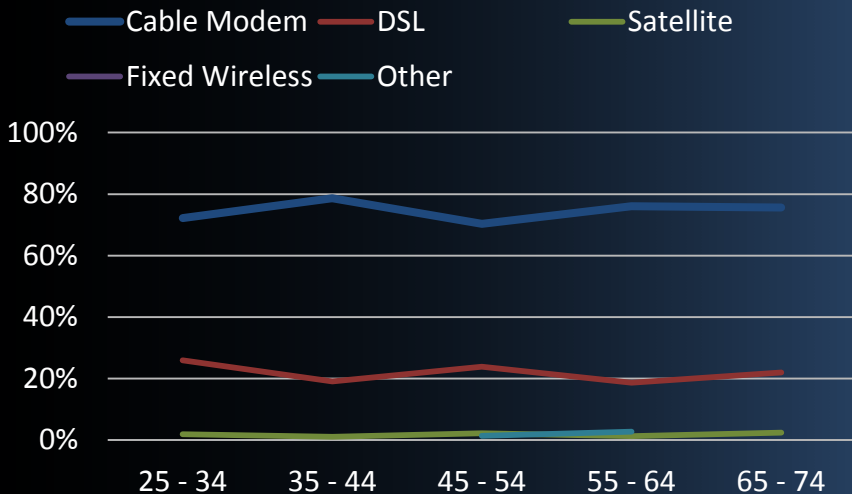
INTERNET USAGE BY HOUSEHOLD DEMOGRAPHIC

- ◆ Internet usage is prevalent across all households
- ◆ Cable modem service is preferred by higher income households.

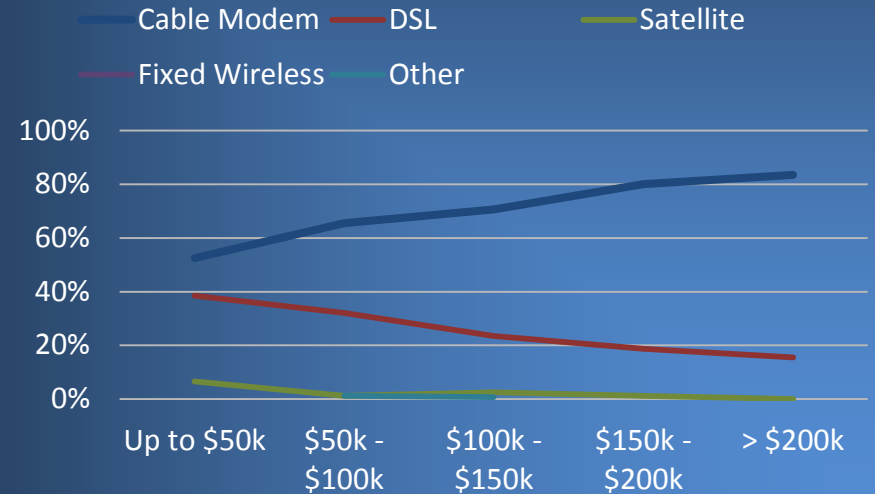
Incidence of No Internet by Income



Internet Type by Age



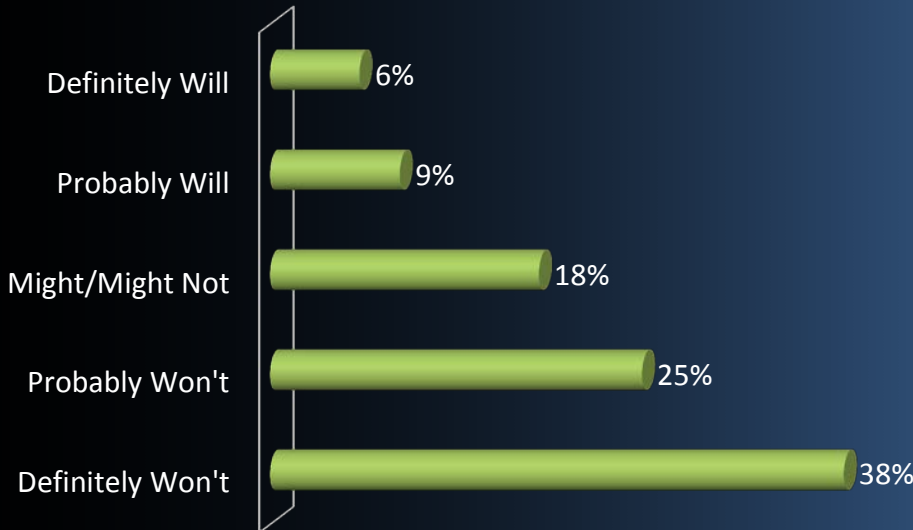
Internet Type by Income



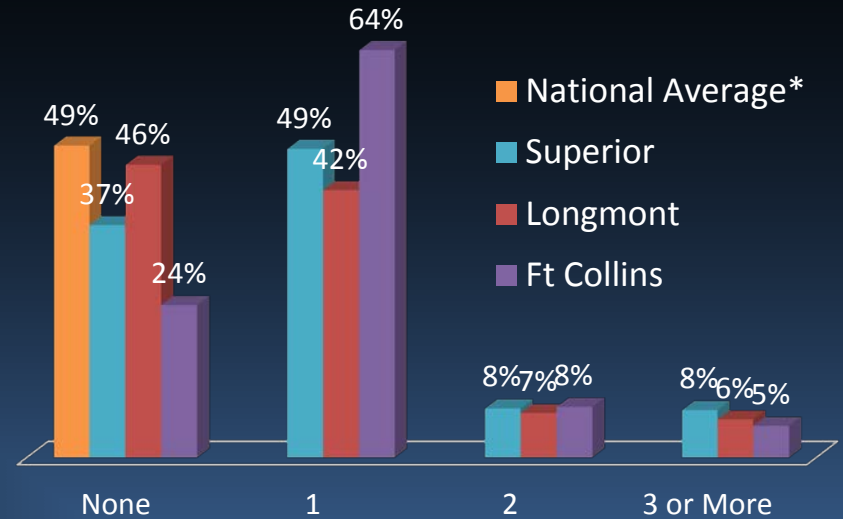
VOICE SERVICES USAGE

- ◆ Wireless substitution is lower than the national average at 37% of HHs
- ◆ A further 9% of wireline phone users will drop for wireless in the next 12 months
- ◆ The average number of lines is:
 - ❖ All Households: 0.9
 - ❖ Wireline Households: 1.4

Q11: "How likely are you to disconnect the wired phone line and only use your cell..."

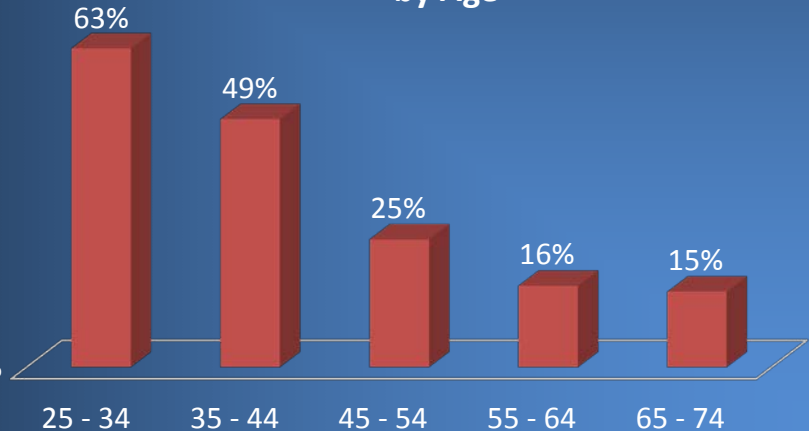


Number of Phone Lines in the Home



*Source: National Health Interview Survey, 2015

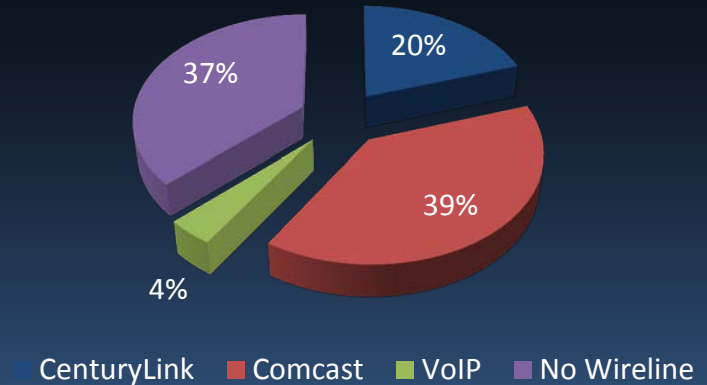
Households Without Wireline Phone Service by Age



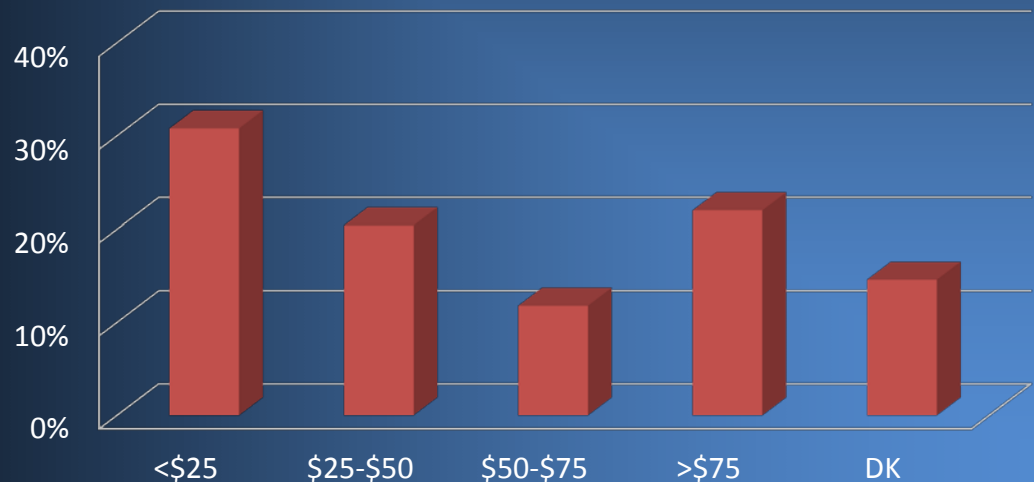
WIRELINER PHONE MARKET SHARE

- Comcast has been able to capture market share leadership from CenturyLink by Internet service bundling

Q7: "Who is your local phone service provider?"



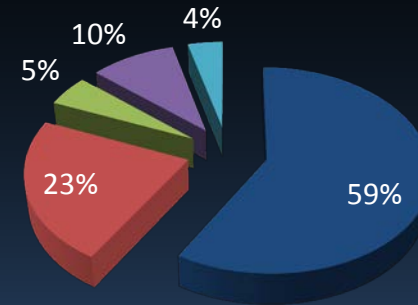
Monthly Local Phone Spending



VIDEO SERVICES PURCHASING BEHAVIOR

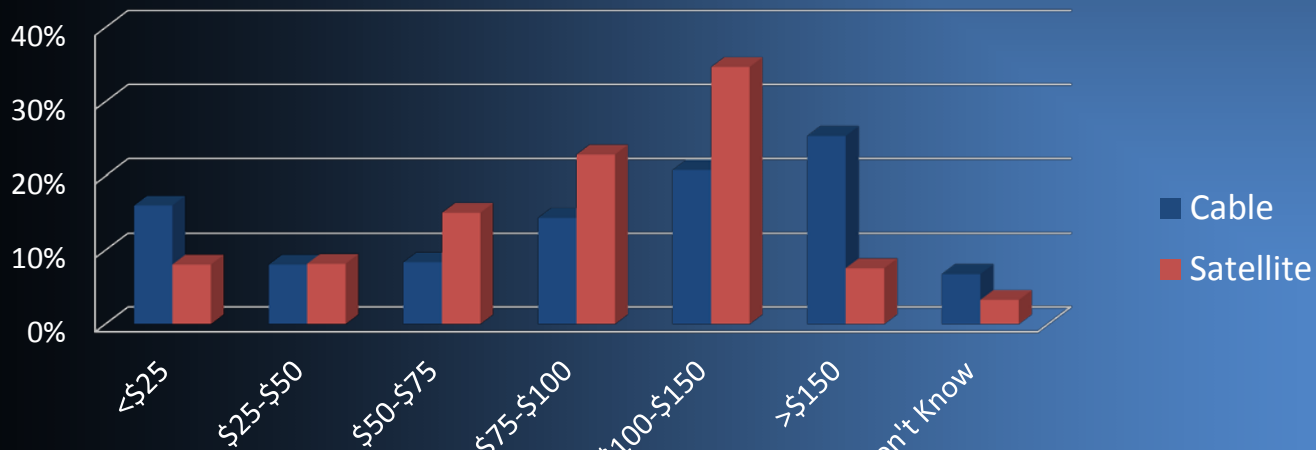
- ◆ 81% of households use traditional pay TV (cable or satellite dish)
- ◆ In Superior today, 19% of households do not have Pay TV, compared to the national average of 22%

Q2: "For TV service, do you have..."



■ Cable ■ Satellite ■ Off Air Only
■ Online Only ■ No TV:

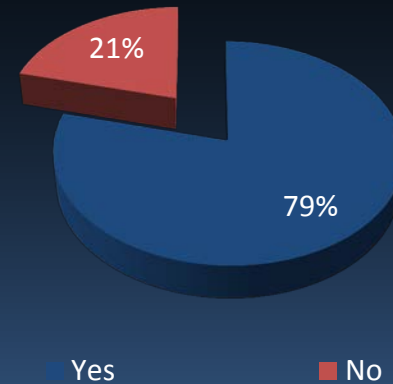
Monthly Pay TV Spend



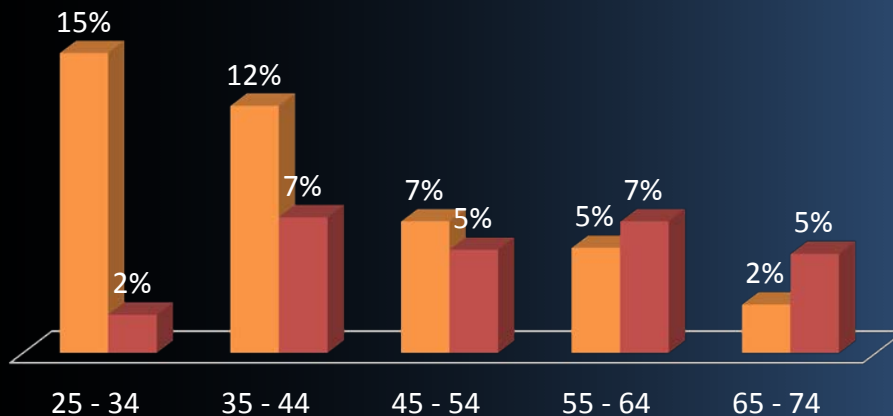
EMERGING VIDEO SERVICES

- ◆ Over-the-Top (OTT) or online TV viewing has become a material substitute service for traditional cable TV with a majority of households using OTT
- ◆ Among younger households, up to 17% are using OTT or Off Air as a substitute service
- ◆ Uptown estimates a further 9% of pay TV users in Superior will 'cut the cord' in the next 12 months

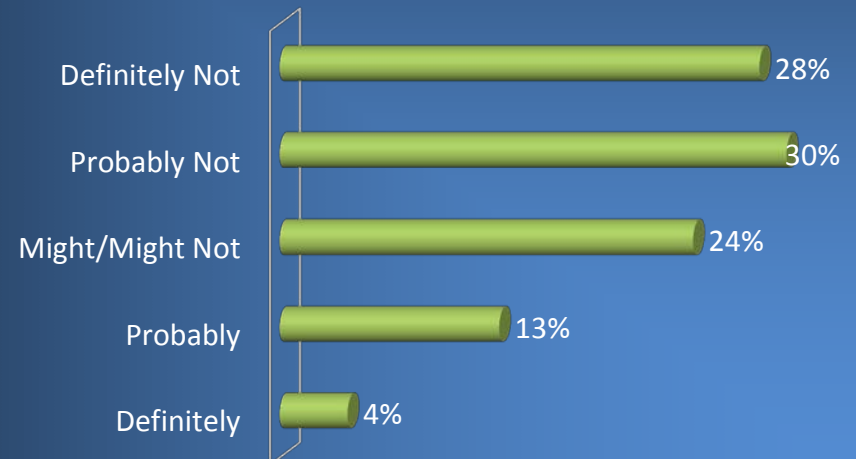
Q5: "Do you sometimes watch TV online?"
(Among Pay TV Households)



Households Using Substitute Service In Place of Pay TV by Age

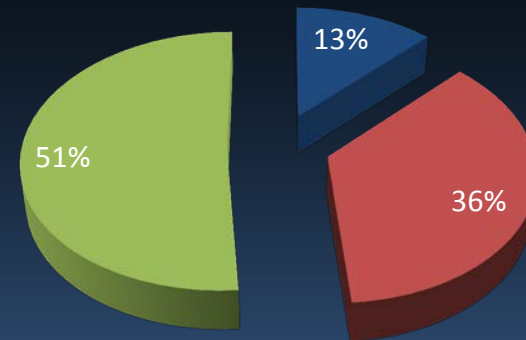


Likelihood of Cancelling Pay TV for OTT
(among all pay TV users)

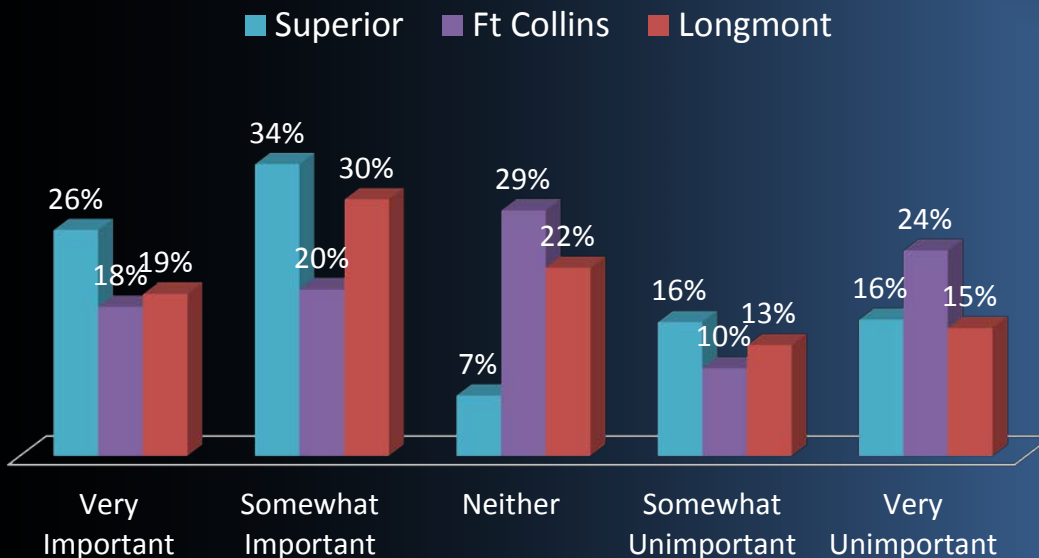


- ◆ Across all households in Superior, 36% have all 3 services from a single provider.
- ◆ The importance of bundling is high when compared to our Longmont (2013) and Ft Collins (2016) surveys

Incidence of Triple Play Bundle

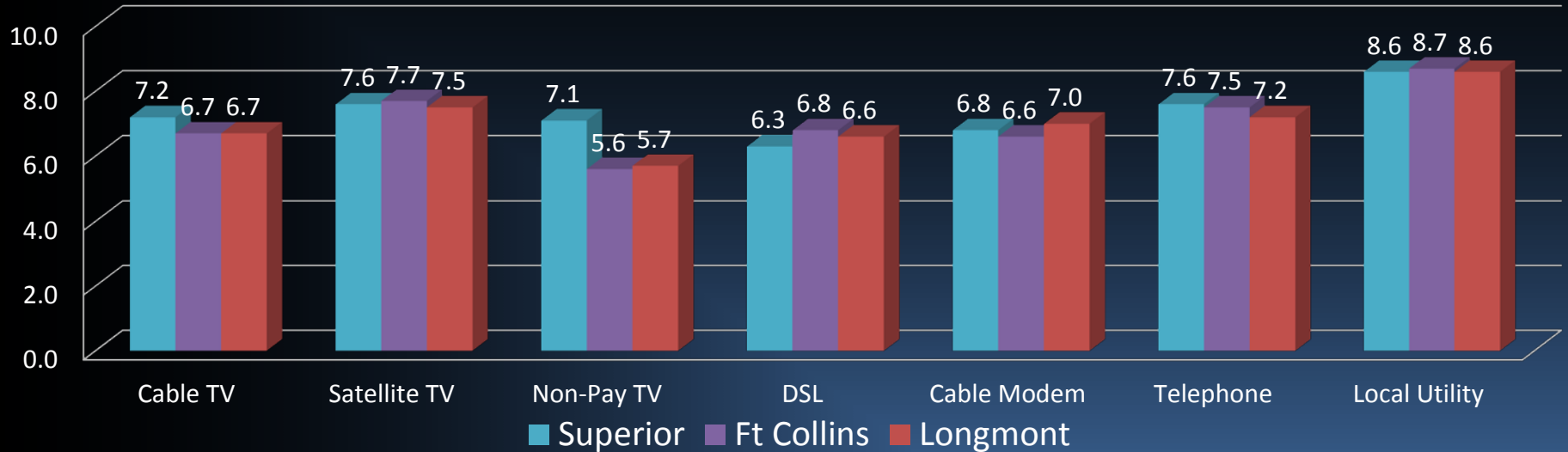


**Importance of Having All 3 Services from a Single Provider
(Among All Respondents)**

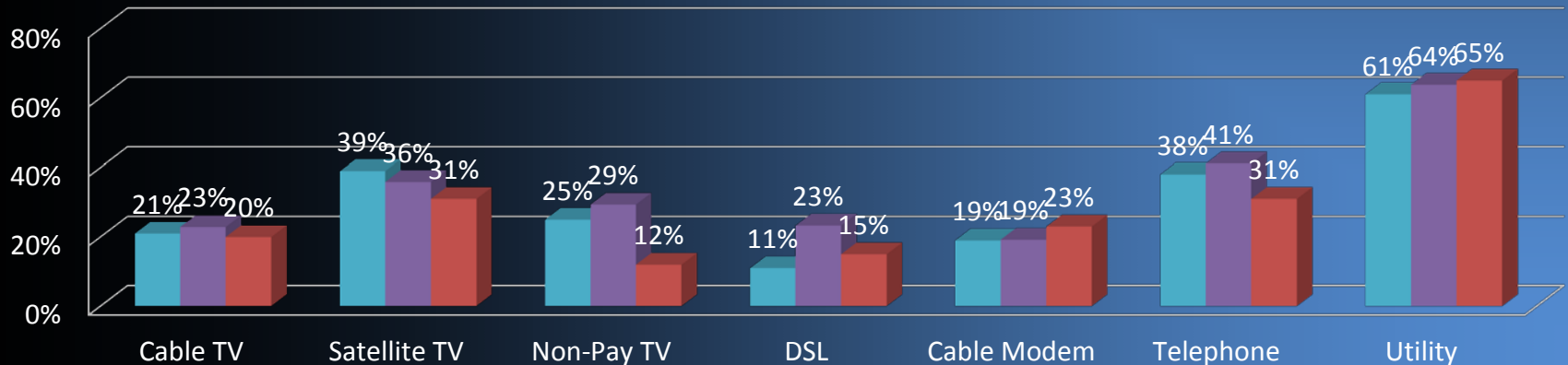


- Have All 3 Services From Multiple Providers
- Have All 3 From Single Provider
- Do Not Have All 3 Services

Satisfaction Rating by Service/Service Provider
(Mean Rating on a 1-10 Scale)



Satisfaction Rating by Service/Service Provider
(Percent Rating a '9' or '10')

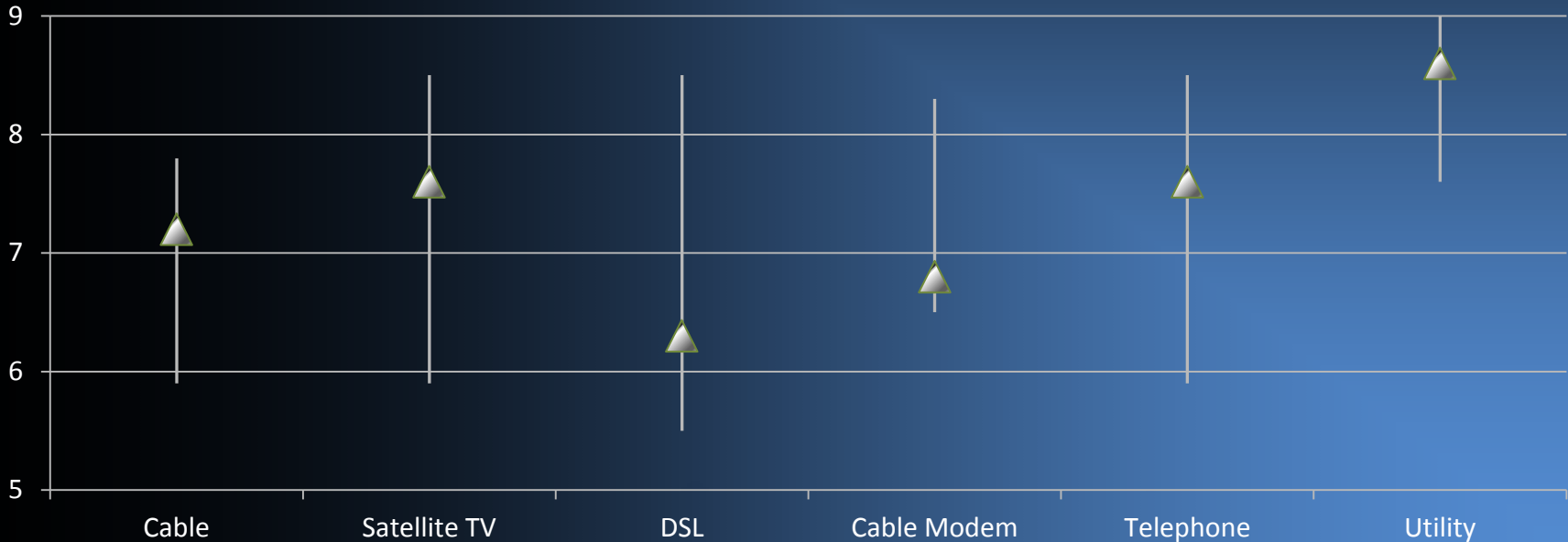


SATISFACTION RATING BENCHMARKS

◆ The chart below compares the results of this study with 26 other markets where Uptown has completed similar quantitative research:

| | | | |
|--------------------------|---------------------|-----------------------|---------------------|
| <i>Northern Ohio (2)</i> | <i>Washington</i> | <i>North Carolina</i> | <i>Oregon (2)</i> |
| <i>Southern Ohio</i> | <i>Wisconsin</i> | <i>Kansas (2)</i> | <i>Alabama</i> |
| <i>Georgia</i> | <i>Oklahoma (2)</i> | <i>New York</i> | <i>Arkansas</i> |
| <i>Tennessee (4)</i> | <i>Michigan</i> | <i>Kentucky</i> | <i>Colorado (4)</i> |

Satisfaction Rating by Service/Service Provider
(Mean Rating on a 1 to 10 Scale)



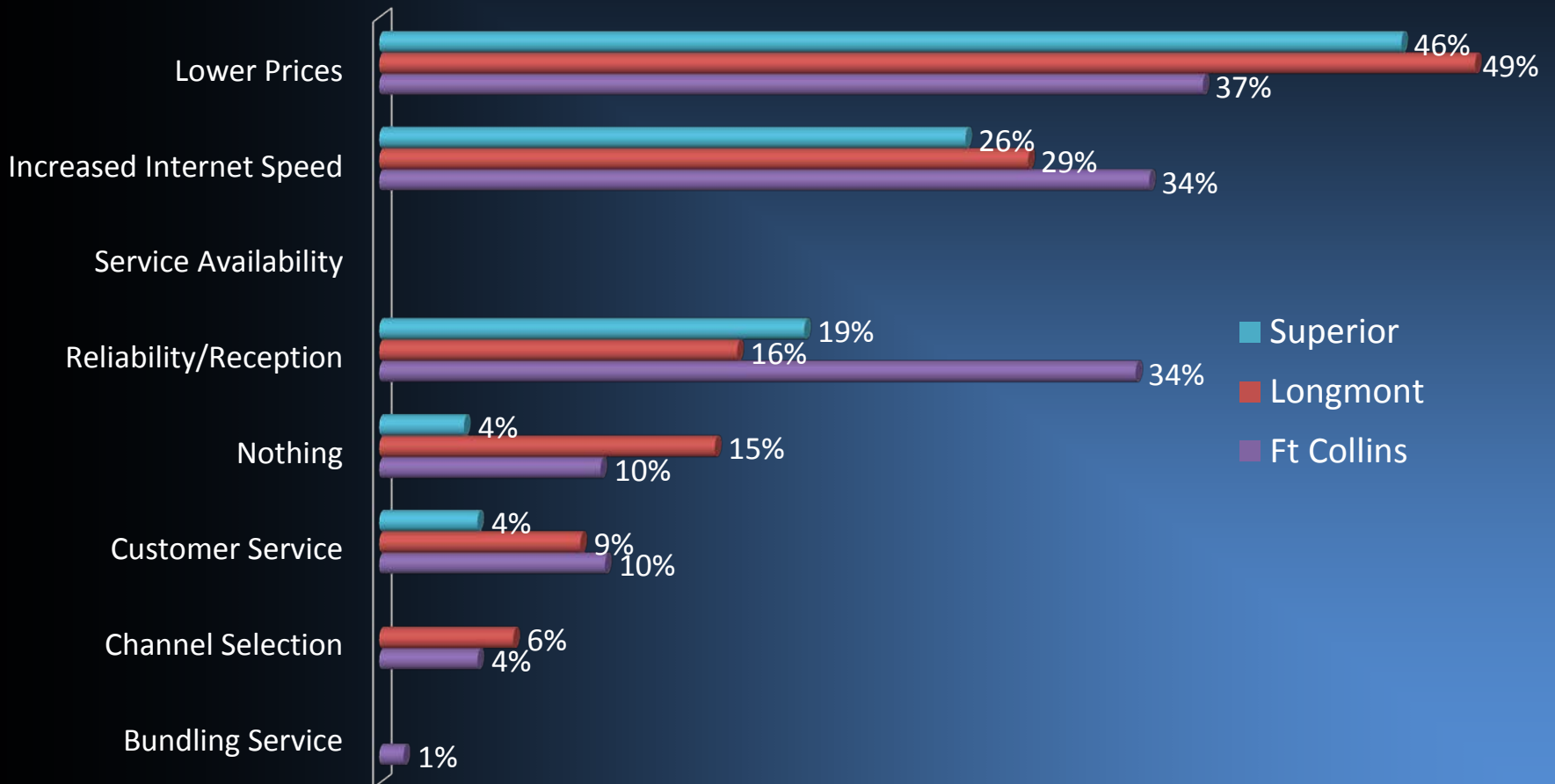
- While reliability and price are always important, Internet speed has dramatically increased in importance over the last several years. Bundling and Brand are secondary in importance to other attributes...

Importance Rating of Select Broadband Service Attributes
(Mean Rating on a 1-5 Scale)



- ◆ Superior households place importance on lower prices and Internet speed...

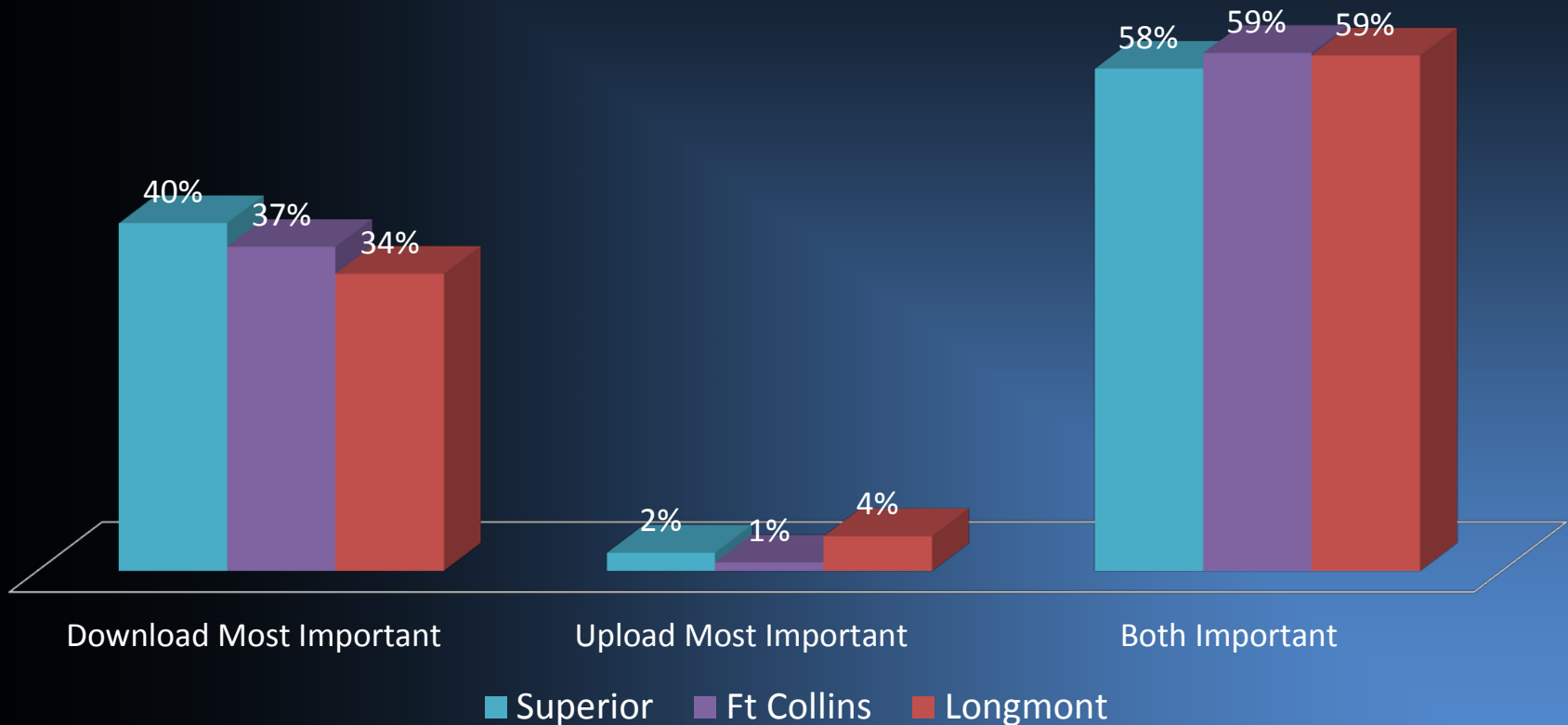
Q30: "What would you like to see most improved from your current broadband services?"



IMPORTANCE OF DOWNLOAD VS. UPLOAD

◆ Question 33: “What aspect of Internet speed is most important?”

Importance of Internet Speed on Download vs. Upload

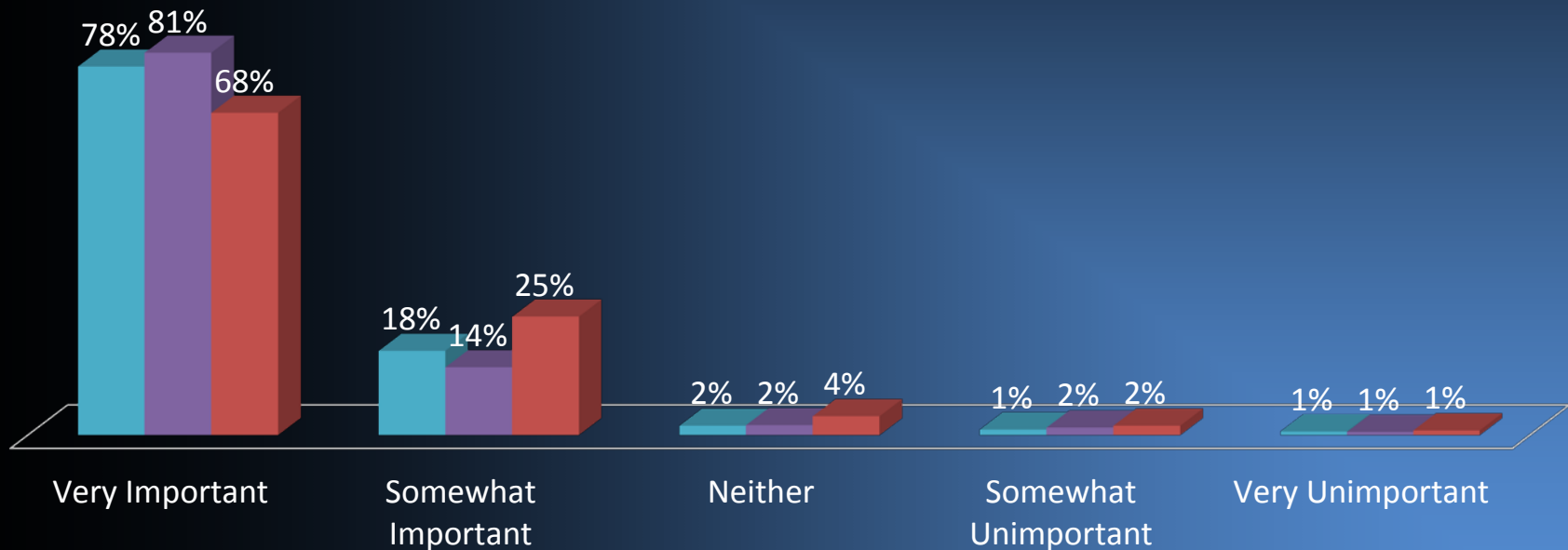


IMPORTANCE OF LOW COST HIGH-SPEED INTERNET

- Question 27: “In your opinion, is the availability of low-cost, high-speed Internet important to the future local economy?”

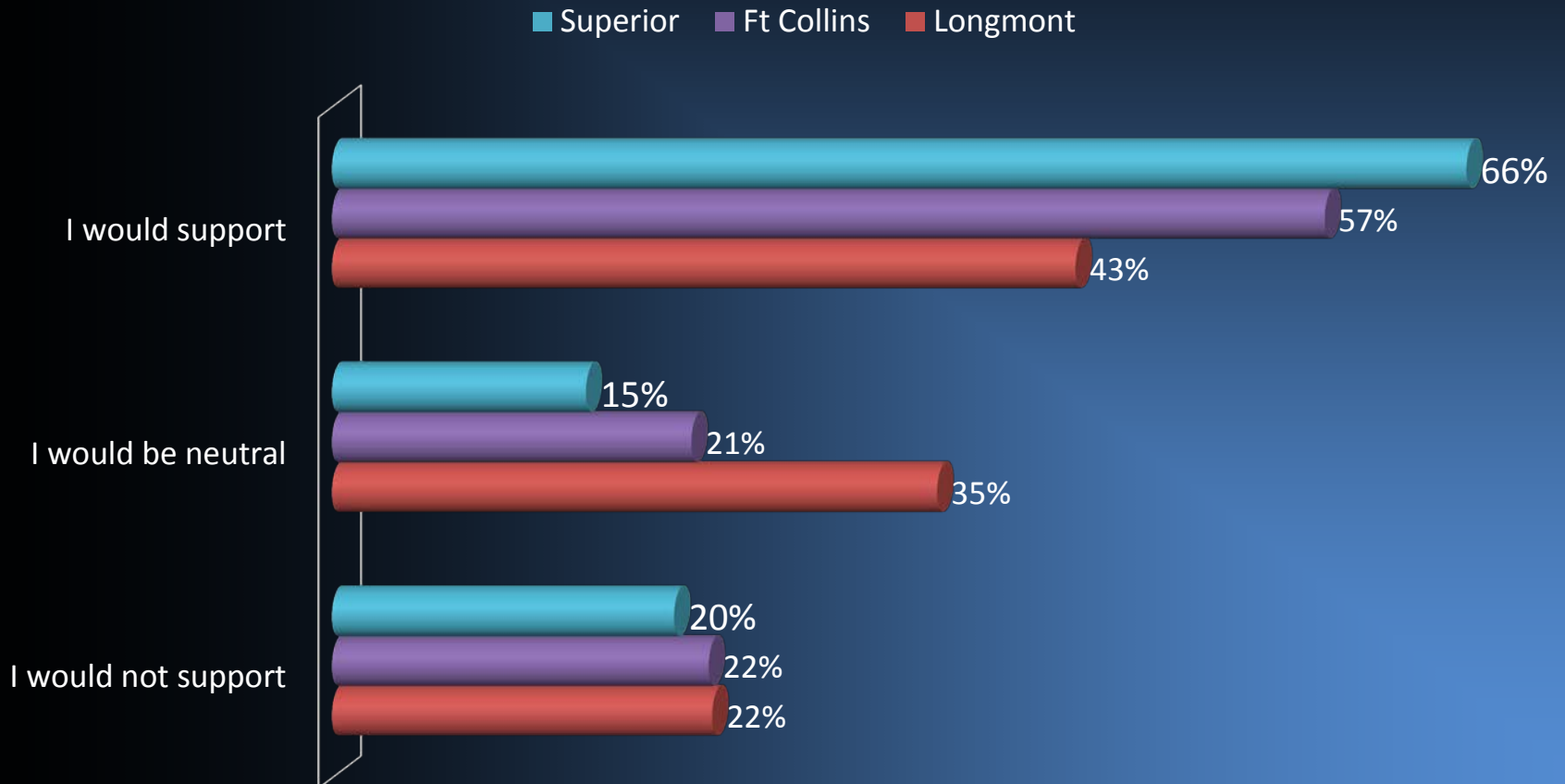
Importance of Having Low Cost High-Speed Internet

■ Superior ■ Ft Collins ■ Longmont



- ◆ Two-thirds of Superior households support the payment of a monthly \$5 surcharge to help fund the new fiber network...

Q34: "Would you support adding a \$5 monthly fee to your water bill to partially fund the construction and operation of this network for the first 24 months of operation?"

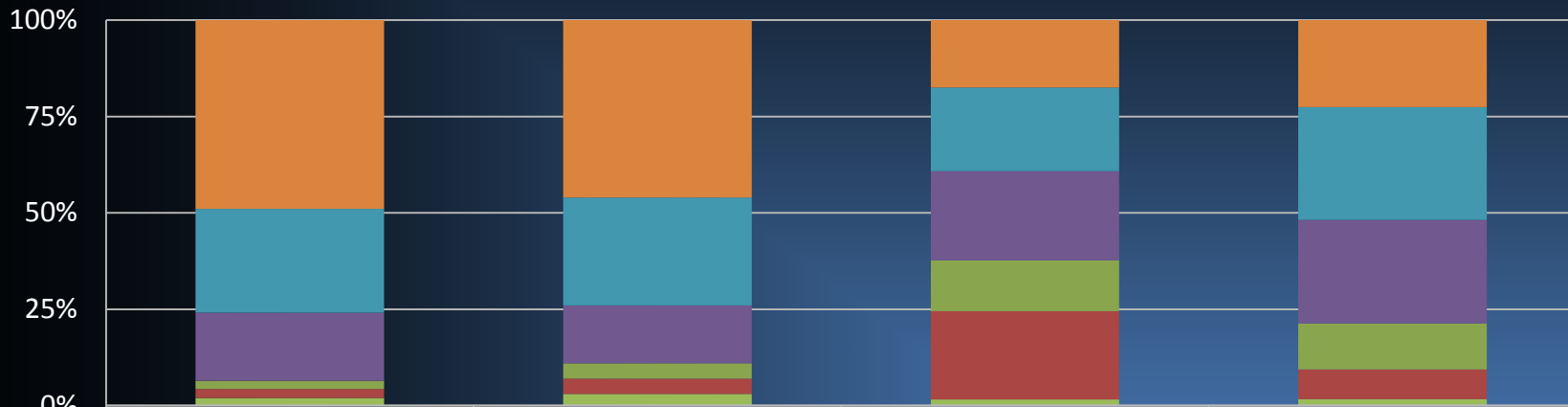


Residential Quantitative Survey

FTTP Market Potential – Current Market

- Two price points were tested: 10% Less corresponding to ≈\$40/month and \$50/month in the follow-up survey...

Q23-25: “How likely would you be to subscribe to [insert service] if it were [10% less / \$50] than Comcast or CenturyLink charges?”



| | Internet - 10% Less | Internet - \$50 | Phone | Video |
|-----------------|---------------------|-----------------|-------|-------|
| Definitely | 49% | 46% | 18% | 23% |
| Probably | 27% | 28% | 22% | 29% |
| Might/Might Not | 18% | 15% | 23% | 27% |
| Probably Not | 2% | 4% | 13% | 12% |
| Definitely Not | 2% | 4% | 23% | 8% |
| Don't Know | 2% | 3% | 2% | 2% |

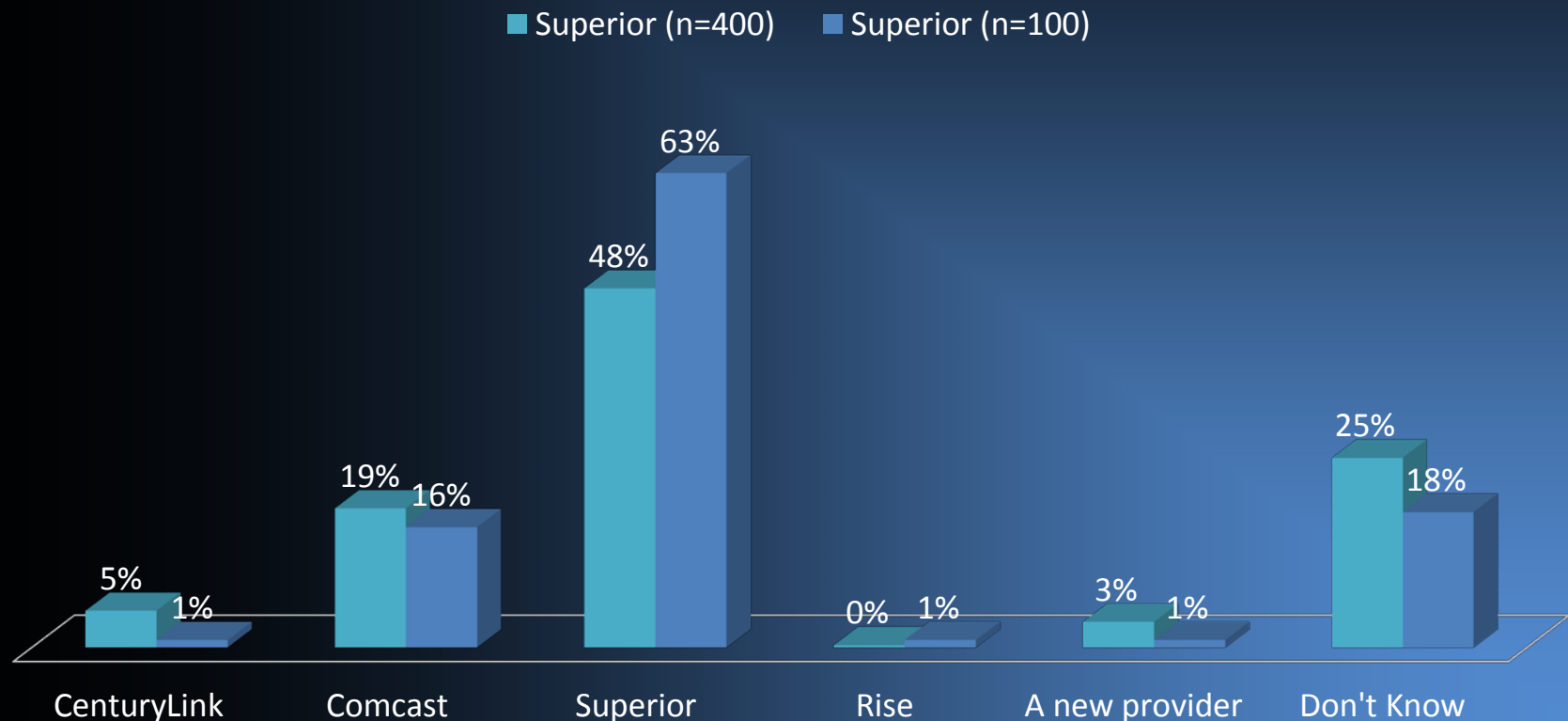
- ❖ Uptown uses a ‘Likert Scale’ with Overstatement Adjustment
 - ❖ Conservative research techniques from the Packaged Goods sector
 - ❖ Clearly specify purchase intent vs. “interest” and removes overstatement bias
- ❖ Example: “How likely would you be to subscribe?”

| | | | |
|------------------------|-------|------------------------------|-------------|
| ❖ Definitely Would | 21.5% | x 70% = | 15.0% |
| ❖ Probably Would | 35.6% | x 30% = | 10.7% |
| ❖ Might/Might Not | 20.0% | x 10% = | <u>2.0%</u> |
| ❖ Probably Would Not | 10.4% | 27.7% = Penetration Estimate | |
| ❖ Definitely Would Not | 4.4% | | |
| ❖ Don't Know | 8.1% | | |

| | Residential (Terminal / Year 5 Eroded) | Small Business (Terminal) |
|-----------|---|------------------------------|
| Video | 27.3% / 23.2% | - |
| Internet | 10% Less: 44.1% \$50/month: 42.1% | 40.0% |
| Telephone | 21.1% / 10.5% | 30.0% |

- ◆ The majority of respondents, when given the choice, would prefer to receive high speed Internet from the Town of Superior...

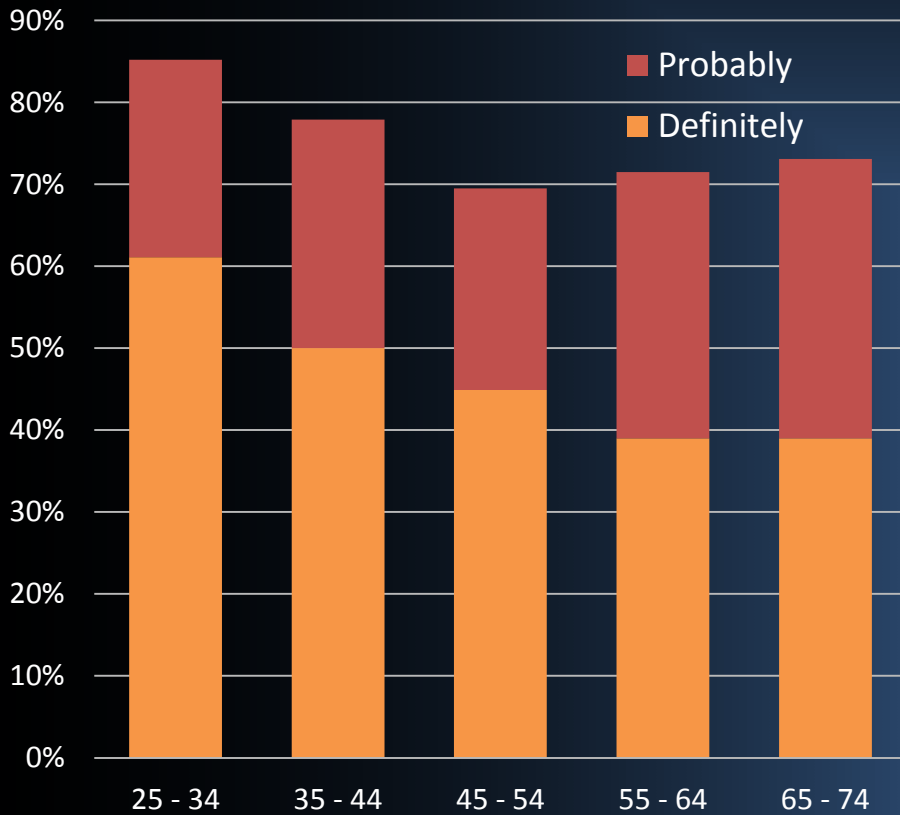
Q26: "Among the following list of potential providers, who would you prefer to receive high-speed Internet service from?"



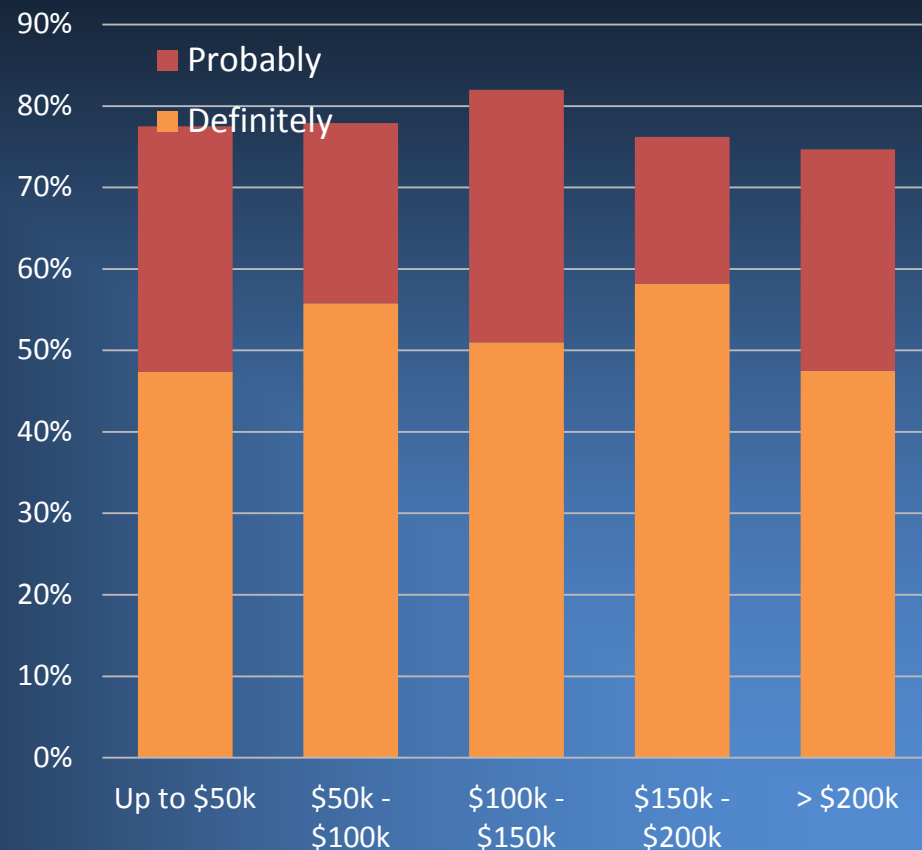
PURCHASE INTENT ACROSS DEMOGRAPHICS

- ◆ Internet purchase intent is consistent across all income groups, but is stronger among younger households...

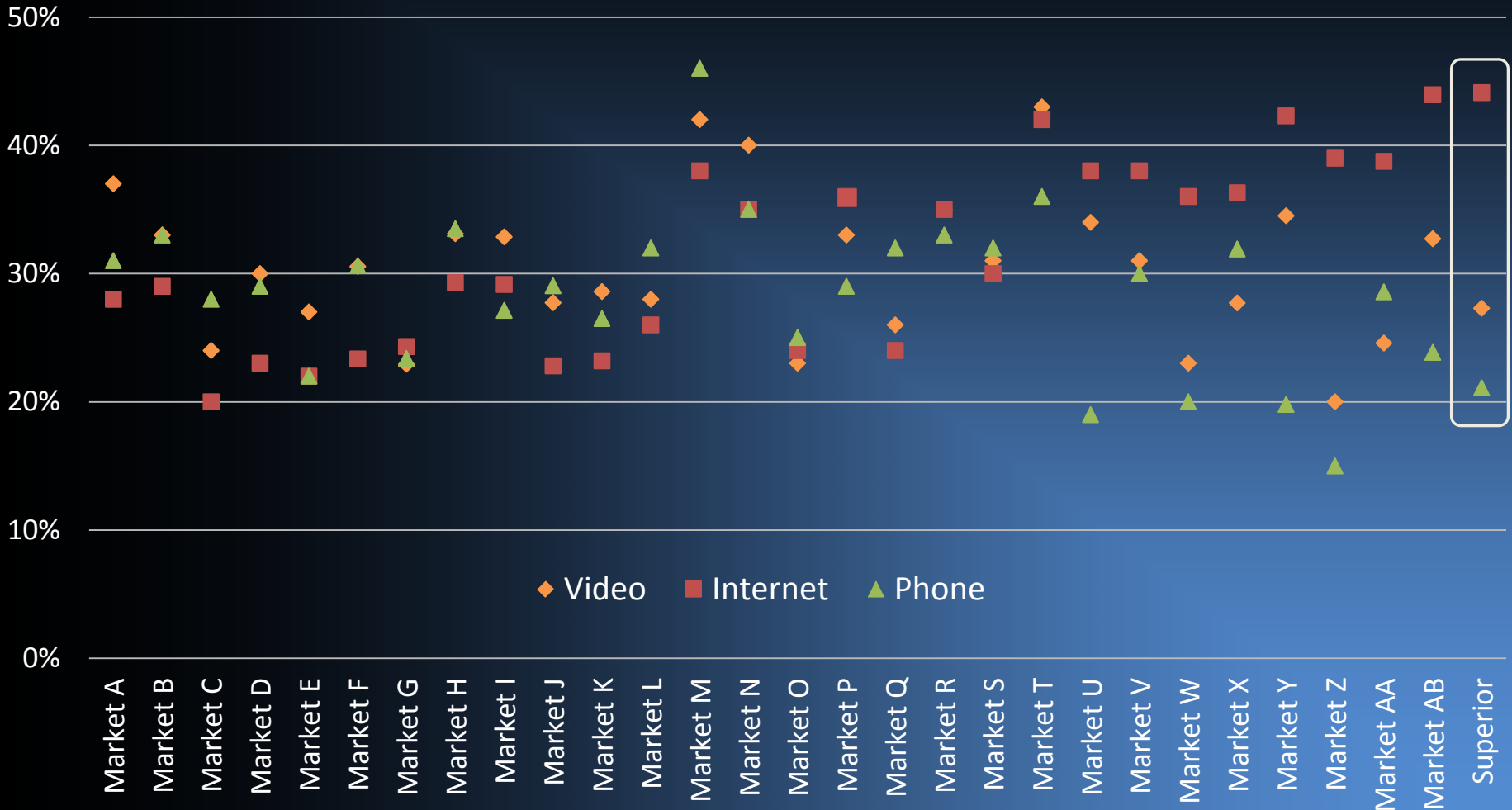
Internet Purchase Intent by Age



Internet Purchase Intent by Income



Terminal Penetration by Service (Across all Tested Price Points)



Residential Quantitative Survey

FTTP Market Potential – Future Market

- ◆ The DOCSIS3.1 cable modem standard was initially deployed by MSOs in select markets starting last year.
- ◆ DOCSIS 3.1 works by using a much denser compression scheme via 4096 QAM and a new channel division multiplexing protocol (OFDM). This has reduced channel width from 6 MHz to 20-50 kHz, enabling bonding of carrier channels into a frequency block of 192 MHz.
- ◆ The upgrade requires cable modem replacement and firmware upgrade to the deployed CMTS platform. Outside plant changes to the HFC distribution network are not required.
- ◆ Comcast has completed initial testing and is deploying across 15 markets in 2017 (including Denver). Announced pricing for Colorado is \$110 (3 year contract) or \$160 (rate card). This was revised upward from 2016 pricing of \$70.

Maximum Synchronization Speed (Maximum Usable Speed)

| | DOCSIS 1.x | DOCSIS 2.0 | DOCSIS 3.0 | DOCSIS 3.1 |
|---------------|-----------------|-----------------|-------------------|--|
| Downstream | 42.88 (38) Mbps | 42.88 (38) Mbps | 171.52 (152) Mbps | Standard: 10 Gbps Initial Modems: 4-5 Gbps* |
| Upstream | 10.24 (9) Mbps | 30.72 (27) Mbps | 122.88 (108) Mbps | 1 Gbps |
| Year Deployed | 1997 | 2005 | 2008 | 2016 |

- ◆ Potential Disruption of DOCSIS3.1 – Two Market Dynamics
 - ◆ 1st to Market Advantage
 - ◆ Elasticity of Demand

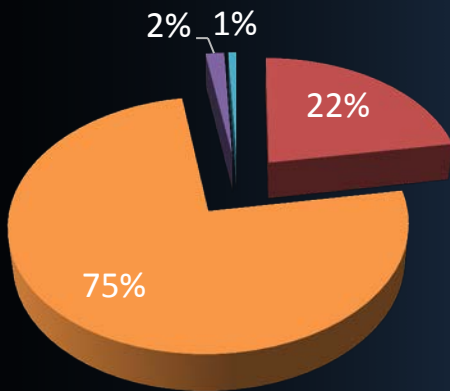
- ◆ Research Methodology to Evaluate Sensitivity
 - ◆ April 2017: 400 sample phone survey
 - Town offers Internet at 10% less than Comcast
 - Subscription to Comcast 1G service at \$70/month
 - ◆ June 2017: 100 sample phone survey
 - Town offers Internet starting at \$50/month (50M)
 - Dispersion between Town's 50M and 1G tiers if priced at \$50/\$60 per month
 - Subscription to Comcast 1G service at \$110/month

MARKET IMPACT OF DOCSIS3.1 WITHOUT FTTP

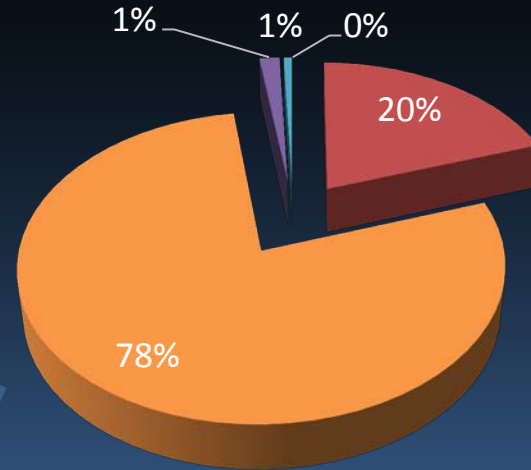
What if Comcast implements DOCSIS3.1 and is the sole provider of residential Gig service if priced at \$110/month?

- ◆ Add 3 points to market share
- ◆ Upsell 12% of subscribers to 1Gig

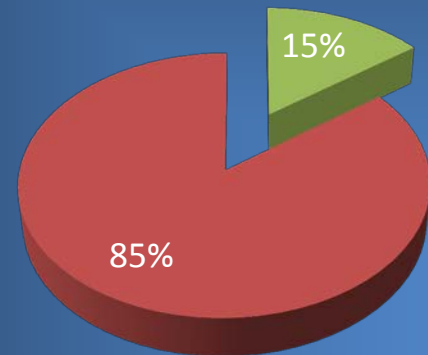
Internet Market Share Pre DOCSIS3.1
(Households)



Internet Market Share Post DOCSIS3.1
(No FTTP & Comcast 1G @ \$110)



Comcast Internet Dispersion
(Comcast 1G @ \$110)



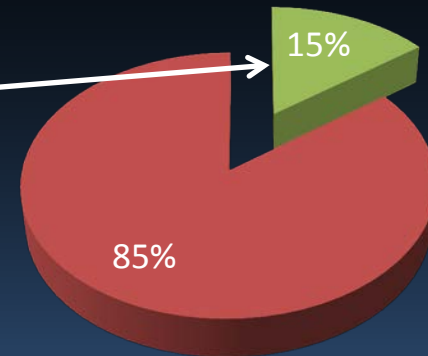
- FTTP System
- Comcast - All Tiers
- Other
- CenturyLink
- Satellite

- 1 Gbps
- All Other Tiers

FUTURE DEMAND WITH FTTP 2ND TO MARKET

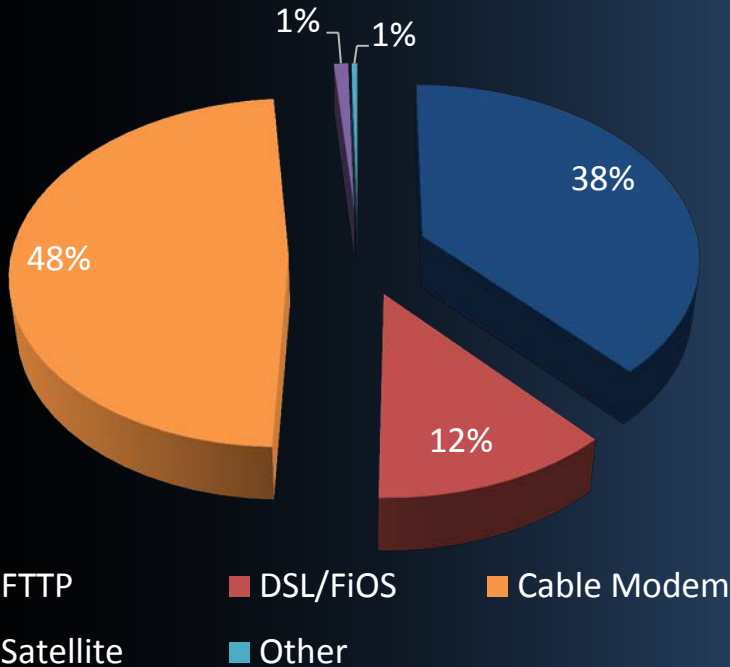
Forecast Assumption
Comcast's upgraded DOCSIS3.1 subs would be under contract and removed from the FTTP opportunity.

Comcast Internet Dispersion
(Comcast 1G @ \$70)



■ 1 Gbps ■ All Other Tiers

Internet Market Share After FTTP

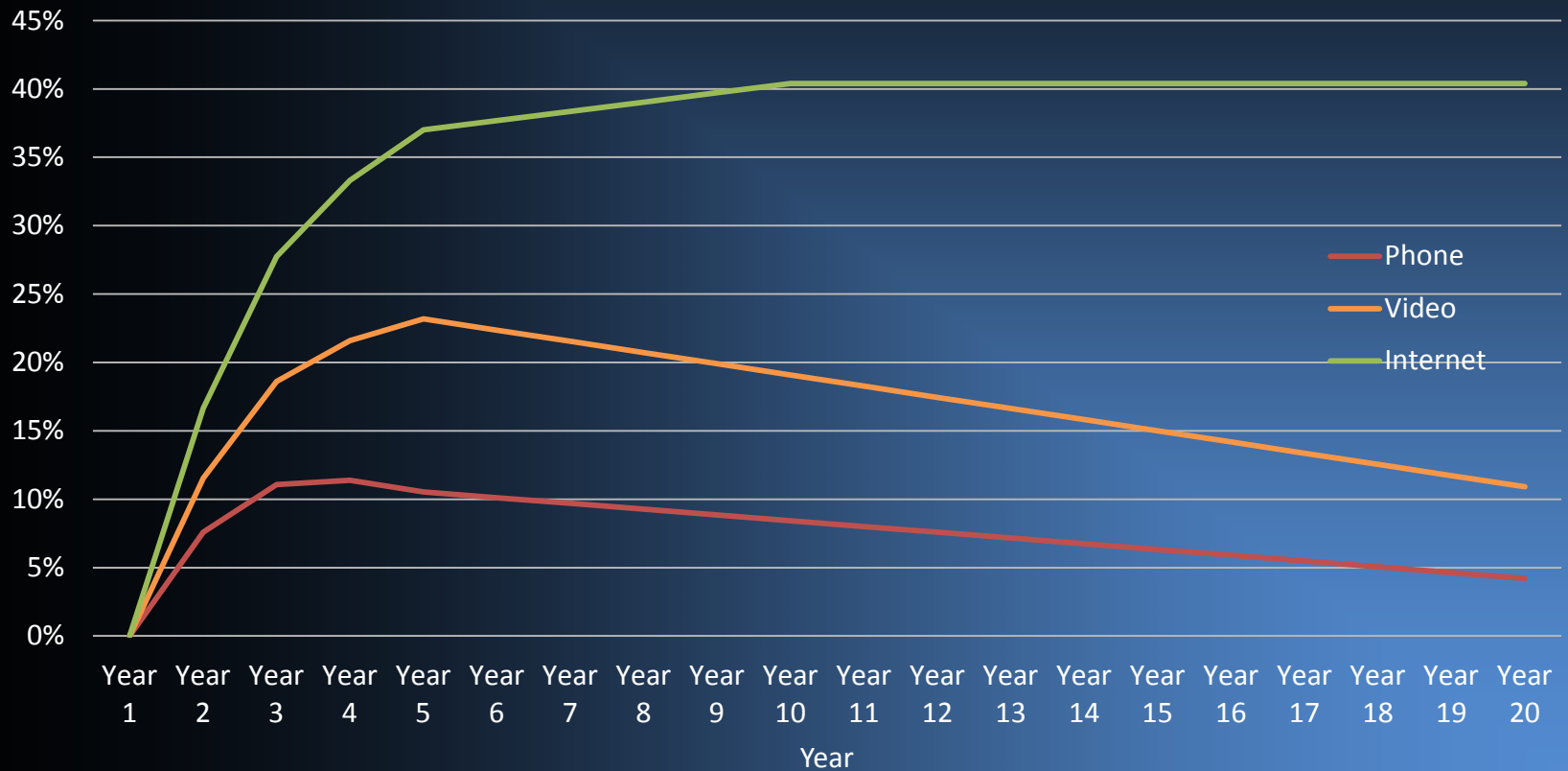


| Current Provider Switching From | FTTP Penetration Estimate Pre DOCSIS3.1 | FTTP Penetration Estimate Post DOCSIS3.1 |
|---------------------------------|---|--|
| Comcast | 43.2% | 38.0% |
| All Others | 39.4% | 35.5% |
| Total | 42.1% | 37.0% |

RESIDENTIAL PENETRATION FORECAST

- ◆ Business case projections for voice penetration reflect the quantitative research outcome and reflect ongoing wireless (voice) and OTT (video) substitution - as well as a Post DOCSIS3.1 environment (Internet) within the residential segment...

Service Penetration
(By Year Since Launch)

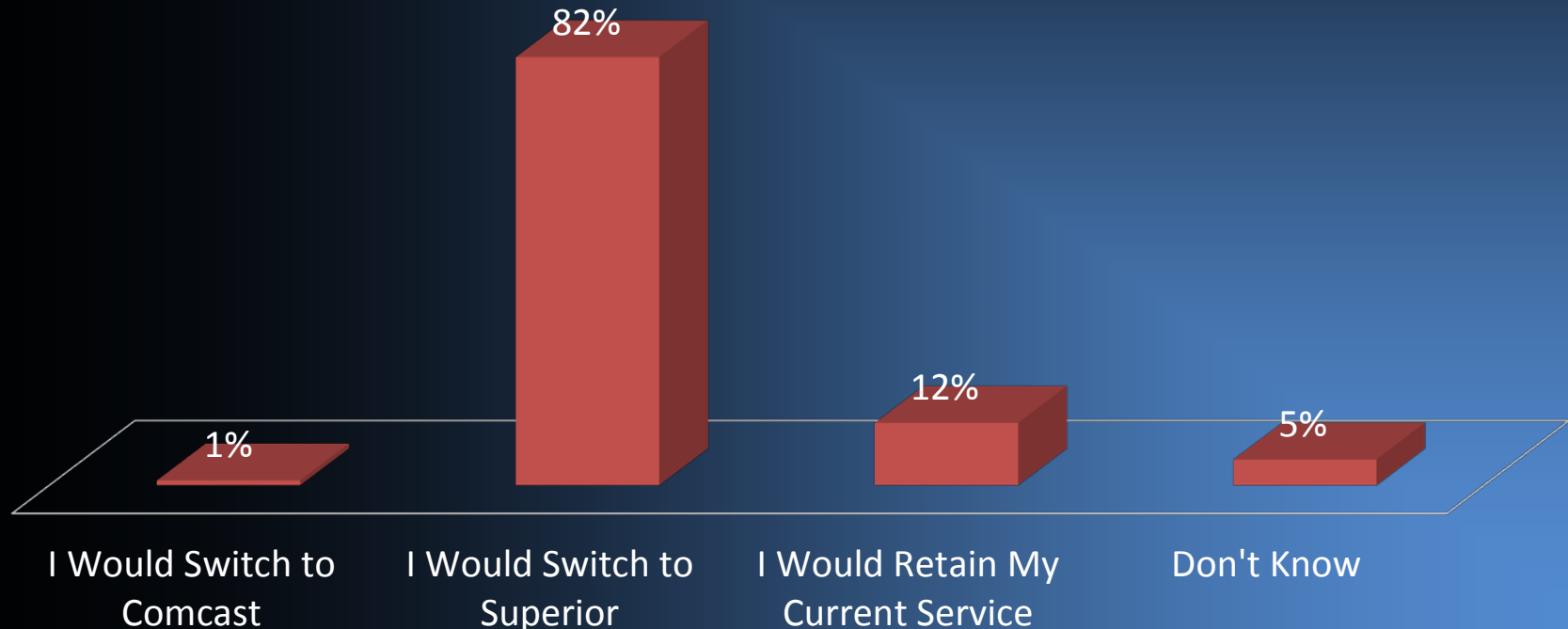


DOCSIS3.1 VERSUS FTTP WITH BOTH AVAILABLE

Participants were asked if they would – or would not – switch to a different Internet service if both of the following services were provided in the future:

- Comcast 1G at \$110/month
- Town FTTP at \$60/month

Q7: “If these services were available to your home, and offer the same speed, which of the following statements best describes your likelihood to switch?”



SUMMARY OF RESEARCH FINDINGS

- ◆ Comcast the vast majority of market share for both Internet and voice services in Superior. 99% of households use Internet at home.
- ◆ Video and voice service services satisfaction levels benchmark as average. Internet satisfaction is low.
- ◆ Top market needs are lower prices and enhanced Internet speed.
- ◆ Residential Internet purchase intent is very high and exceeds Longmont and Fort Collins survey metrics.
- ◆ Strong provider preference for the Town of Superior versus other incumbent options.
- ◆ Determined that Comcast would add 3 points in market share and temporarily lock in 15% of Internet subscribers with a \$110 Gig tier (3 year contract term)
- ◆ This results in an initial drop of FTTP Internet penetration from 42.1% to 37.0% for the pro forma analysis.
- ◆ Once FTTP is launched, Comcast's \$110 Gig service is not competitive with FTTP service at \$60/month due to strong provider preference and price elasticity

Technology Analysis
Gigabit Passive Optical Network vs. Active Ethernet

- ▣ Gigabit Passive Optical Network (GPON)
 - ITU G.984.x standard
 - Pure Ethernet services
 - 2.4G downstream / 1.2G upstream
 - Single fiber delivery to subscriber optical network terminal (ONT)
 - GPON ONT's support ActiveE connections where needed
 - Comprehensive bandwidth management standards
 - Passive system with up to 128 splits and 35 km reach
- ▣ Active Ethernet (IEEE 802.x)
 - Point to point GigE
 - Single fiber delivery to subscriber ONT
 - Dedicated symmetrical 1G to serving switch port - up to 60 km reach
- ▣ Majority of FTTP deployments have been GPON

- ▣ Current bandwidth utilization
 - Uptown 1Gig client seeing 1.5 Mbps peak utilization per subscriber
 - Industry data ranges between 1-2Mbps peak per subscriber
 - Consumption tied to subscriber behavior not their provisioned bandwidth on fiber (high breakage on 1Gig service)
- ▣ When will GPON 2.4G run out of gas?
 - Calix Networks estimates GPON saturation between 2022 and 2024
 - Bandwidth headroom impacted by IPTV delivery on FTTP system
- ▣ *Challenges for system design*
 - Cater to all levels of the broadband user continuum
 - Build a network that will never be obsolete
 - Time the technology lifecycle correctly
 - Create the right economics for the enterprise to succeed over time

- ▣ GPON – Low Cost and Flexible
 - 2.5G of shared downstream bandwidth
 - Flexible splitter placement and less demand for fiber strands
 - High port density – 5,210 subs in one chassis (10 rack units)
 - Consumes less space in rack and 33% as much power required
 - Supports path to 10G GPON
- ▣ Active Ethernet – “Futureproof”
 - Dedicated GigE from serving switch to each subscriber
 - One strand from subscriber to serving switch location
 - Better suited for high capacity transport services than GPON
 - Longer reach – 60 km
 - Extreme fiber strand counts required without active field cabinets
 - Requires more fiber, space, power, cabinets, electronics and capital
- ▣ Tradeoffs can be quantified

- ▣ Network Electronics
 - GPON cards and ports = \$50 per subscriber
 - AE cards and ports = \$320 per subscriber
 - AE is \$675K more than GPON at 2,500 subscribers
- ▣ Outside Plant Materials
 - GPON splitters = \$15 more per passing
 - AE fibers per cable 2x-3x more = \$400K over 50 miles
 - AE is \$325,000 more than GPON at 5,000 passings
- ▣ Technical Services
 - AE requires two additional splices / passing = \$60 per passing
 - AE is \$300K more than GPON over 5,000 passings
- ▣ AE will also require more and larger cabinets

Technology Analysis
Evolving FTTP Standards

- ▣ ITU GPON Standards Evolution
 - XG-PON1 (G.987) – 10G Down / 2.5G Up
 - XG-PON1 available for four years
 - Operators waiting for symmetrical 10G (NG-PON2)
 - NG-PON2 (G.989) – 10G Down / 10G Up
 - Commercial deployments for NG-PON2 in 2017

- ▣ IEEE Ethernet Standards Evolution
 - Point to Point GigE (802.3ah) – 1G symmetrical
 - 10G EPON (802.3av) – 10G symmetrical
 - Commercially available in 2013

- ▣ Full Service Area Network (FSAN) NG-PON2
 - Four time and wave division multiplexing (TWDM) channels
 - Up to four 10G PONs combine for 40G aggregate capacity
 - Will operate over legacy splitters
 - Higher split ratios and longer reach included in the standard
- ▣ Will accommodate point to point overlay
 - WDM technology used to deliver line rates of 1, 2.5 and 10G over separate wavelengths
 - Will occupy 1603nm – 1625nm channels
 - Full coexistence with other services
- ▣ Full 4x10G capability not expected until 2017
 - XGS-PON - 10G/10G interim option to be available in 2016
 - XGS-PON standard expected to be ratified in early 2016
- ▣ Eventual capability of 8x10G PONs

- ▣ Deploy GPON as the ruling architecture
 - Design approach for mass market service areas
 - Implement robust design standards in terms of network capacity
 - ▣ Centralized versus distributed split?
 - ▣ Deployed splitter capacity?
- ▣ Deploy hybrid architecture as needed for hi-cap services
 - Design for dedicated fiber to equipment sites for active Ethernet
 - Less “cookie cutter” than GPON network
 - One-off designs to reflect specific market conditions
- ▣ Monitor GPON product lifecycle
 - Determine final GPON platform strategy based on bid results
 - Design system that will easily accommodate upgrades
 - Plan for upgrades based on service mix (linear video?)

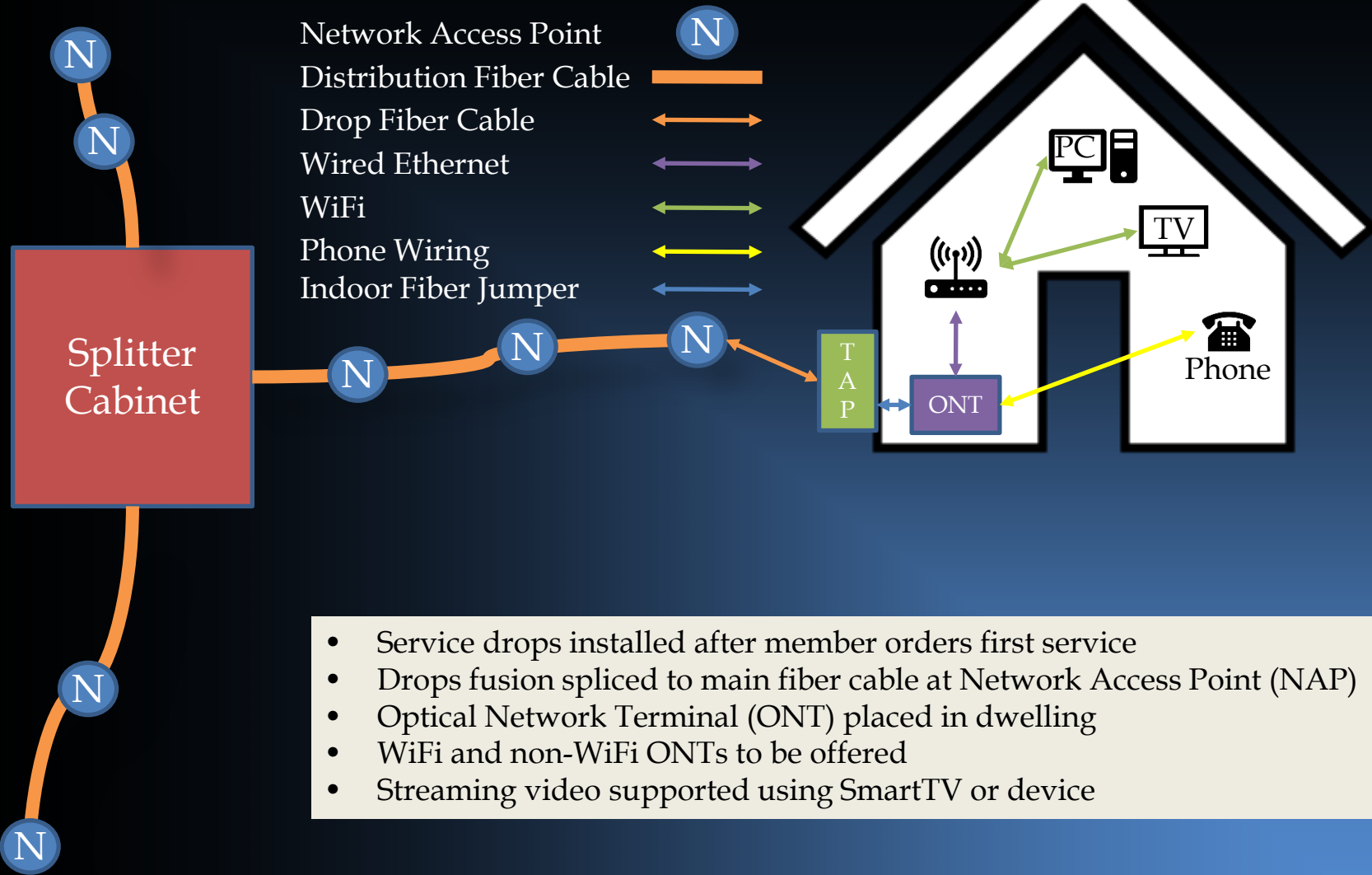
Technology Analysis
Reference Architecture – Building Blocks

- ◆ **Provider Owned Premises Equipment**
 - Optical Network Terminal – indoor wall mount or desktop versions
 - Optional router capability (wireless or not)
 - Set Top Boxes required for all TV sets receiving digital video services
- ▣ **Customer Owned Premises Equipment**
 - Router – may not be GigE capable
 - All end user computing devices
 - Standard telephones for telephone service
- ▣ **Inside Wire**
 - Phone services use the existing phone wiring
 - Digital video services use new CAT6 wiring or Wi-Fi
 - Data services delivered over new CAT6 cable or Wi-Fi

- ▣ **Service Drop and Test Access Point**
 - One fiber drop cable installed from drop terminal to premises
 - Fiber drop pushed or pulled in shallow drop conduit
 - Drop fiber terminated in test access point (TAP) mounted on dwelling
 - TAP provides demarcation between outside and inside fiber (bulkhead)
 - Drops installed after subscriber orders service

- ▣ **Network Terminal**
 - Network terminals connect drops to the FTTP outside plant network
 - One network terminal serves between four and sixteen passings
 - Drops have traditionally been spliced at the terminal location
 - Network terminals are connected to the distribution system

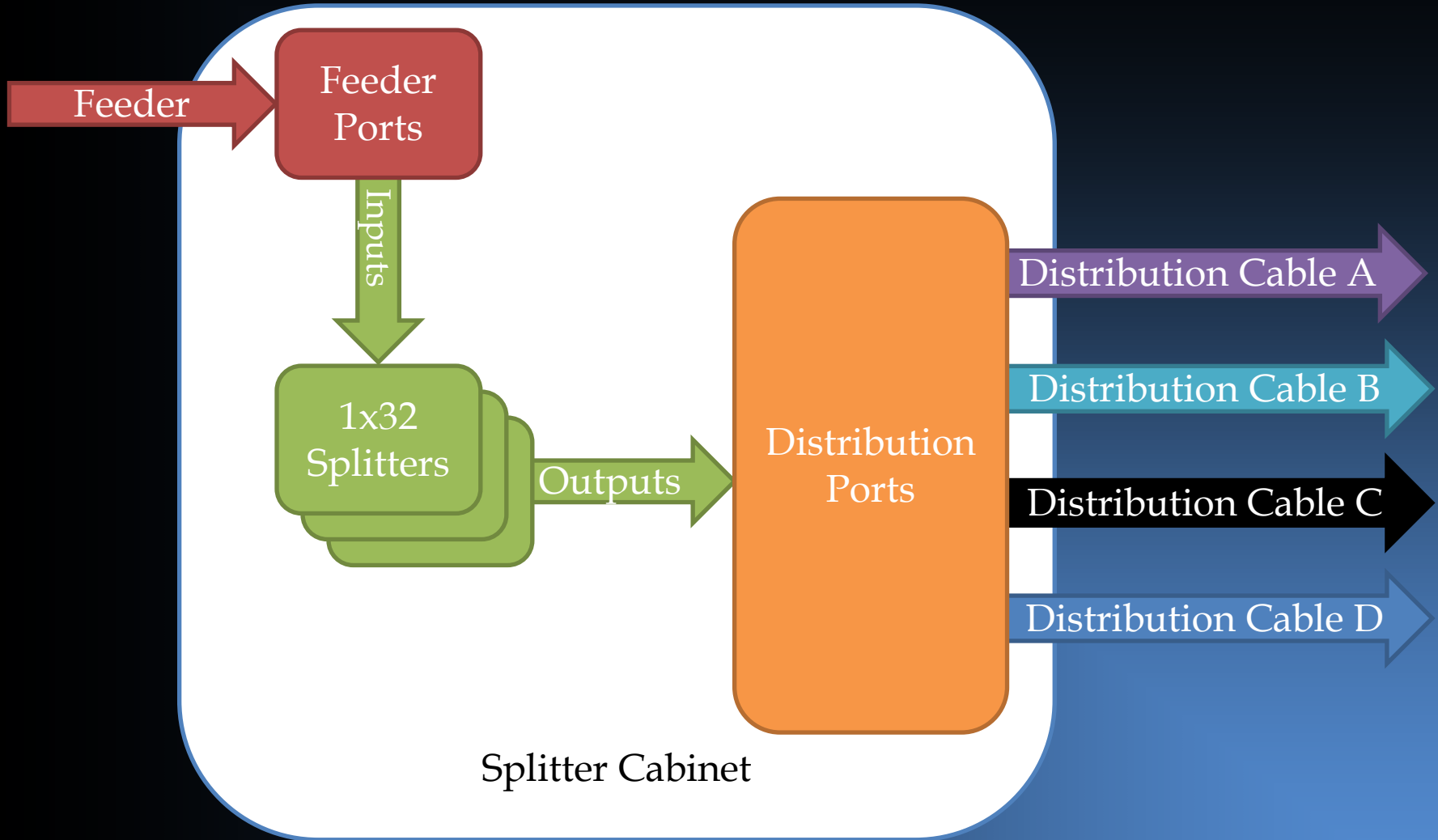
FOTP DISTRIBUTION NETWORK BUILDING BLOCKS



- Service drops installed after member orders first service
- Drops fusion spliced to main fiber cable at Network Access Point (NAP)
- Optical Network Terminal (ONT) placed in dwelling
- WiFi and non-WiFi ONTs to be offered
- Streaming video supported using SmartTV or device

- ▣ **Distribution and feeder fiber**
 - Distribution fiber connects network terminals to the feeder network
 - Feeder network connections can occur at a splice closure or cabinet
 - Distribution cables can range in size from 1 to 144 fibers
 - The size and type of cable is driven by the splitting approach
- ▣ **Centralized split approach**
 - 1x32 splitters aggregated in splitter cabinets
 - Dedicated fiber strands from network terminals to cabinets
 - Each cabinet typically fed with 12-24 feeder fibers
 - One cabinet for every 250 homes on average
- ▣ **Distributed split approach**
 - 1x4 and 1x8 splitters deployed in network terminals
 - 1x4 and 1x8 splitters also deployed upstream in closure or cabinet
 - Approach reduces fiber and splicing in distribution network by 87.5%
 - One cabinet can support up to 1,500 homes with distributed split

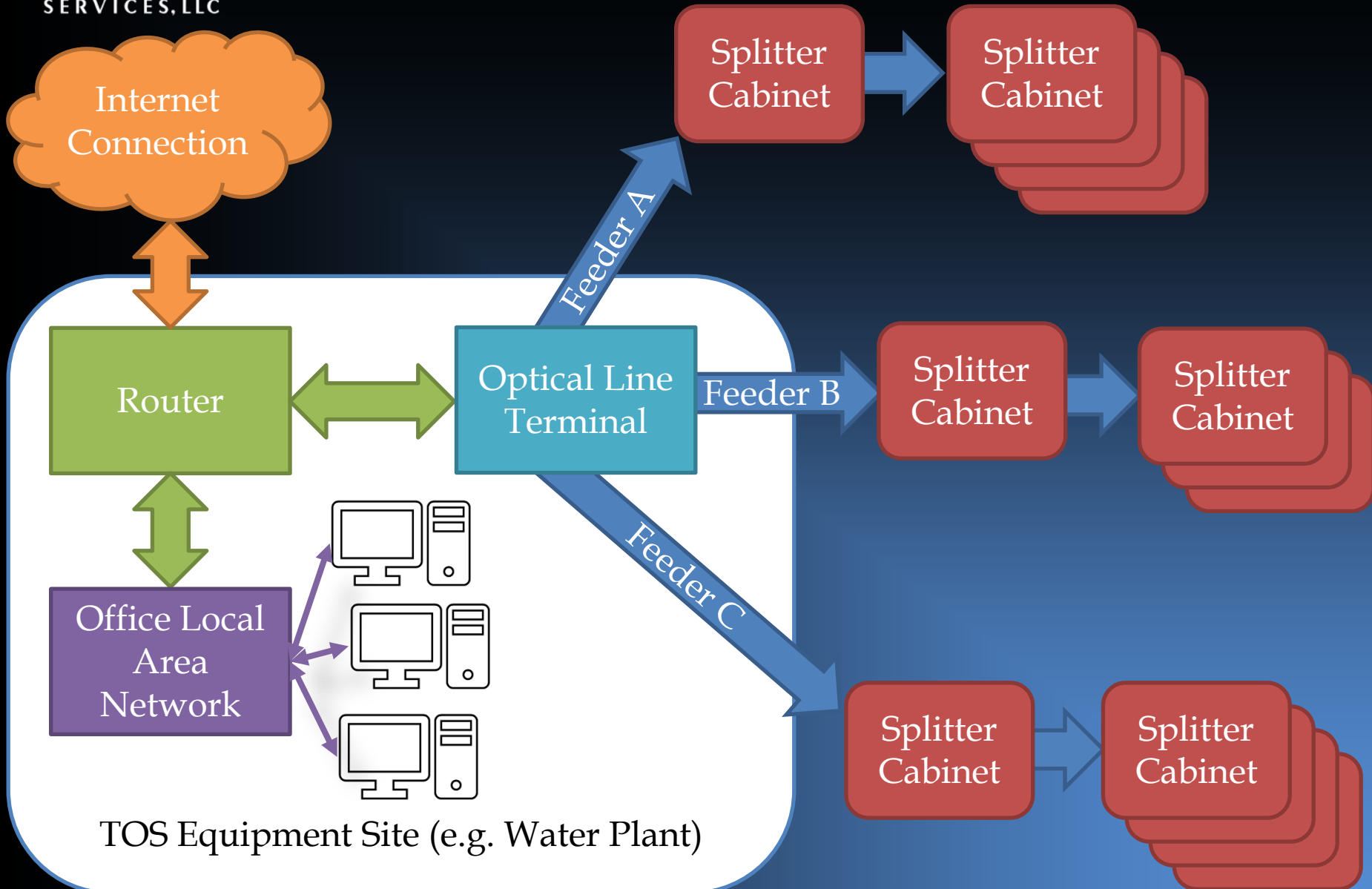
SPLITTER CABINET BUILDING BLOCKS



- ▣ Optical Line Terminals (OLTs)
 - An OLT combines all digital content onto PON ports
 - Each 20 card chassis supports up to 5,120 GPON subscribers
 - Requires environmentally controlled space and 10 Rack Units
 - OLTs connect upstream via multiple 10G uplinks
- ▣ Feeder Network
 - Feeder connects splitter cabinets to serving OLTs
 - Typically one feeder fiber per 32 passings (PON port)
 - \approx 175 feeder fibers would be required to service 5,000 passings
 - Multiple equipment sites reduces the number of fibers per site
 - Typical feeder cable is 144 fiber with multiple OLT sites

- ▣ Backbone Network – Layer 2
 - Backbone connects equipment sites to the core network routers
 - OLTs can connect to each other using protected 10G rings (ERPS)
 - Backbone uses much less fiber capacity than feeder – 12 to 24 fibers
- ▣ Core Network – Layer 3
 - Core network safely routes traffic to and from the outside world
 - Border Gateway Protocol (BGP) routers connect to the Internet
 - BGP routers deployed in pairs
 - Installed on backbone network in physically diverse locations
 - Each router connects to at least two Internet backbone providers
- ▣ Outside World – Content
 - Two physically diverse Internet backbone connections desired
 - Video content would come in over one or both Internet connections
 - Phone would also route over one or both Internet connections

PRIMARY EQUIPMENT SITE COMPONENTS

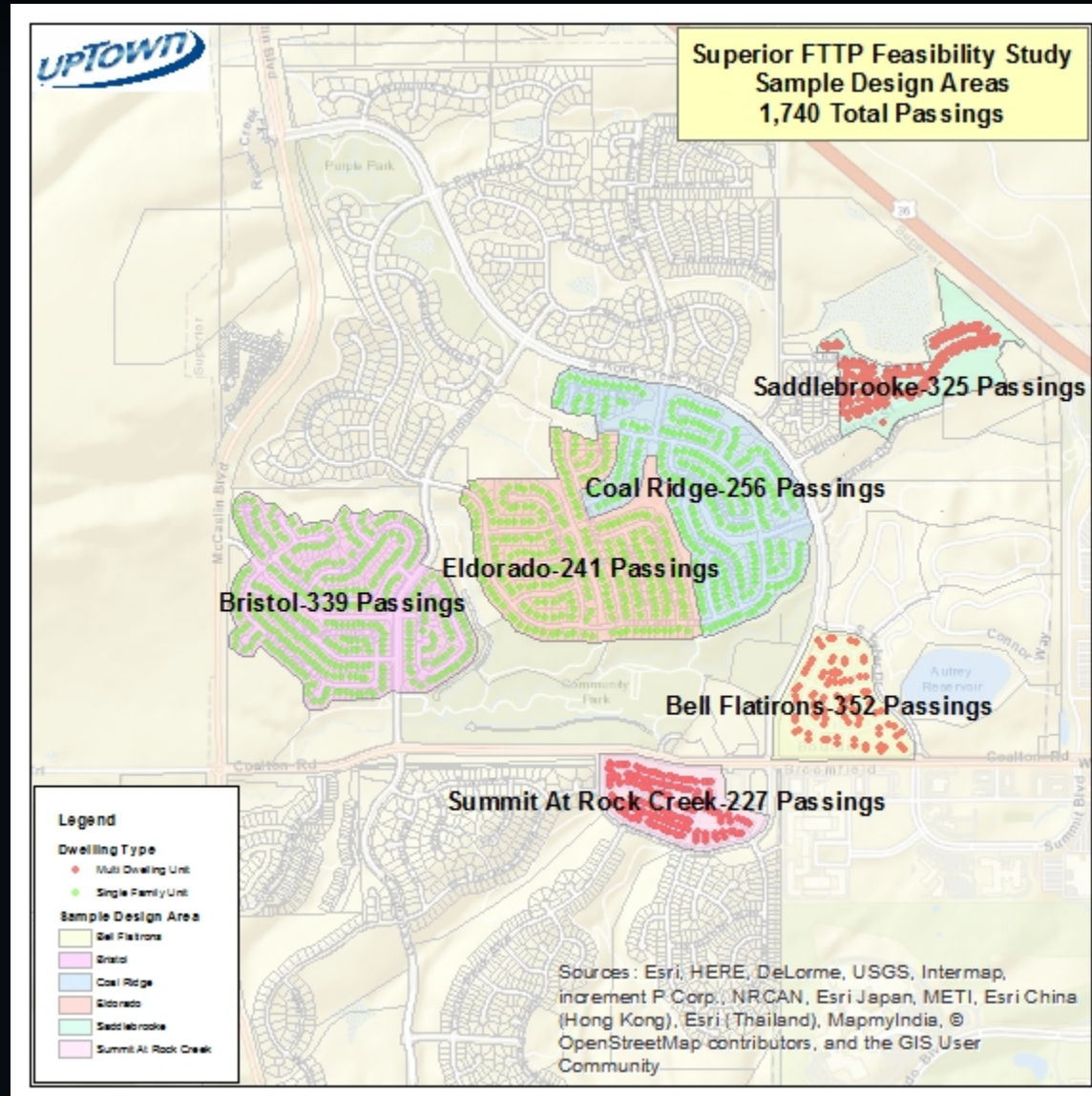


Technology Analysis

Sample Designs

- ▣ 100% GPON standards based system
 - Relying on next generation standards to support future growth
 - Nx10G capabilities over time
- ▣ Centralized split architecture
 - One fiber per passing terminates in splitter cabinet
 - Approximately one splitter cabinet per 250 passings
 - Deploy 1x32 splitters as required in splitter cabinets
 - Network Access Points (NAPs) connect subscriber drops to network
 - All drops fusion spliced at serving NAP
- ▣ Design assumes the use of standard cable technology
 - Single jacket – loose tube fiber cable design throughout
 - 1.5 IN HDPE conduits employed for drops and distribution pathways

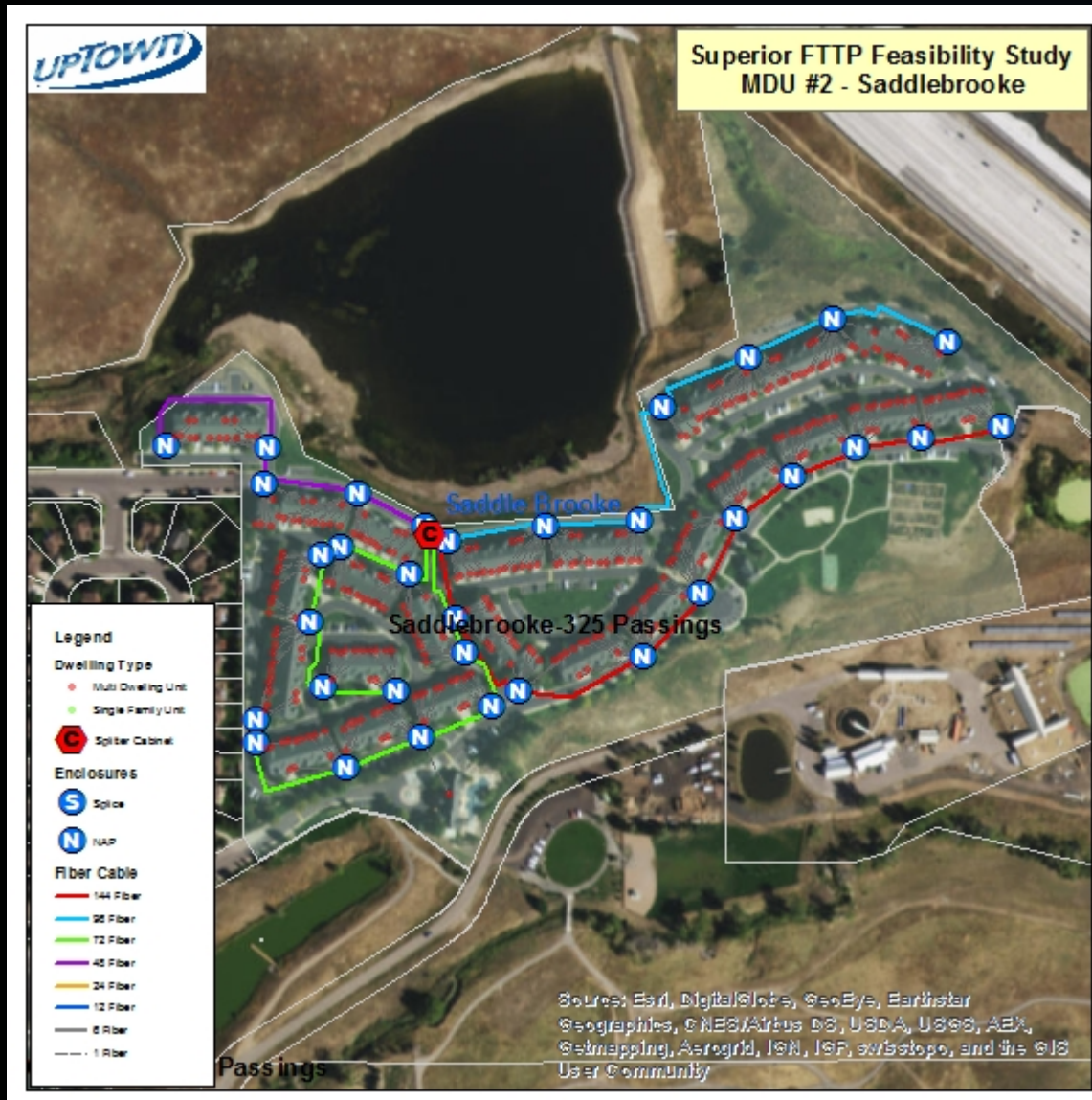
SAMPLE DESIGN AREA OVERVIEW





| Design Metric | Value |
|-------------------------------|------------------|
| Aerial Plant Miles | 0.0 |
| Underground Plant Miles | 1.9 |
| % Aerial | 0% |
| % UG | 100% |
| Passings | 352 |
| Passings per Mile of Plant | 183 |
| Materials Cost per Passing | \$88 |
| Labor Cost per Passing | \$511 |
| Total Cost per Passing | \$598 |
| Total Materials (no drops) | \$30,842 |
| Total Labor (no drops) | \$179,772 |
| Total Cost | \$210,614 |

* - Does not include engineering, fixed equipment, subscriber capital and installation costs.



| Design Metric | Value |
|-------------------------------|------------------|
| Aerial Plant Miles | 0.0 |
| Underground Plant Miles | 1.6 |
| % Aerial | 0% |
| % UG | 100% |
| Passings | 325 |
| Passings per Mile of Plant | 204 |
| Materials Cost per Passing | \$98 |
| Labor Cost per Passing | \$606 |
| Total Cost per Passing | \$704 |
| Total Materials (no drops) | \$31,847 |
| Total Labor (no drops) | \$196,858 |
| Total Cost | \$228,705 |

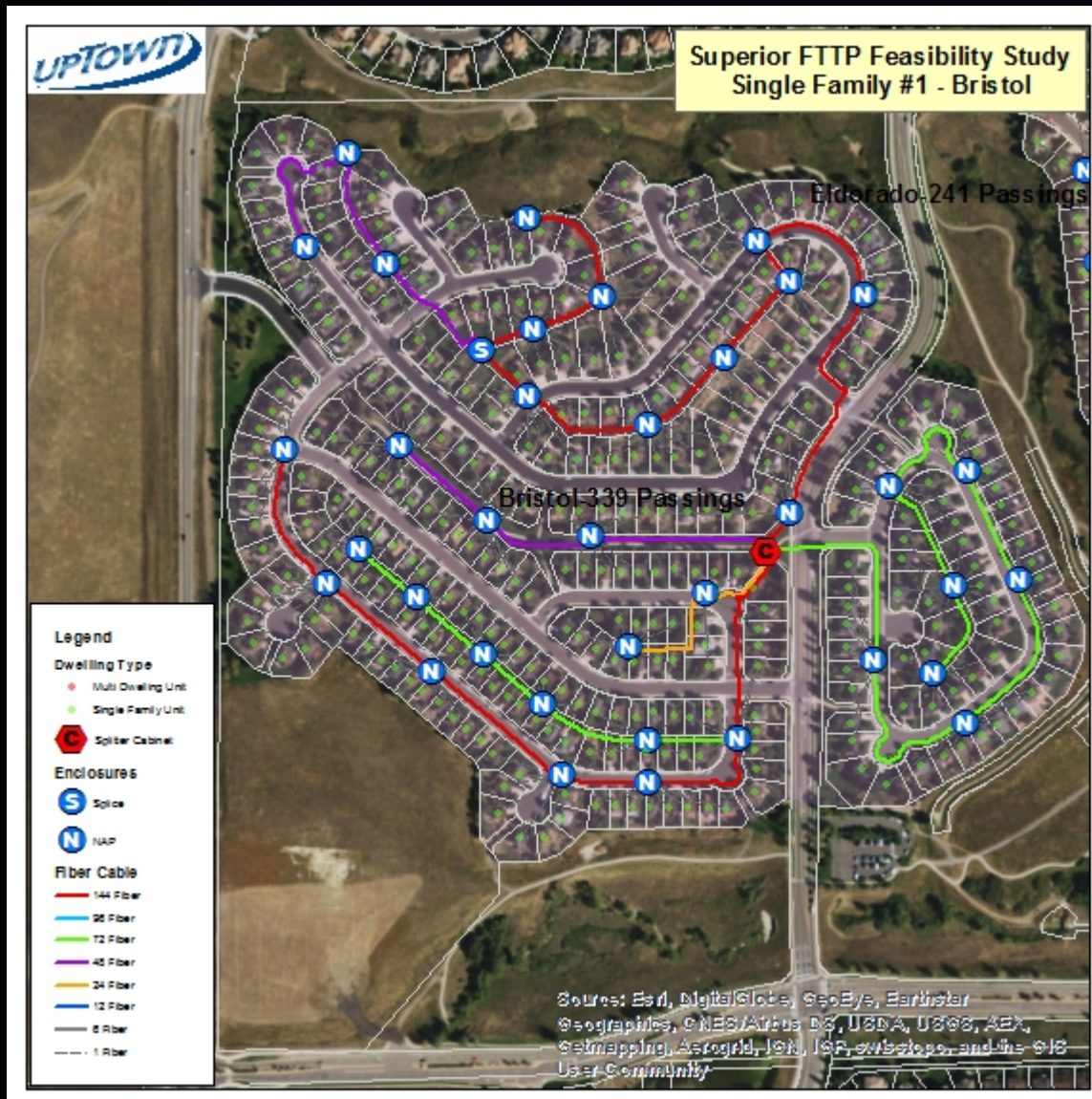
* - Does not include engineering, fixed equipment, subscriber capital and installation costs.



| Design Metric | Value |
|-------------------------------|------------------|
| Aerial Plant Miles | 0.0 |
| Underground Plant Miles | 1.2 |
| % Aerial | 0% |
| % UG | 100% |
| Passings | 227 |
| Passings per Mile of Plant | 192 |
| Materials Cost per Passing | \$118 |
| Labor Cost per Passing | \$887 |
| Total Cost per Passing | \$1,005 |
| Total Materials (no drops) | \$26,769 |
| Total Labor (no drops) | \$201,306 |
| Total Cost | \$228,074 |

* - Does not include engineering, fixed equipment, subscriber capital and installation costs.

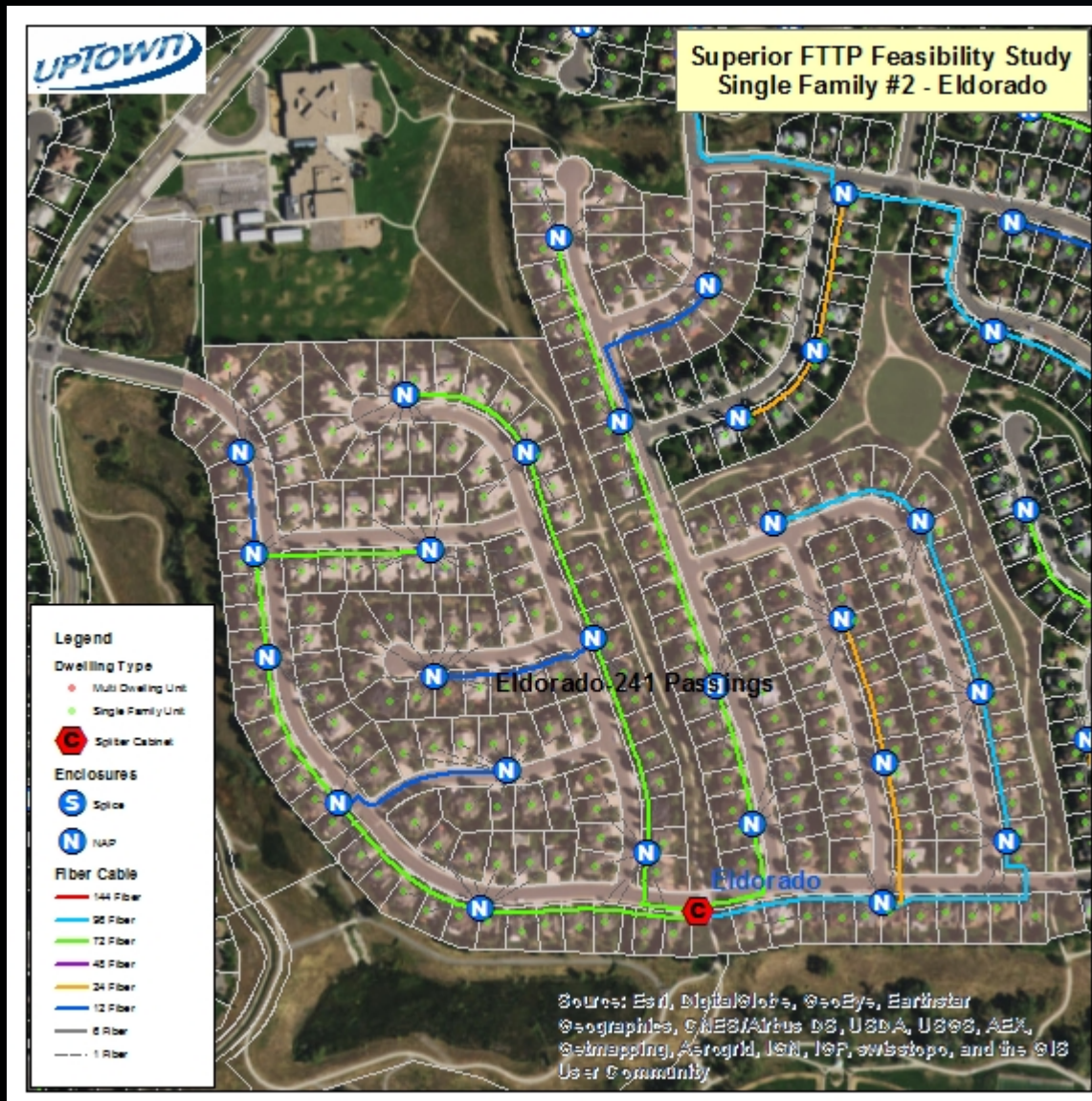
SINGLE FAMILY #1 – BRISTOL (BACK LOT)



| Design Metric | Value |
|-------------------------------|------------------|
| Aerial Plant Miles | 0.0 |
| Underground Plant Miles | 3.1 |
| % Aerial | 0% |
| % UG | 100% |
| Passings | 339 |
| Passings per Mile of Plant | 108 |
| Materials Cost per Passing | \$154 |
| Labor Cost per Passing | \$779 |
| Total Cost per Passing | \$934 |
| Total Materials (no drops) | \$52,300 |
| Total Labor (no drops) | \$264,184 |
| Total Cost | \$316,484 |

* - Does not include engineering, fixed equipment, subscriber capital and installation costs.

SINGLE FAMILY #2 – ELDORADO (FRONT LOT)



| Design Metric | Value |
|-------------------------------|------------------|
| Aerial Plant Miles | 0.0 |
| Underground Plant Miles | 3.6 |
| % Aerial | 0% |
| % UG | 100% |
| Passings | 241 |
| Passings per Mile of Plant | 67 |
| Materials Cost per Passing | \$163 |
| Labor Cost per Passing | \$1,192 |
| Total Cost per Passing | \$1,355 |
| Total Materials (no drops) | \$39,351 |
| Total Labor (no drops) | \$287,152 |
| Total Cost | \$326,502 |

* - Does not include engineering, fixed equipment, subscriber capital and installation costs.

SINGLE FAMILY #3 – COAL RIDGE (FRONT LOT)



| Design Metric | Value |
|-------------------------------|------------------|
| Aerial Plant Miles | 0.0 |
| Underground Plant Miles | 3.0 |
| % Aerial | 0% |
| % UG | 100% |
| Passings | 256 |
| Passings per Mile of Plant | 85 |
| Materials Cost per Passing | \$159 |
| Labor Cost per Passing | \$967 |
| Total Cost per Passing | \$1,125 |
| Total Materials (no drops) | \$40,609 |
| Total Labor (no drops) | \$247,473 |
| Total Cost | \$288,082 |

* - Does not include engineering, fixed equipment, subscriber capital and installation costs.

| Sample Design Area | OH Miles | UG Miles | Passings | Passings per Mile | Weight | Materials per Passing | Labor per Passing | Total per Passing |
|---------------------------------|----------|----------|--------------|-------------------|-------------|-----------------------|-------------------|-------------------|
| Bell Flatirons | 0.0 | 1.9 | 352 | 183 | 25% | \$88 | \$511 | \$598 |
| Saddlebrooke | 0.0 | 1.6 | 235 | 204 | 12% | \$98 | \$606 | \$704 |
| Summit | 0.0 | 1.2 | 227 | 192 | 4% | \$118 | \$887 | \$1,005 |
| Coal Ridge | 0.0 | 3.0 | 256 | 85 | 0% | \$159 | \$967 | \$1,125 |
| Eldorado | 0.0 | 3.6 | 241 | 67 | 0% | \$163 | 1,192 | \$1,355 |
| Bristol | 0.0 | 3.1 | 339 | 108 | 56% | \$154 | \$779 | \$934 |
| Original Town | 1.9 | 0.0 | 190 | 100 | 4% | \$154 | \$444 | \$598 |
| Weighted Average / Total | | | 1,930 | N/A | 100% | \$130 | \$685 | \$815 |

- ❖ Weighting based on estimated number of passings in each category
- ❖ Total fiber mileage estimated to be 40-50 miles

Incumbent and Proposed FTTP Service Offerings
Internet and Data Services



INCUMBENT RESIDENTIAL INTERNET PRICING

| | Download | Upload | Price | Technology |
|-------------|----------|----------|--------------------------------------|-----------------------------|
| Comcast | 10M | 2M | \$49.95 | Cable Modem (DOCSIS 3.0) |
| | 25M | 5M | \$59.95 | |
| | 75M | 5M | \$74.95 | |
| | 150M* | 10M | \$89.95 | |
| | 250M* | 25M | \$149.95 | |
| | 1G** | 1G | Monthly: \$160 3 Year Term: \$110 | Cable Modem (DOCSIS 3.1) |
| CenturyLink | 1.5M | 896k | \$44.99 | DSL |
| | 7M | 896k | \$54.99 | |
| | 7M | 5M | \$59.99 | |
| | 12M | 896k | \$64.99 | |
| | 12M | 5M | \$69.99 | |
| | 20M | 896k | \$74.99 | |
| | 20M | 5M | \$79.99 | |
| | 40M* | 5M | \$114.99 | |
| | 40M* | 20M | \$124.99 | |
| | 40M | 5M | \$55.00 | FTTP |
| | 100M | 50M | \$70.00 | |
| 500M | 250M | \$99.99 | | |
| 1G | 1G | \$129.99 | | |

Prices reflect subscription to Internet service at non-promotional rates. CenturyLink pricing per centurylink.com. Comcast pricing from xfinity.com as of January 2016 and published 'Services and Pricing' brochure (Ft. Collins).

*Not available in all areas. **DOCSIS3.1 may or may not be launched in Superior as part of the 'Denver area' deployment.

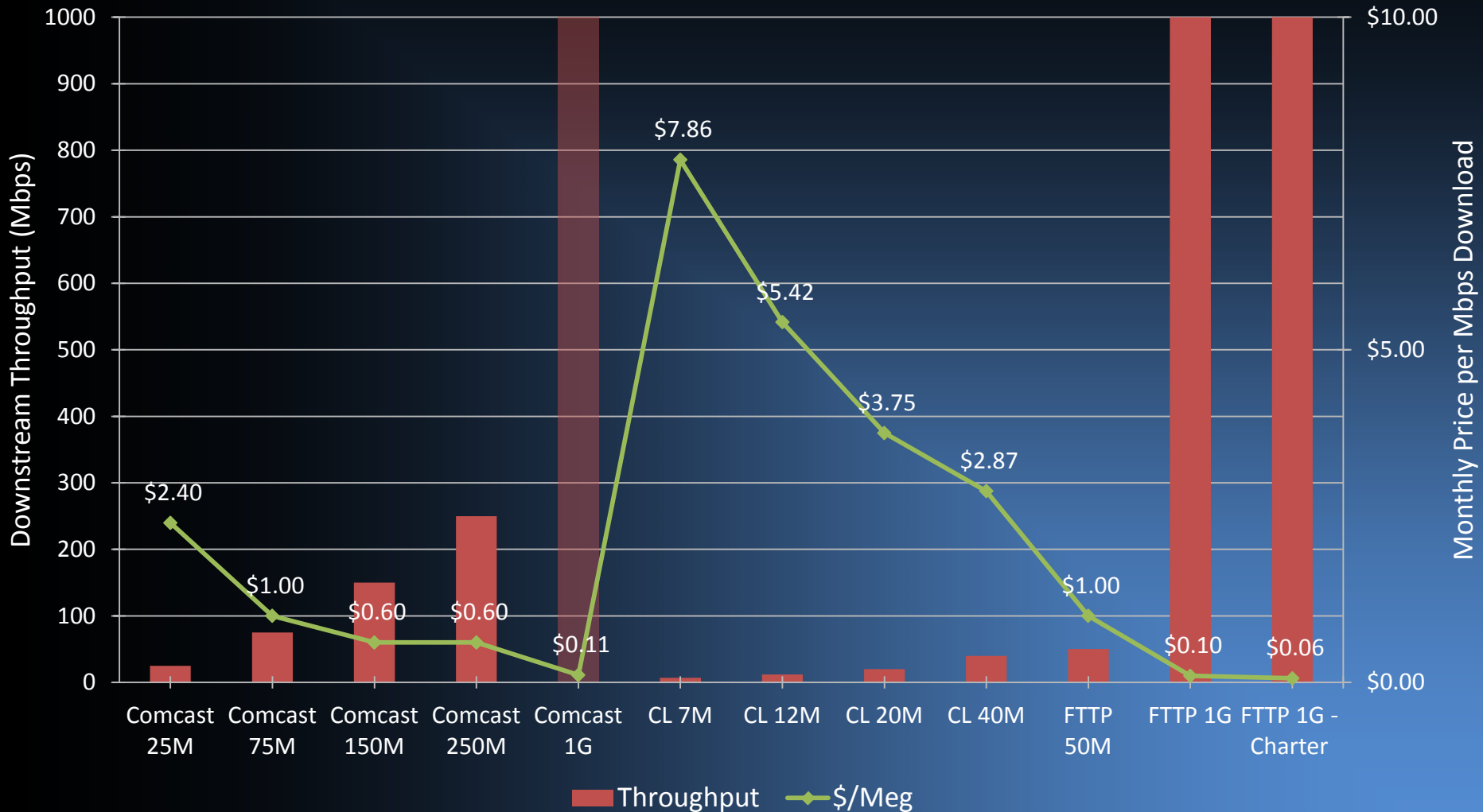


PROPOSED RESIDENTIAL INTERNET PRICING*

| FTTP System | Comcast DOCSIS 3.0 | Comcast DOCSIS 3.1 | Discount |
|---|--|---|------------------------------------|
| 50M / 50M Tier \$50 | Comcast 75M / 5M Monthly: \$74.95 12-Month Term: \$49.99 | - | 33% |
| 1G / 1G Tier \$100 | Comcast 2G \$299.95 | Comcast 1G Monthly: \$160 36-Month Term: \$110 | DOCSIS 3.0: 67% DOCSIS 3.1: 38% |
| 1G / 1G Charter Member \$60 | | | DOCSIS 3.0: 83% DOCSIS 3.1: 63% |
| WiFi ONT Upgrade (80211.ac) \$10.00 | \$10.00 | | 0% |

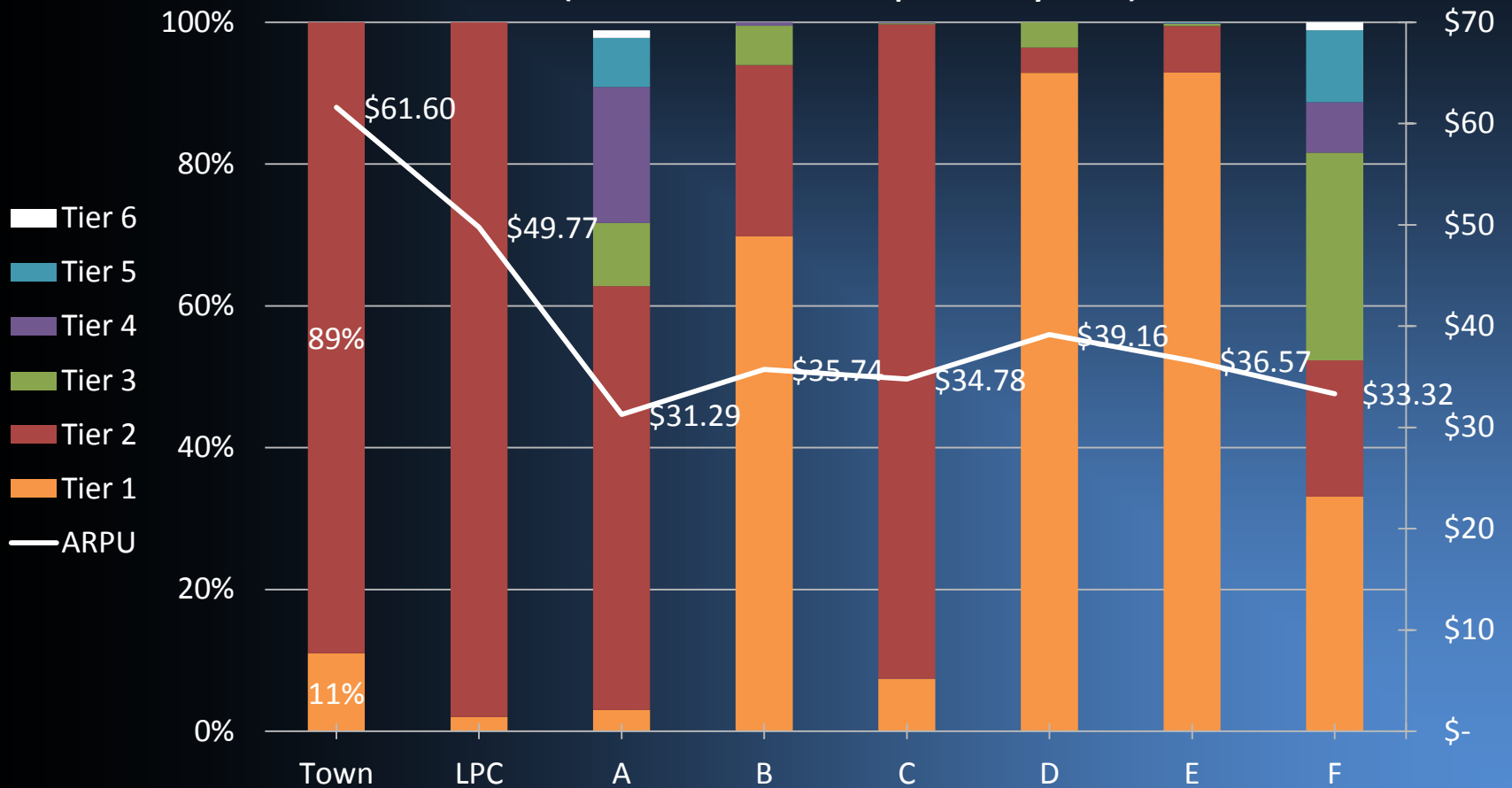
*Prices reflect providers single-service Internet rate card, month-to-month pricing unless noted.

Internet Downstream Throughput and Price per Mbps
(Incumbents and Proposed FTTP Tiers at 20M+)



The follow-up survey identified the dispersion between the 2 residential Internet tiers as 11% for the 50M tier and 89% for the 1G tier and if priced at \$50 and \$60/month respectively...

**Internet Dispersion and Average Revenue Per User (ARPU)
(Town and Other Municipal FTTP Systems)**



1. Standard Internet Access
 - ◆ Shared capacity connection over GPON
 - ◆ No contract requirement and no SLA guarantees
 - ◆ Can upgrade to symmetrical bandwidth and add BGP Routing (some tiers)
2. Dedicated Internet Access*
3. High Capacity Direct Fiber Access*
 - ◆ Multiple connection options:
 - ◆ Direct routed connection
 - ◆ Customer CPE connection (either non-protected media converter or protected)
 - ◆ Protected connection is optional
 - ◆ Contract agreement with SLA and term requirement
 - ◆ Resale rights may be included
4. Point-to-Point (Transport Circuit): Dedicated pathway of defined capacity without access*
5. MAN: Customized access and transport solution for multi-site business or institution*

*Not included in the FTTP business case as revenues.



INCUMBENT COMMERCIAL INTERNET PRICING

| | Download | Upload | Price Rate Card / Promo | Technology |
|--|----------|---------------|----------------------------|-----------------------------|
| Comcast | 16M | 3M | \$84.90 | Cable Modem (DOCSIS 3.0) |
| | 25M | 10M | \$114.90 | |
| | 50M | 10M | \$124.90 | |
| | 75M | 15M | \$164.90 | |
| | 100M | 20M | \$214.90 | |
| | 150M | 20M | \$264.90 | |
| <i>All rates include \$14.95/mo. equipment fee</i> | | | | |
| CenturyLink | 12M | Not Disclosed | \$54.99 (24 mos.) | DSL |
| | 20M | | \$64.99 (24 mos.) | |
| | 40M | | \$84.99 (24 mos.) | |
| | 100M | | <i>Custom Quote</i> | |

Note: Prices reflect providers single-service Internet rate card pricing. Comcast pricing from account rep quote as of September 2016 . CenturyLink pricing from centurylink.com as of October 2016 .



PROPOSED COMMERCIAL INTERNET PRICING

| Superior Download / Upload | Superior Price | Incumbent Comparable | Incumbent Price | Discount |
|---------------------------------------|---------------------------|---------------------------------|------------------------|-----------------|
| 25M / 5M <i>Add Symmetrical</i> | \$59.95 + \$10 | Comcast 25M | \$114.90 | 48% |
| 50M / 10M <i>Add Symmetrical</i> | \$79.95 +\$30 | Comcast 50M | \$124.90 | 36% |
| 100M / 20M <i>Add Symmetrical</i> | \$89.95 + \$50 | Comcast 100M | \$214.90 | 58% |
| 250M / 50M <i>Add Symmetrical</i> | \$199.95 + \$100 | - | - | - |
| 500M / 250M <i>Add Symmetrical</i> | \$349.95 + \$150 | - | - | - |
| 1G / 500M <i>Add Symmetrical</i> | \$599.95 + \$200 | - | - | - |

Note: Prices reflect providers single-service Internet rate card pricing.

**Internet Downstream Throughput and Price per Mbps
(Incumbents and Proposed FTTP Tiers)**



Incumbent and Proposed FTTP Service Offerings
Video Services

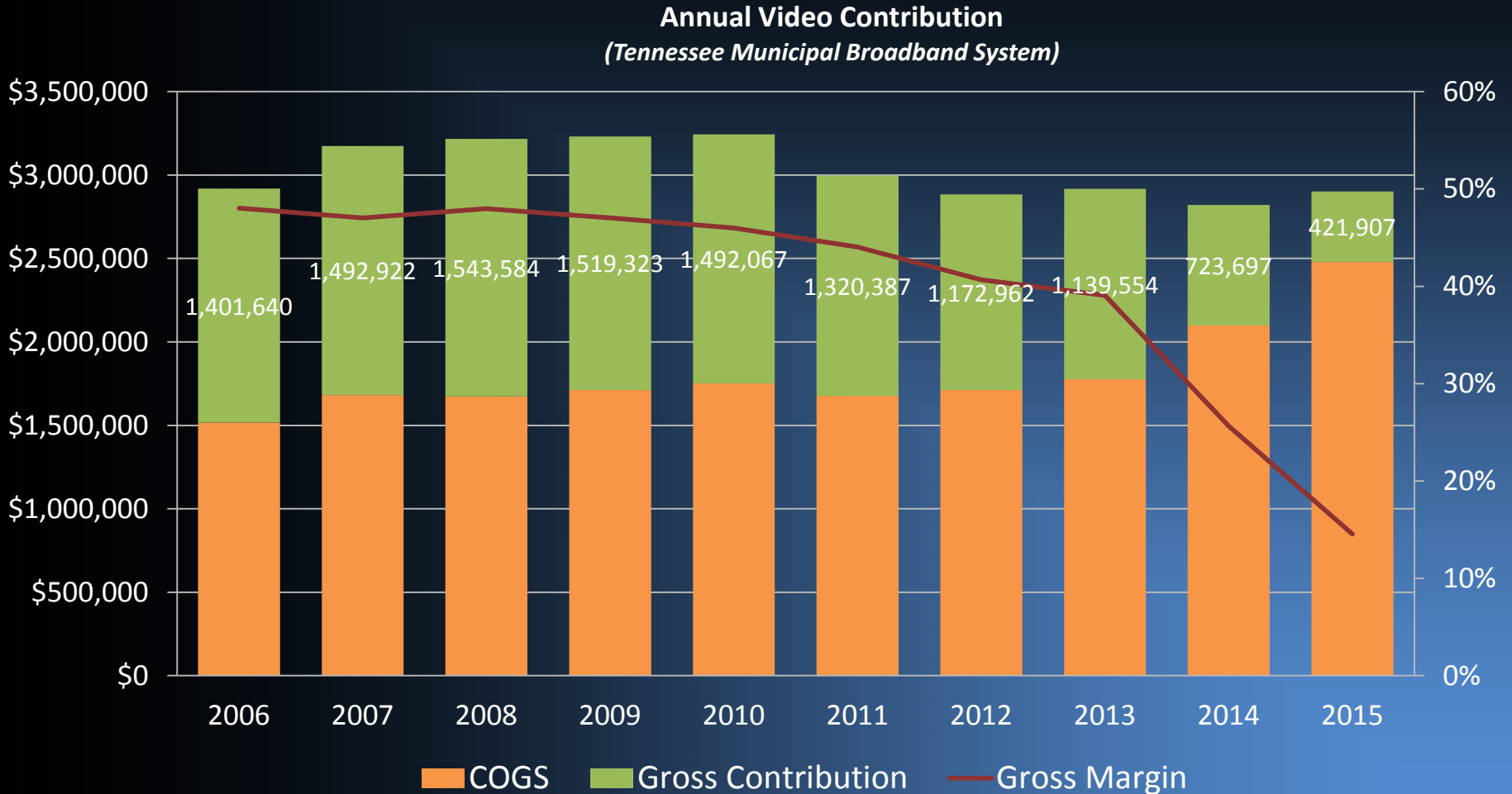
| | Traditional Pay TV | Over-The-Top |
|------------------------------------|---|--|
| Examples | Comcast, Spectrum, AT&T (U-verse) | Hulu Plus, Netflix, PlayStation Vue, AT&T (DirecTV Now) |
| Regulation | FCC rules require: <ul style="list-style-type: none"> • Ownership and control of ‘closed-end path’ • Video franchise • Pricing deregulated via ‘effective competition’ | Unregulated |
| Access to Content | Guaranteed via FCC rules | No programmer requirement (specific OTT rights required) |
| Signal Delivery | Provider last mile plant (may be leased access with ‘ownership and control’) | End user’s Internet connection |
| Signal Format | Analog, Digital (QAM), or IP Video | IP Video |
| Signal Decryption & Authentication | Set top box controlled by service provider | Subscriber authentication only |

- ◆ Margin Erosion
 - ◆ Sub loss due to value destruction from rate increases and no perceived increase in value
 - ◆ Gross margin has been halved by programming cost increases despite these rate increases
- ◆ Ongoing Capital Investment
 - ◆ Traditional QAM systems out of capacity face a major capital investment to migrate to IP video (hardware, software, set tops)
 - ◆ Headend capex continues in all systems due to MPEG4 adoption and vendors' end of life announcements
- ◆ Loss of Competitive Advantage
 - ◆ Existing traditional Cable Systems had market protection as a duopoly via last mile infrastructure and franchise agreements entry barriers. Key assets were last mile infrastructure and local operations.
 - ◆ New 'Virtual Video Providers' (OTT) will have ubiquitous market reach across the U.S. via the broadband connection. Key assets will be national brand power and consumer platform integration.
 - ◆ National consumer brands can leverage their brand, existing consumer base, and huge cash positions to quickly capture market share (e.g. Google, Apple...)



TYPICAL VIDEO GROSS CONTRIBUTION TREND

Market forces have dramatically impacted video gross margins from a combination of subscriber loss and escalating video COGS...



Source: CPWS Comprehensive Annual Financial Report, 2014-2015

1. No Video

- ◆ Example: Longmont, CO from 2015-2016
- ◆ Risks: Loss of bundling and no financial contribution

2. Cooperative Marketing (co-branding with 3rd party)

- ◆ Receive a one-time commission (≈\$50)
- ◆ Example: Longmont, CO in 2017 (Layer3 TV)
- ◆ Risks: No control over video service and minimal financial contribution

3. Hosted Video (leased access to 3rd party)

- ◆ Receive a wholesale fee or gross margin split per sub/month (\$5-7)
- ◆ Example: Skitter TV
- ◆ Risks: Capex requirement (off-airs, custom channels, set tops)

4. Own Headend (insourced)

- ◆ Pay a fee for video transport and license fees. Staff technical resources
- ◆ Example: Municipals until recently
- ◆ Risks: Major capex requirement (headend, set tops)

| | <i>Capex</i> | <i>Opex</i> |
|---|---|--|
| No Video & Cooperative Marketing | No Capex or Opex. | |
| Hosted Video | Headend Initial Buy-In: \$60k Channel Customization Costs: \$30k Tower & Dishes: \$15k Generator/UPS: Not Included VOD Platform: Not Included Set Top (Gateway w/ DVR): \$300 ea. Set Top (Client): \$100 ea. Total Capex (Years 1-5): \$833K | Middleware License Fees: \$1.67/STB Network DVR Service Fee: \$4.00/Subscriber/Mo. Video Transport License Fee: \$1.00/Subscriber/Mo. Leased Transport Circuit: \$12k/Mo. Premise Install Contractor Rate: +\$50 OSS/BSS Software: +\$50,000 Total Opex (Years 1-5): \$871K |
| Own Headend | Headend System Electronics: \$415k Tower & Dishes: \$150k Generator/UPS: \$50k VU-IT Initial Fee: \$65k VOD Platform: Not Included Middleware/CAS Framework License: \$200k (500 ILU) Middleware/CAS Per Sub (After 500 ILUs): \$65 ea. Set Top (Gateway w/ DVR): \$300 ea. Set Top (Client): \$100 ea. Total Capex (Years 1-5): ≈\$1.6 | Video Transport Circuit Lease to LiveVU POP: \$9k/Mo. Live Vu Transport License Fee: \$1.75/Sub/Mo. Vendor Maintenance of Video Electronics: \$23k/Year Vendor Maintenance of Middleware/CAS: \$15k/Year Premise Install Contractor Rate: +\$50 Headcount: 1 FTE for Headend Technician OSS/BSS Software: +\$50,000 NCTC Membership Fee: \$1/premise passed Total Opex (Years 1-5): ≈\$4M |

| Capex | Skitter TV | Layer3 TV |
|----------------------------------|--------------------|-----------------|
| Video Headend | Des Moines | Denver |
| Middleware/CAS | Conklin | Proprietary |
| Set Top Boxes & STB Pathway | City Provides | Layer3 Provides |
| 4K Video | Depends on STB | All STB support |
| OTT Integration (user interface) | Medium term | Short term |
| Customer Install | City | Layer3 |
| Marketing & Sales | | |
| Customer Care | | |
| Transport Circuit(s) | | |
| Total Capex | ≈\$2.2M | \$0 |
| End User Pricing | Skitter Sets | Layer3 Sets |
| Financial Terms | Gross margin split | TBD – very low |

NET CASH: VIDEO STRATEGY OPTIONS

Can the fixed costs associated with offering traditional video be recovered prior to widespread adoption of virtual streaming video services?



Incumbent and Proposed FTTP Service Offerings
Voice Services



RESIDENTIAL VOICE SERVICES

| | | CenturyLink | Comcast | FTTP System | Discount to CL / Comcast |
|---------------------------|-------------------------------------|-------------------------------|------------------------------|-----------------|--------------------------|
| Package | Line Only LD per Minute | \$17.00 | - | - | - |
| | Line & Features LD per Minute | \$35.00 <i>11 features</i> | \$20.00 <i>3 features</i> | - | - |
| | Line & Features Unlimited LD | \$49.00 | \$44.95 \$39.95 Bundled | \$34.95 Bundled | 29% / 13% |
| Subscriber Line Charge | | Yes | No | No | - |

CenturyLink prices from centurylink.com Comcast pricing from comcast.com as of March 2016 and published 'Services and Pricing' brochure.



COMMERCIAL VOICE EXCHANGE SERVICES (PER LINE)

| Service | | CenturyLink | Comcast | FTTP |
|-------------------------|--|---|---|---|
| Line & Feature Packages | Business Prime <i>(3 Calling Features)</i> | Monthly: \$40.00 1 Year: \$36.00 2 Year: \$34.00 3 Year: \$32.00 | - | - |
| | Choice Business <i>(3 Calling Features and Voicemail)</i> | Monthly: \$45.00 1 Year: \$40.50 2 Year: \$38.25 3 Year: \$36.00 | - | - |
| | Choice Business Plus <i>(15 Calling Features)</i> | Monthly: \$55.00 1 Year: \$49.50 2 Year: \$46.75 3 Year: \$44.00 | \$29.95 2 Year Term <i>(New Customers)</i> \$44.95 <i>(8 Features & Unlimited LD)</i> | With Internet Monthly: \$29.95 2 Year: \$24.95 3 Year: \$22.95 Without Internet Monthly: \$39.95 2 Year: \$34.95 3 Year: \$32.95 |
| Long Distance | Unlimited Domestic | \$28.00 | Included | Add \$2/line |



COMMERCIAL VOICE NETWORK SERVICES

| Service | | CenturyLink | Comcast | FTTP <i>(Contract Required)</i> |
|----------------------|---|---|--|---|
| ISDN / SIP Trunks | Primary Rate Interface Access / Per B Channel (23B+D) | Facility Charge Monthly: \$150 3 Year: \$127 5 Year: \$110 7 Year: \$108 Per B Channel Monthly: \$30.49 | \$26.04 - \$32.13 depending upon bandwidth | With Internet 2 Year: \$24.95 3 Year: \$22.95 Without Internet 2 Year: \$29.95 3 Year: \$27.95 |

| Function | Operational Responsibility | FTTP System | CLEC |
|-------------------|---|-------------|------|
| Capital | Local Loop and Premises NIU | ✓ | |
| | Fiber MUX, Transport, and Switch | | ✓ |
| Interconnect | LNP, Operator Services, PSAP, IC Agreements | | ✓ |
| Marketing & Sales | Advertising, Sales | ✓ | |
| | Brand, Pricing | ✓ | ✓ |
| Provisioning | Work Order Creation | ✓ | |
| | Bell Processes | | ✓ |
| | Switch Provisioning | | ✓ |
| Billing | Customer Install | ✓ | |
| | Bill Fulfillment | ✓ | |
| | Call Detail Record (LD), Taxes & Fees | | ✓ |
| Internet | Backbone Interconnection | | ✓ |

| | | FTTP Retail | Wholesale Rate | FTTP Share | Dispersion | Contribution per Line |
|----------------------|----------------------------|----------------|-------------------|------------|------------|--------------------------|
| Residential | Unlimited local & LD | \$34.95 | ≈ \$10.00 | ≈ \$25 | 100% | ≈ \$25 |
| | Business Package (Monthly) | \$29.95 | ≈ \$12.00 | ≈ \$18 | 40% | - |
| Commercial (Unl. LD) | Business Package (2 Year) | \$24.95 | ≈ \$12.00 | ≈ \$13 | 20% | - |
| | Business Package (3 Year) | \$22.95 | ≈ \$12.00 | ≈ \$11 | 40% | - |
| | Total Commercial | | | | | ≈ \$14 |

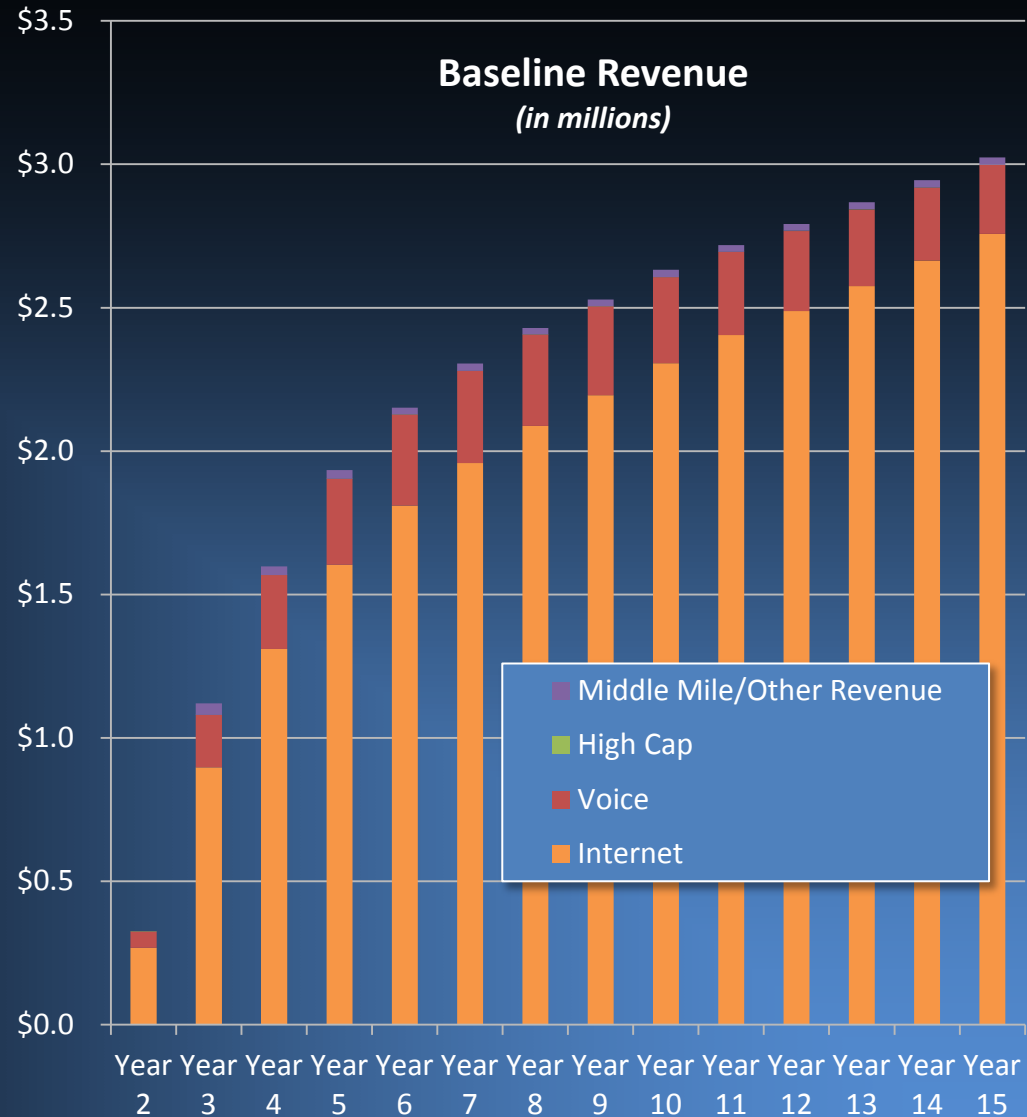
Financial Analysis

Overview of Revenue, Opex, & Capex Inputs

- ◆ Reflects specific Superior service area market conditions
 - ◆ Quantitative market research
 - ◆ Sample designs to evaluate and cost out construction options and methods
 - ◆ Salaries, wages, and overhead
- ◆ Retail Business Structure (wholesale options evaluated as a separate pro forma scenario)
- ◆ Internet and voice services (video included via Layer3 TV is pro forma neutral)
- ◆ Cost inputs based on Longmont and other Municipal FTTP deployments
 - ◆ Headcount and contractor costs
 - ◆ Recent bids/proposals for equipment, construction labor, software, CLEC terms, etc.
- ◆ Assumes FTTP launch prior to Comcast deployment of DOCSIS3.1
- ◆ Capital budget uses estimated cost/passing + 10% contingency
- ◆ Long term debt interest rate at 4.0% for 20 year revenue bond (w/ 3 years capitalized interest)

KEY INPUTS

- Premises
 - Residential: 4,900
 - Commercial: 70
 - Premise Growth: 6% (Res & Biz)
 - % Complex: 0%
- Year 5 Penetration
 - Internet: 37.0%
 - Voice (eroded): 16.9%
- Residential Internet
 - 50Mbps Tier: \$50.00
 - 1Gbps Tier: \$60.00
 - WiFi Upgrade: \$10.00
- Commercial Internet
 - 25Mbps Tier: \$59.95
 - 50Mbps Tier: \$79.95
 - WiFi Upgrade: \$10.00
- Voice
 - Residential: \$25 net wholesale
 - Commercial: \$14 net per line
- Install Fees
 - Residential: \$49.95 (Year 3)
 - Commercial: \$99.95 (Year 3)

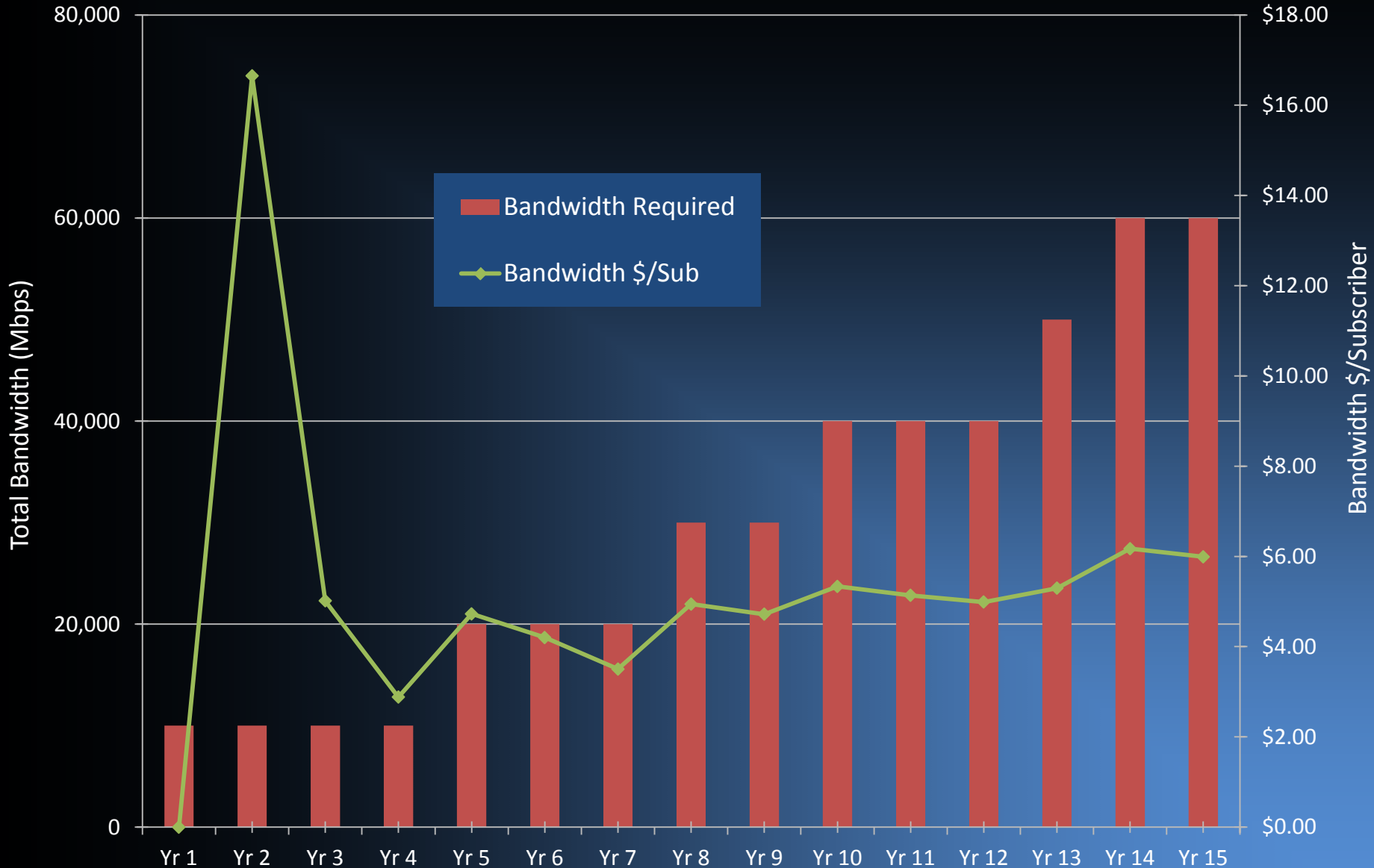


There are 2 strategy options for Superior to acquire the necessary bandwidth to provide Internet access service:

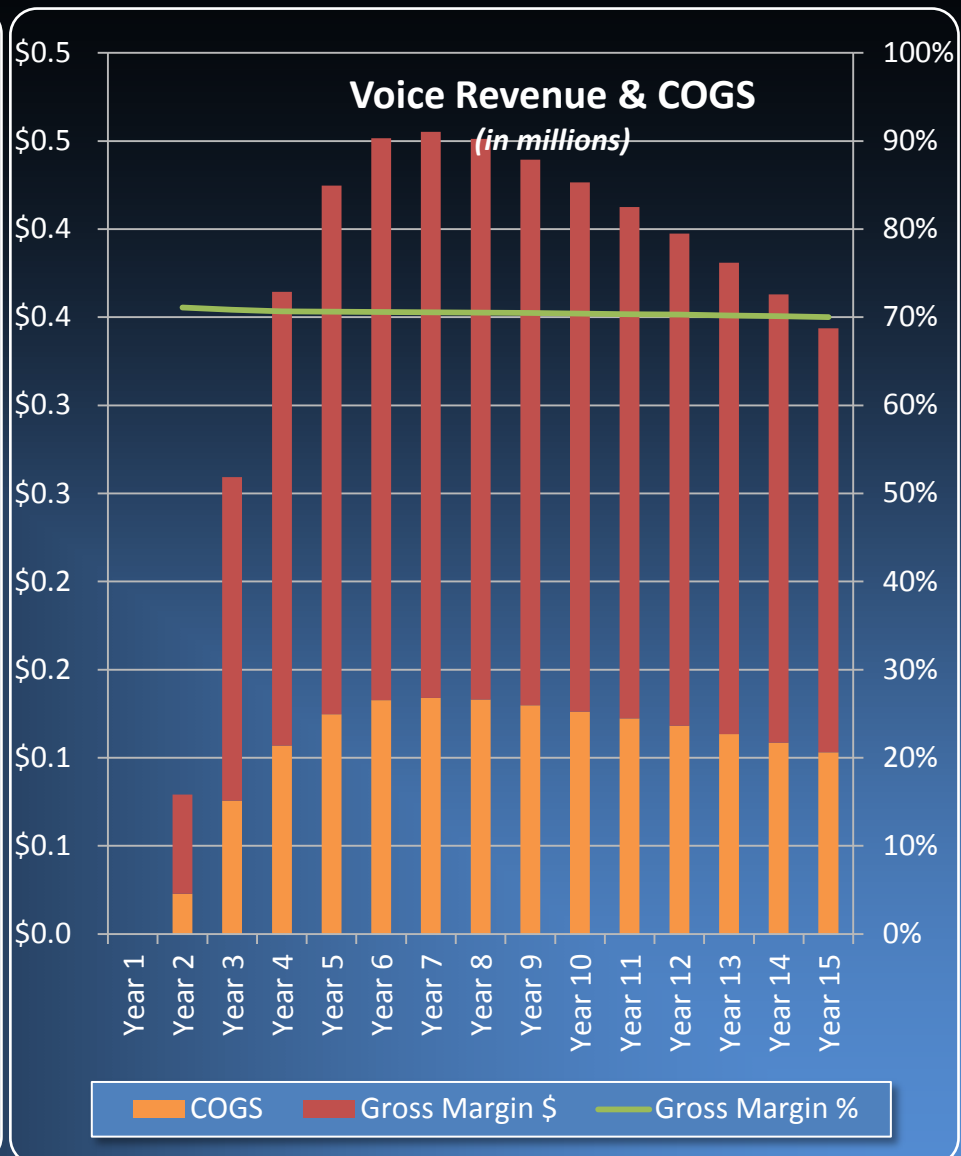
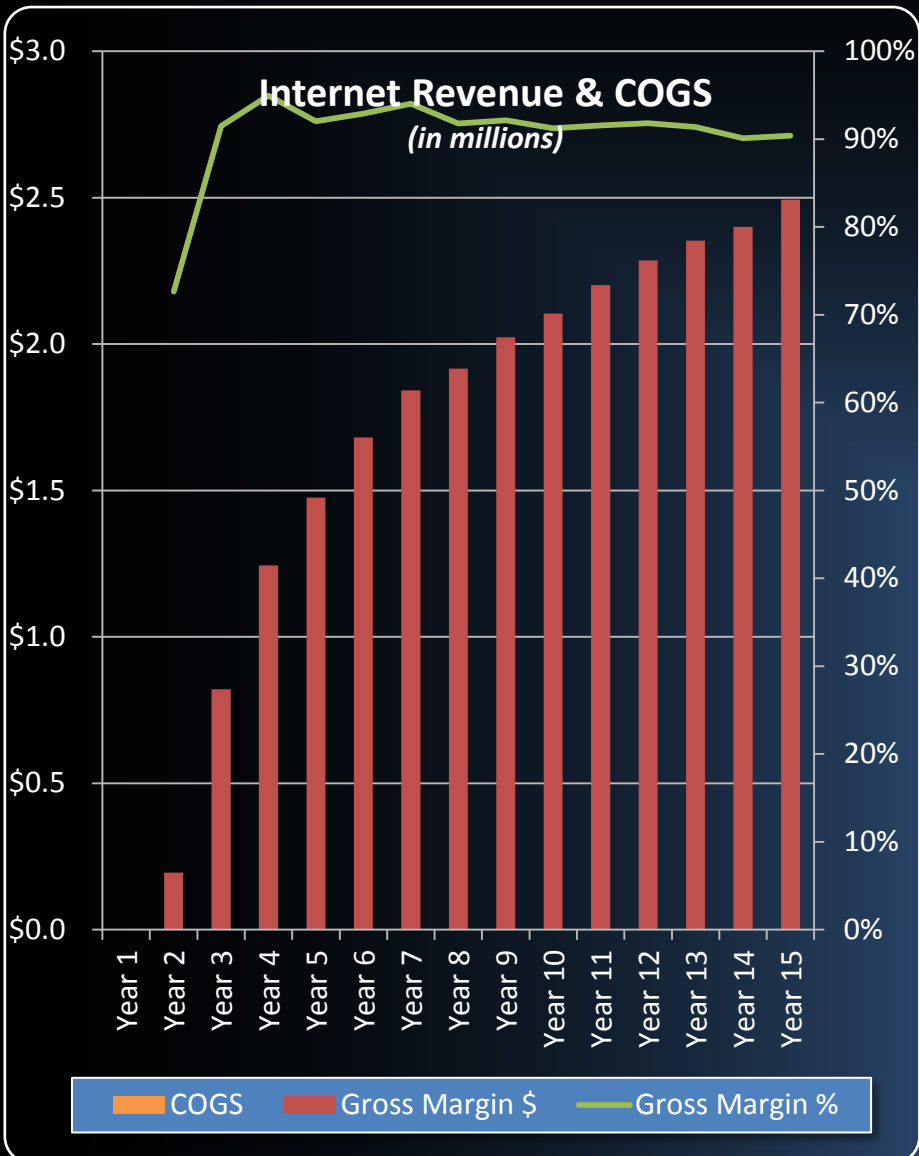
- A. Contract for delivered bandwidth to the Water Plant from a service provider
- B. Lease/build a transport circuit for direct access to a major POP and separately lease bandwidth from another provider via x-connect to their cage

| | | | |
|---------------------------------------|-------------------|--|---------------------------|
| A. Delivered Bandwidth | | Provider brings their circuit directly to 1300 McCaslin Boulevard <ul style="list-style-type: none"> • Provider “A”: 10G capacity for \$4,415 MRC/\$0 NRC and 3 year term • Provider “B”: 10G capacity for \$7,625 MRC/\$3,000 NRC and 3 year term | <i>\$0.60/Mbps</i> |
| B. Direct Access Configuration | Transport | Lease 2 10G transport circuits to 910 15 th Street in Denver <ul style="list-style-type: none"> • A Location is 1300 McCaslin Boulevard • Z Location is Meet Me Room at 910 POP • Provider “A”: 10G circuit pricing is TBD • Provider “B”: 10G circuit pricing is TBD | TBD |
| | Access | Lease 2 backbone connections at 910 15 th for 10G capacity (CDR) on each <ul style="list-style-type: none"> • Provider “A”: 10G Bandwidth for \$2,000 MRC/\$0 NRC and 3 year term • Lease IP addresses (IPv4). Budget at 50¢ each. | <i>\$0.20/Mbps</i> |
| | Other Fees | X-Connect: \$300 MRC per circuit x 2 = \$600 MRC | |

BANDWIDTH FORECAST

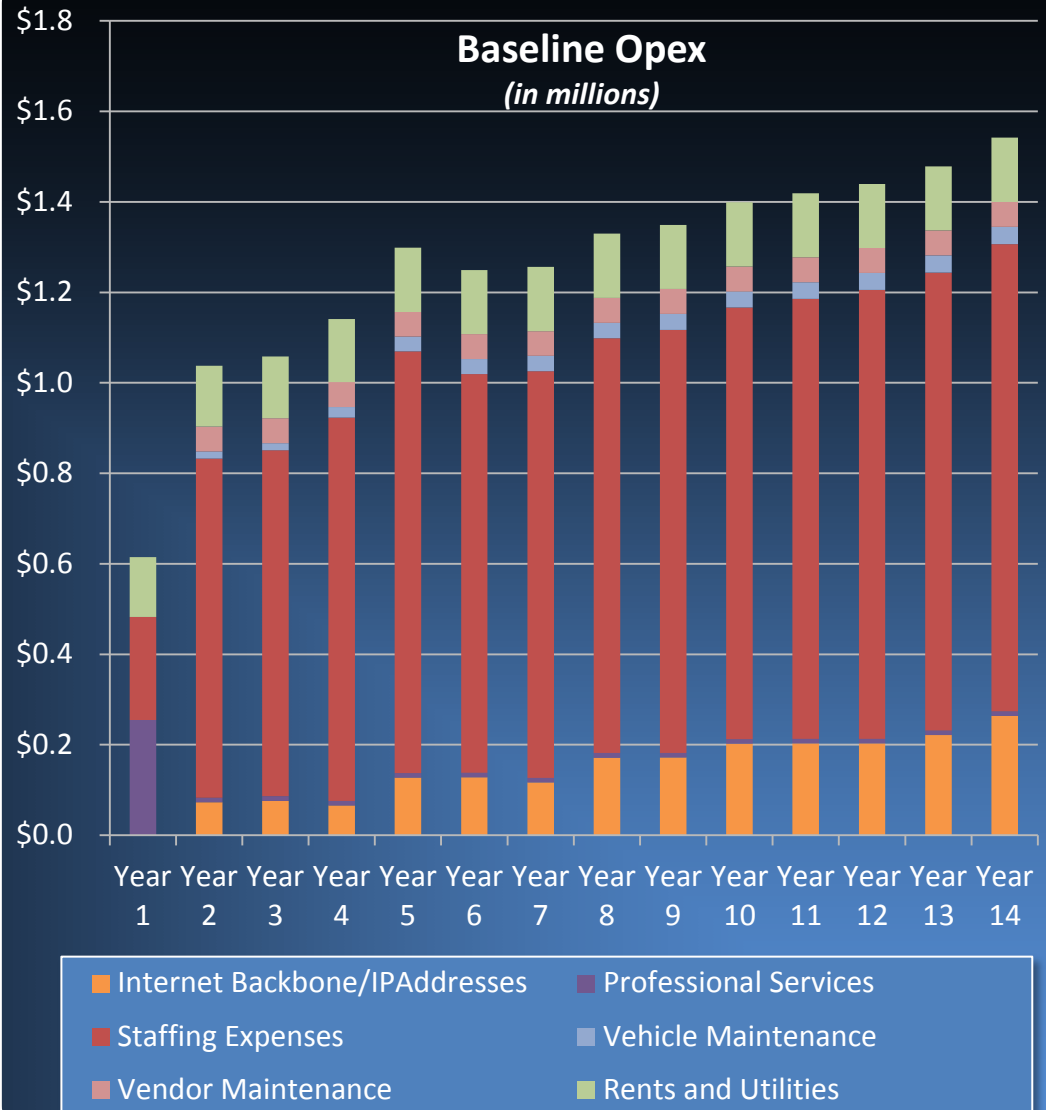


BASELINE COGS & GROSS MARGIN



KEY INPUTS

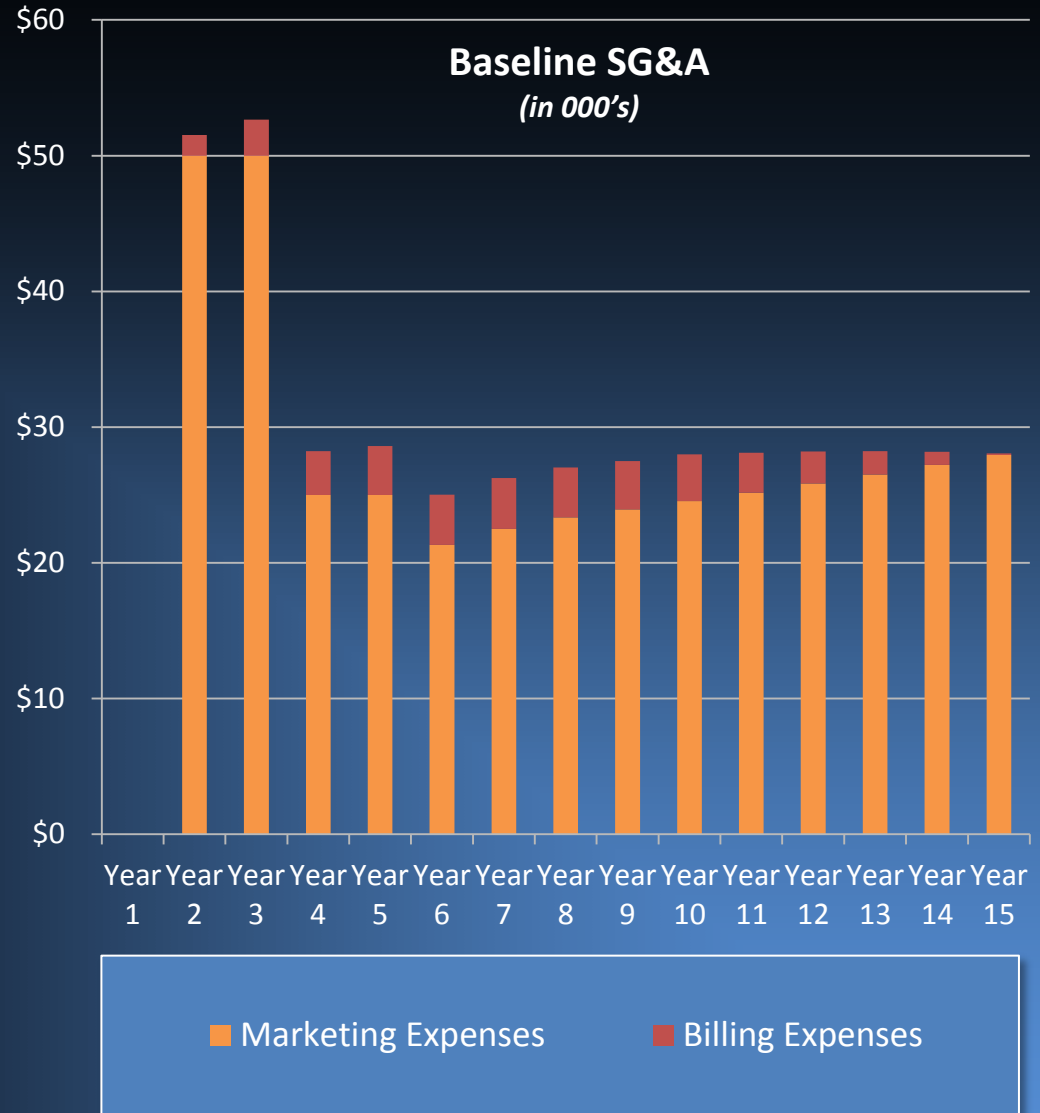
- Bandwidth/IP Addresses
 - 2 transport circuits w/ delivered bandwidth quoted at \$.60/Mbps composite.
 - IPv4 lease fee of \$.50/address/mo.
- Staffing
 - Headcount per detail slide
 - 2% annual wage increase
 - 40% benefits loading
- Vehicle Maintenance
 - 15k miles annually per vehicle
 - \$.75/mile growing at 2.5%
- Professional Services
 - Implementation Support: \$240k
 - Legal/Acct: \$5k/year
 - Marketing Agency: \$10k (Year1) /\$5k (years 2+)
- Other Opex
 - Vendor maintenance of \$55k/year for OSS/BSS and FTTP electronics
 - Vehicle Maintenance: \$.75/mile
 - Rent: \$120k/year
 - Utilities: \$20k/year



GENERAL & ADMINISTRATIVE EXPENSE

KEY INPUTS

- Marketing
 - Year 1: \$100k
 - Years 2-5: \$250k
 - Year 6+: 1% of revenues
- Billing
 - 80% of residential and 50% of commercial using paperless billing
 - Paper bill cost of \$.75/each/month and growing 3% annually
- Overhead Cost Allocation
 - None



- ◆ Dedicated FTTP System Full Time Equivalent (FTE)
 - ◆ System GM: 1 FTE
 - ◆ Data Technician: 1 FTE
 - ◆ Marketing Coordinator: Not included
 - ◆ Commercial Account Rep: Not included
 - ◆ Sales Engineer / MDU Accounts: Not included

- ◆ Positions funded using 2017 proposed pay plan, 40% benefits loading, and 2% annual salary increase



FTE LEVELS: DEDICATED FRONTLINE EMPLOYEES

- ◆ Customer / Technical Service Representatives (CSRs/TSRs)
 - ◆ CSRs handle inbound/office sales, order entry and first tier support
 - ◆ TSRs handle all second tier customer support, dispatch and service provisioning
 - ◆ Staffed at 1 FTE per 2k accounts growing to 4k by Year 5, but with minimum of 3 FTE for CSR and 2 for TSR positions to ensure phone coverage. Data Technician serves as backup TSR when needed.
- ◆ Install Technicians
 - ◆ Installs are 2-phase with pre-install followed by separate premise install
 - ◆ Pre-installs completed by a contractor at fixed rate (\$210) for all connections for Years 1-3, 50% of Year 4 connections, and then insourced
 - ◆ Premise installs are completed by a contractor at fixed rate (\$175), for all connections for Years 1-3, 50% of Year 4 connections, and then insourced
 - ◆ Each Install Tech can complete 3/day
- ◆ Service Technicians
 - ◆ Service techs fix subscriber problems
 - ◆ Service call volume equals 50% of all subscribers/year dropping to 25% by year 5
 - ◆ Each Service Tech can complete 4/day growing to 6/day by Year 5
- ◆ Maintenance Technicians
 - ◆ Network techs maintain the fiber system from the backbone to the network access point. Network tech is most senior tech in the line crew
 - ◆ 1 per 1,000 plant miles



INCREMENTAL BROADBAND FTE REQUIRED

| Position Title | Salary (unloaded) | Year1 | Year2 | Year3 | Year4 | Year5 | Year6 | Year7 |
|-------------------------------|-------------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| System GM | \$120,000 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Marketing Coordinator | \$65,000 | - | - | - | - | - | - | - |
| MDU Account Manager | \$80,000 | - | - | - | - | - | - | - |
| Comm. Acct Rep | \$80,000 | - | - | - | - | - | - | - |
| Sales Engineer / MDU Accounts | \$90,000 | - | - | - | - | - | - | - |
| Headend Tech | \$85,000 | - | - | - | - | - | - | - |
| Data Tech / Backup TSR | \$85,000 | 0.5 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Field Ops Supervisor | \$70,000 | - | - | - | - | - | - | - |
| CSRs | \$40,000 | - | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| TSRs | \$50,000 | - | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Install Techs | \$45,000 | - | - | - | 1.0 | 2.0 | 1.0 | 1.0 |
| Maintenance Techs | \$55,000 | - | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Service Techs | \$45,000 | - | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Total Headcount | | 1.5 | 9.0 | 9.0 | 10.0 | 11.0 | 10.0 | 10.0 |

- ◆ Network Construction
 - ◆ OSP Construction: \$815 composite cost per premise passed
 - ◆ Subsequent plant extensions: \$407/meter passed
 - ◆ Backbone/Feeder Construction: \$85/meter passed
 - ◆ Year 10 Network electronics upgrade: \$75/premise passed
- ◆ Facility Capital Costs
 - ◆ Build-out of new leased office location: \$100k
- ◆ Software
 - ◆ OSS/BSS: \$250k
 - ◆ Fiber Management & Network Management: \$50k
- ◆ Fixed Equipment
 - ◆ Core HE switch/router: \$125k
 - ◆ Internet systems back office: \$75k
 - ◆ Field Tech Equipment/Tools: \$95k

- ◆ Vehicles
 - ◆ Service Vans Per Install Technician: 1.0
 - ◆ Heavy Service Trucks Per Maintenance Technician: 0.5
 - ◆ Service vans: 6 at \$45k each
 - ◆ Heavy Service Trucks (non-insulated): 1 at \$90k each
 - ◆ Install Rigs: 1 per Install Technician at \$20k each
 - ◆ Vehicles replaced at 6 year intervals
- ◆ Contract Labor
 - ◆ Pre-Installs: 100%/100%/100%/50%/0% for Years 1-5 at \$210 each
 - ◆ Premise Installs: 100%/100%/100%/50%/0% for Years 1-5 at \$175 each
- ◆ Optical Network Terminals (ONTs)
 - ◆ Residential/Business ONT (non-WiFi): \$150 each
 - ◆ Residential/Business ONT (80211.ac WiFi): \$200 each
 - ◆ Year 7 ONT upgrade: \$124k (\$40/ea.)
- ◆ Fiber Drop & Powering
 - ◆ Fiber drop and connectors: \$125 each
 - ◆ Power cord and UPS: \$52 each (\$12 for non-voice install without UPS)

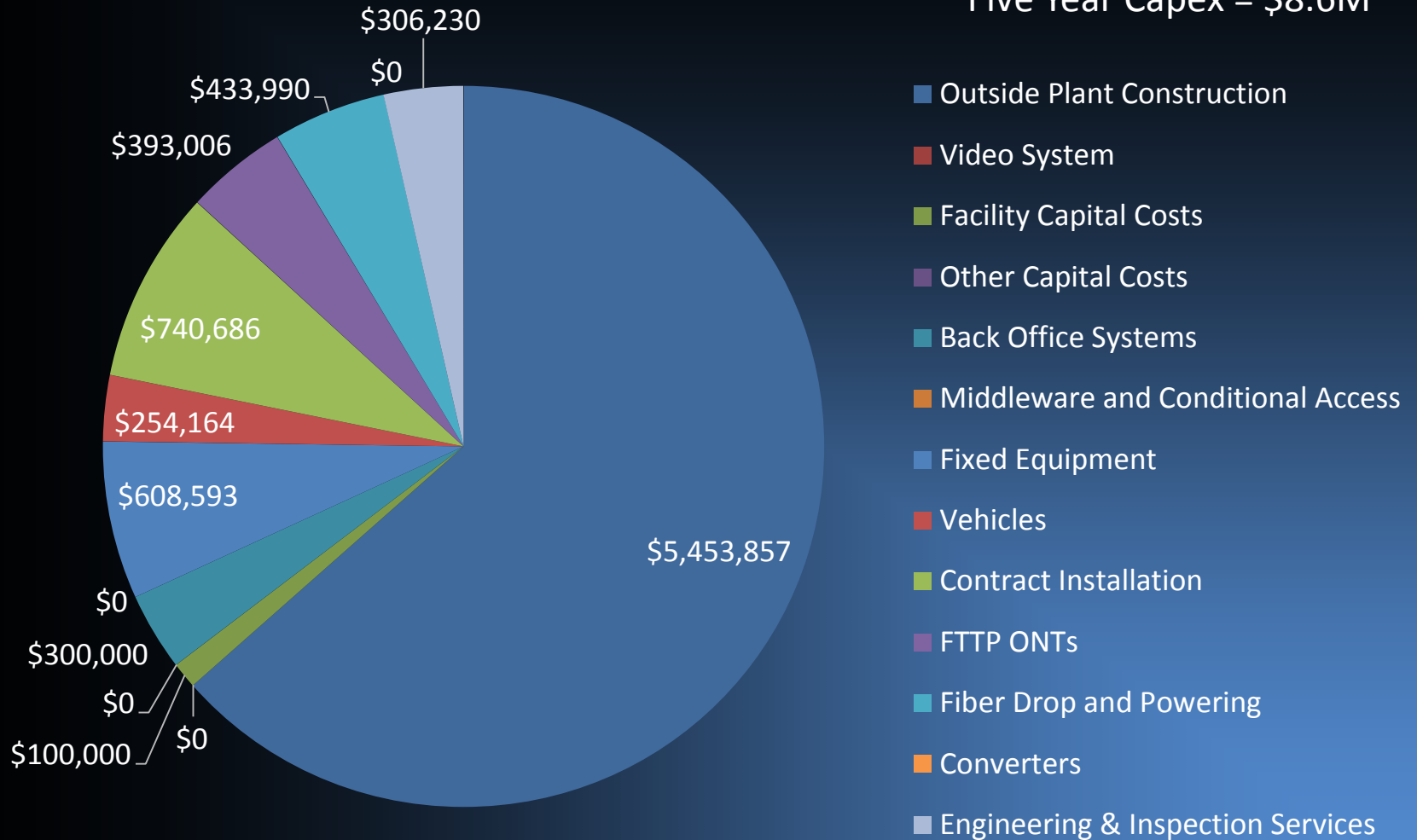
- ◆ Engineering and Integration
 - ◆ Walk out & strand mapping: \$0 per mile
 - ◆ Make ready engineering: \$0 per mile
 - ◆ FTTP design: \$2,000 per mile
 - ◆ Construction management services: \$3,000 per mile
 - ◆ As-built drawings: \$250 per mile
 - ◆ Backbone/Feeder design: \$75k flat fee

- ◆ Locates
 - ◆ Not included

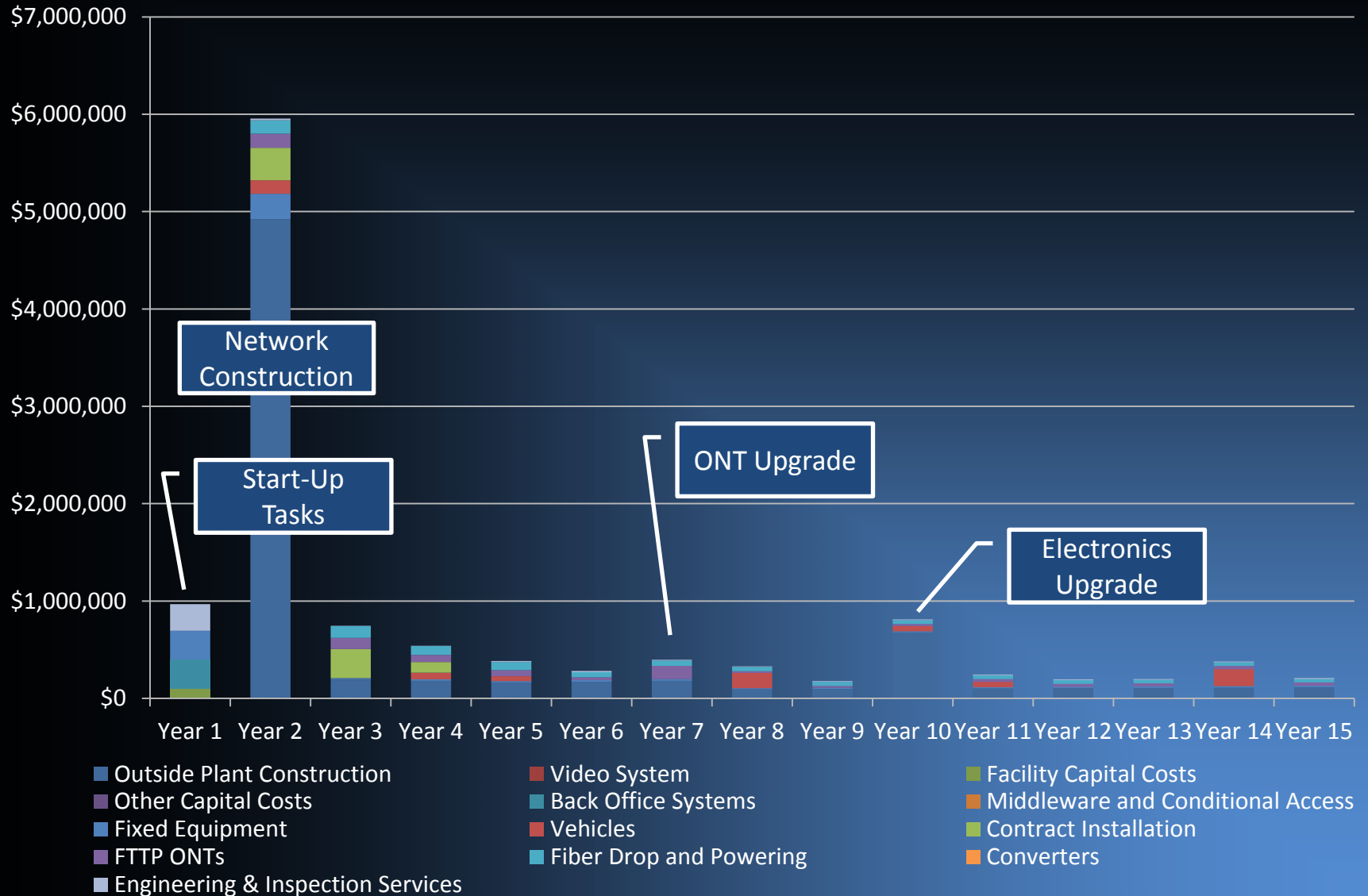
- ◆ Long term financing
 - ◆ Single round of financing (Year 1)
 - ◆ Three years interest only and 17 years of principal payments
 - ◆ 2.0% issuance, \$0 reserve requirement
 - ◆ Interest rate – 4%
- ◆ Short term financing
 - ◆ Provides for cash needs not covered by long term financing
 - ◆ Balance accumulates over first 10 years including interest (4%)
 - ◆ Level payments begin in year six over ten year payment plan
- ◆ Start-up period included as Year 1 of the business case
 - ◆ No revenues assumed during first year of the plan
 - ◆ Technical Trial underway at the end of Year 1
- ◆ Other assumptions
 - ◆ Bad debt = 3% of gross revenues
 - ◆ 2% interest on cash reserves
 - ◆ Discount rate = 5% for present value calculations
 - ◆ 10 billable months in Year 2

BASELINE CAPEX – YEARS 1-5

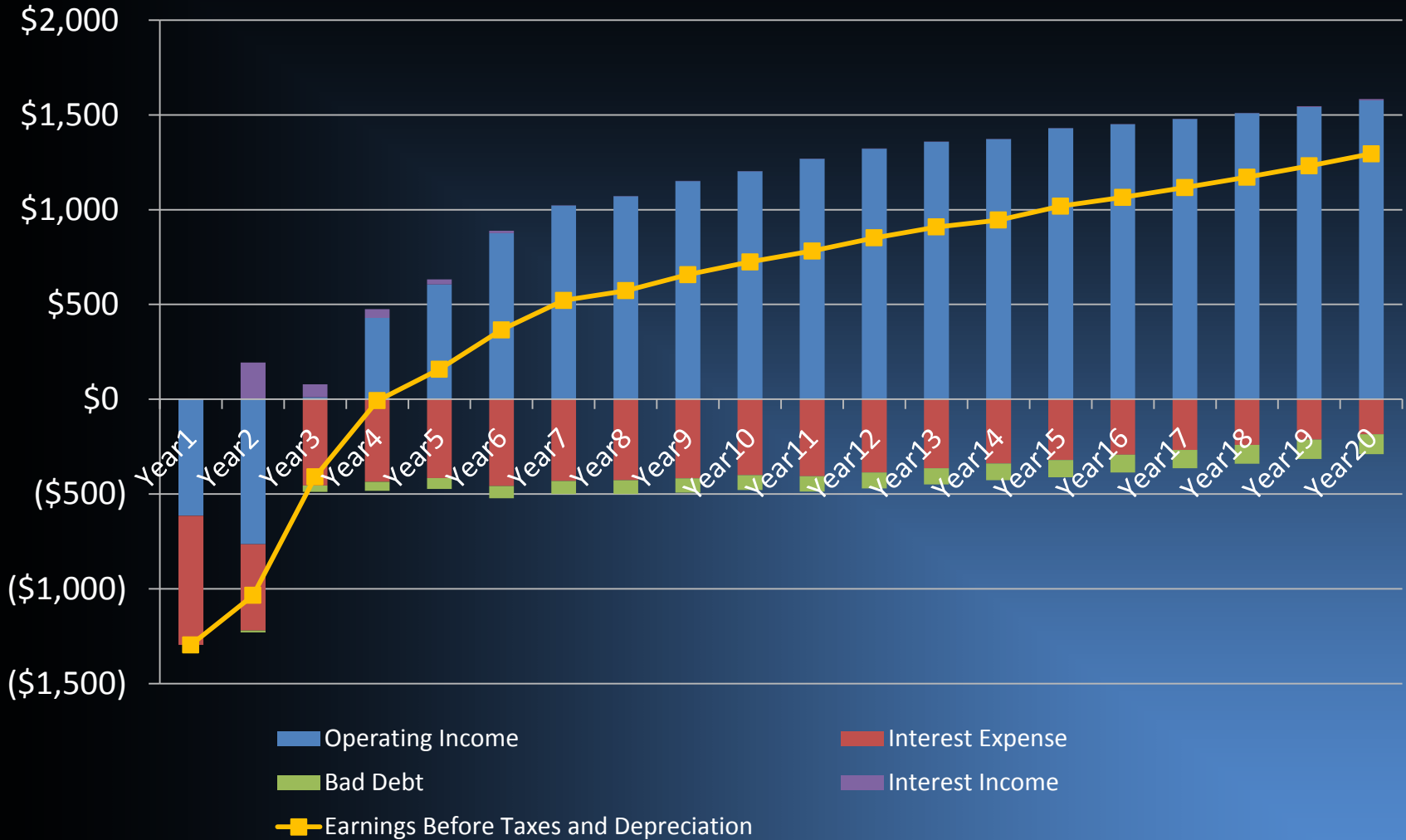
Five Year Capex = \$8.6M



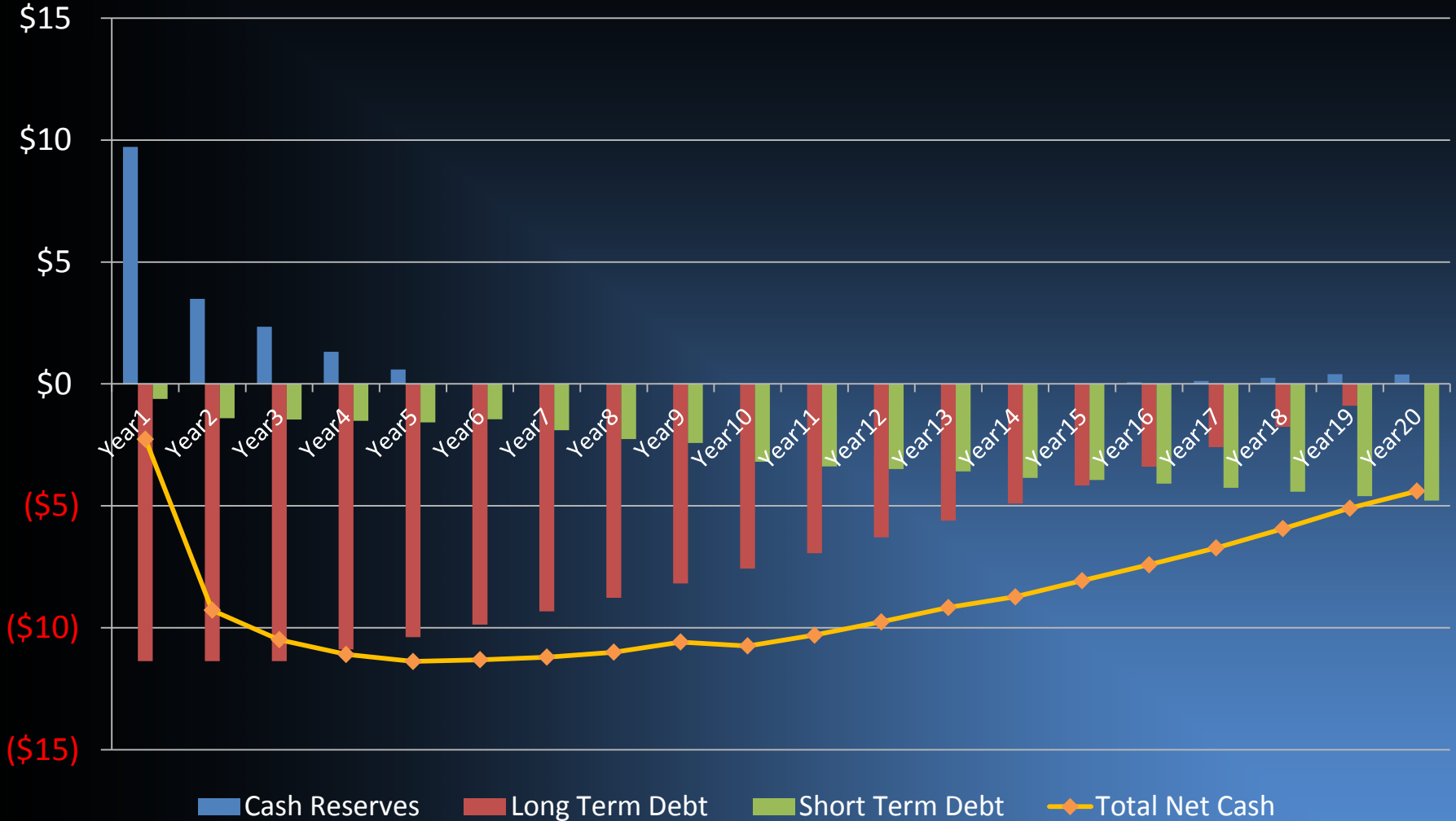
RETAIL MODEL: BASELINE CAPEX BY YEAR



BASELINE: EBITDA (\$'000'S)



BASELINE: NET CASH (\$M)



Financial Analysis
Business Structure Options

EXAMPLE MUNICIPAL FTTP SYSTEMS MODELS

| Business Model | Municipality | Service Provider | Funding |
|----------------|------------------------|------------------|---|
| Retail | Longmont, Colorado | The City | The City via Revenue or General Obligation Bond |
| Wholesale | Westminster, Maryland | Ting | |
| | Huntsville, Alabama | Google Fiber | |
| Franchise | Lincoln, Nebraska | Allo | The Service Provider |
| | Austin, Texas & Others | Google Fiber | |

- ◆ Wholesale Model
 - ◆ Superior builds and maintains the physical fiber network to pass all premises
 - ◆ Retailer is responsible for all other functions/costs
 - ◆ Details of partner roles on next slide

- ◆ Franchise Model
 - ◆ Franchising authority grants franchise agreement including terms for franchise fee, premises passed, ROW access, and construction requirements
 - ◆ End user fees are not specified or regulated other than non-discriminatory pricing
 - ◆ Superior plays no role and does not fund the FTTP system*
 - ◆ Not recommended based on recent withdrawal of Google Fiber and Axia

* Pro forma analysis is not relevant to the Franchise Model with no Superior investment requirement.



WHOLESALE MODEL ROLES

| Function | Operational Responsibility | Longmont Model | Westminster Model |
|-----------------------|--|---|--|
| Private Partner | | NA | Ting |
| Network Services | | Data: Superior Voice: CLEC Video: Not Offered | Data: RSP Video & Voice: RSP or 3 rd Party |
| Network Assets | Backbone, Feeder, and Distribution Conduit/Fiber | Superior | Superior |
| | FTTP Electronics | | RSP |
| | Fiber Drop | | Superior |
| | ONT and Inside Wiring | | RSP |
| Network Maintenance | Fiber & Conduit | | Superior |
| | Electronics | | RSP |
| | Outage Response | | Superior |
| Bandwidth | Backbone Interconnection | | RSP |
| Software | OSS/BSS | | RSP |
| | Fiber Management | | Superior & RSP |
| Marketing & Promotion | Advertising, Sales, Branding | | RSP or 3 rd Party |
| | Community Engagement | | Superior & RSP |
| | End User Pricing | | RSP |
| Customer Operations | Help Desk, Service Calls, Billing | | RSP or 3 rd Party |
| | Customer Installs and Disconnects | | RSP |

- ◆ City Role
 - ◆ Design, construction, and maintenance of the fiber network. City retains title to the network.
 - ◆ 24/7 availability for unscheduled maintenance with 4 hour on-site response timeframe
- ◆ Network Point of Demarcation
 - ◆ Residential: Exterior wall closest to public ROW
 - ◆ Commercial: Patch panel in telecom closet
- ◆ Services
 - ◆ Triple Play with Ting providing data service (up to 1Gbps) and ‘arranging’ for voice and video
 - ◆ Retail rates are at the sole discretion of Ting
- ◆ Financial Terms
 - ◆ Premise Passed Fee: \$6/month
 - ◆ Connected Premise Fee: \$17/month
 - ◆ Fees apply whether business or residential connection
 - ◆ ARPU Adjustment: The Connected Premise Fee will increase by \$1 for every 10% increase in Ting’s realized ARPU (compared to baselined ARPU at 1,500 subscribers)

- ◆ Ting is exclusive provider for Phase 1
 - ◆ 'Open Access', but with initial period of exclusivity for Ting for data service. Exclusivity protection lasts until either:
 - ◆ Two years after the launch of each deployment phase service area, or
 - ◆ Penetration reaches 20% and/or Ting achieves 3,000 end user customers (of 7,200 HHs)
- ◆ Ting operates under 2 roles: Network Operator and Services Provider
 - ◆ As Network operator it is the active wholesaler to unaffiliated Service providers that it will be competing with. The City has no active role with RSPs other than Ting.
 - ◆ Ting will individually negotiate wholesale agreements with each additional RSP. Agreements must be non-discriminatory but terms can vary across these agreements.
 - ◆ As Network Operator Ting will install and maintain all premise inside wiring and CPE, including the ONT. The ONT will be outdoor vs. indoor.
- ◆ Other Terms
 - ◆ 10 Year Term with 2 ten year renewal periods
 - ◆ City must renew if actual wholesale revenues exceed debt service by 10% or more
 - ◆ Termination for Convenience: City can terminate with 6 months notice

- ◆ Background
 - ◆ Virtual Wireless Network Operator launched in 2012. Sprint and T-Mobile are their host networks.
 - ◆ Owned by parent Tucows
- ◆ FTTP Services
 - ◆ Residential and commercial Internet access (1G residential/commercial and 5M residential)
 - ◆ Video in development
- ◆ Retail Service Provider for 2 municipal FTTP systems
 - ◆ May 2015: Charlottesville, VA (18k households)
 - ◆ August 2015: Westminster, MD (7k households)
 - ◆ In development: Holly Springs, NC (8k households) and Sandpoint, ID (4k households)
- ◆ Overbuild Competitors
 - ◆ Charlottesville, VA: Comcast and CenturyLink
 - ◆ Westminster, MD: Comcast and Verizon
 - ◆ Holly Springs, NC:

- ◆ Retail Model Risks
 - ◆ Service revenues may be insufficient to cover debt service requirement
 - ◆ Technology advances may require more frequent or costly system upgrades than forecast
 - ◆ Personnel or other operating expenses may exceed forecast
- ◆ Wholesale Model Risks
 - ◆ Lease rates may be too low to pay off the long term debt from the fiber build
 - ◆ Retailer price levels may not be competitive in a DOCSIS3.1 environment with Comcast's \$70 Gig service
 - ◆ Retailer may go bankrupt or default on wholesale payments
- ◆ Franchise Model Risks
 - ◆ Not applicable to Superior

Pro Forma Analysis

Wholesale Models

- ◆ Financial feasibility requires both parties to meet financial return obligations
 - ◆ Wholesaler: Debt service of the bond(s)
 - ◆ Retail Service Provider (RSP): Sufficient ROI for shareholders = Net Cash positive by Year 8
- ◆ Pro forma methodology
 - ◆ RSP Case: Identify the Per Passing and Per Connect wholesale fees that enable the RSP to become Net Cash positive by Year 8 (this equates to an 8 year IRR of 0%)
 - ◆ Superior Case: Input these Per Passing and Per Connect wholesale fees as the Superior revenues and compare the financial outcome to the Superior Retail Case
- ◆ RSP Case key financial inputs
 - ◆ Same penetration levels as Retail Case. Pricing is higher with lower 1G dispersion
 - ◆ Headcount efficiencies (detail next slide). Same wage levels, but lower overhead loading (30% vs. 40%)
 - ◆ Higher cost of debt without substantial revenue/asset backing (5.5% vs. 4%)

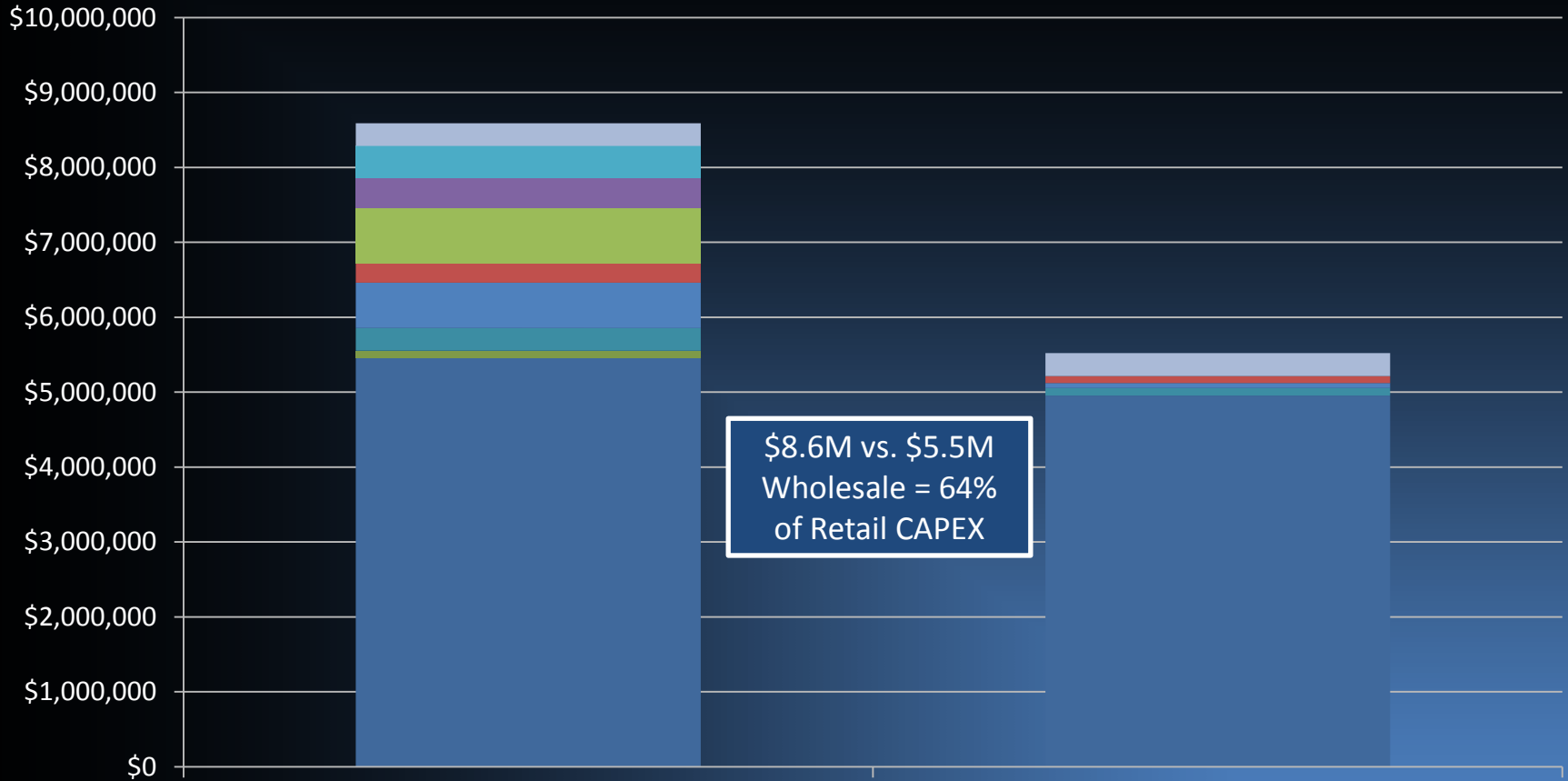
- ◆ Private partner serves as Retailer and offers Triple Play (Retail Service Provider)
- ◆ RSP staffing:
 - ◆ 1 FTE as system GM
 - ◆ 1 Data Technician
 - ◆ No incremental CSRs or marketing staff
 - ◆ No incremental TSRs
 - ◆ Same resource levels for Field Technicians and contractors
- ◆ RSP responsible for:
 - ◆ Customer drop, ONT, set tops, and installation process and materials
 - ◆ Bandwidth, voice switch, video feed
 - ◆ Customer service, billing, help desk, and ONT monitoring



BROADBAND FTE FOR WHOLESALE MODEL

| Position Title Superior / RSP Headcount | Salary (unloaded) | Year1 | Year2 | Year3 | Year4 | Year5 | Year6 | Year7 |
|--|----------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| System GM | \$120,000 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Marketing Coordinator | \$65,000 | - | - | - | - | - | - | - |
| MDU Account Manager | \$80,000 | - | - | - | - | - | - | - |
| Comm. Acct Rep | \$80,000 | - | - | - | - | - | - | - |
| Sales Engineer / MDU Accounts | \$90,000 | - | - | - | - | - | - | - |
| Headend Tech | \$85,000 | - | - | - | - | - | - | - |
| Data Tech | \$85,000 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Field Ops Supervisor | \$70,000 | - | - | - | - | - | - | - |
| CSRs | \$40,000 | - | - | - | - | - | - | - |
| TSRs | \$50,000 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Install Techs | \$45,000 | - | 1 | 1 | 1 | 2 | 2 | 2 |
| Maintenance Techs | \$55,000 | - | 1 | 1 | 1 | 1 | 1 | 1 |
| Service Techs | \$45,000 | - | 1 | 1 | 1 | 1 | 1 | 1 |
| Total Headcount | | 1 / 2 | 2 / 4 | 2 / 4 | 2 / 4 | 2 / 5 | 2 / 5 | 2 / 5 |

CAPEX: RETAIL VS. WHOLESALE (YEARS 1-5)

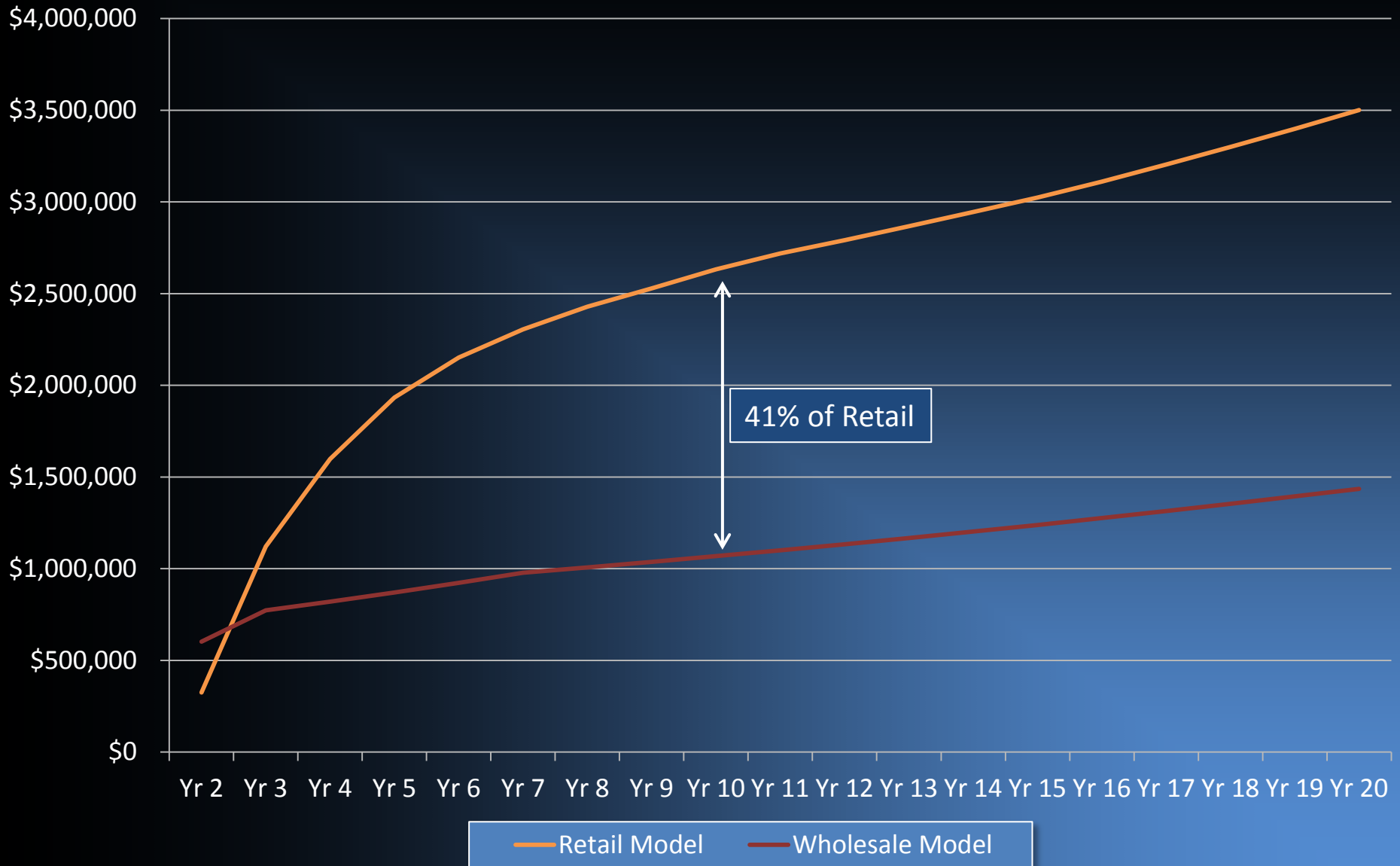


Retail Model

Wholesale Fiber Lease Models

- Outside Plant Construction
- Video System
- Facility Capital Costs
- Other Capital Costs
- Back Office Systems
- Middleware and Conditional Access
- Fixed Equipment
- Vehicles
- Contract Installation
- FTTP ONTs
- Fiber Drop and Powering
- Converters
- Engineering & Inspection Services

SUPERIOR REVENUES: RETAIL VS. WHOLESALE



WHOLESALE FINANCIAL OUTCOMES

| Outcome | Superior as Wholesaler | Retail Service Provider |
|-----------------------------|--------------------------------|-------------------------|
| Wholesale Terms | Per Passing & Per Connect Fee* | |
| Equity Investment | - | \$2.0M |
| Long Term Debt | \$7.6M | \$1.0M |
| Working Capital Requirement | \$0.3M | \$1.6M |
| Total Funding | \$7.9M | \$4.6M |
| 10 Year IRR | - | -7.2% |
| Net Cash – Year 10 | - | (\$1.9M) |
| Net Cash – Year 15 | \$0.3M | \$0.5M |
| Project Break Even | 15 Years | 14 Years |

*Undisclosed to not reveal Superior's minimum negotiation position

Pro Forma Analysis

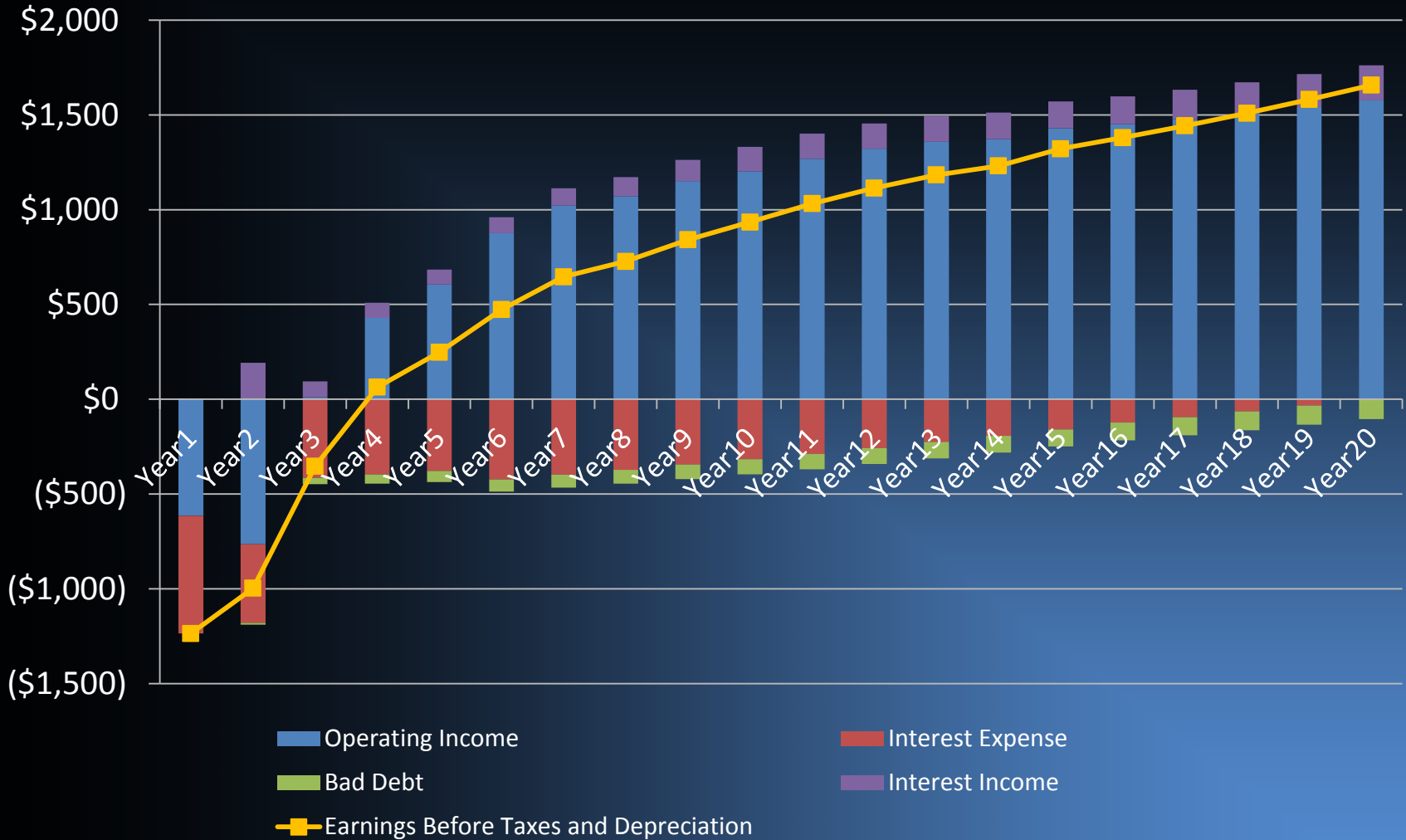
Conclusions

- ◆ Baseline Model is not financially self-sufficient
 - ◆ Primary weakness is staffing opex relative to limited revenue scale with just 4,900 passings
 - ◆ Implementing a wholesale strategy does not alleviate the scale issue under realistic 'win-win' wholesale fee financial terms

- ◆ Strategy options
 - ◆ Use equity funding: Sales Tax (.25%) or Property Tax (4.00 mills) to provide \$840k annually in supplemental funding for Years 1-10.
 - ◆ Share customer support staffing with an existing CO municipal FTTP system

- ◆ Next Steps?

TAX SUBSIDY VIEW: EBITDA (\$'000'S)



TAX SUBSIDY VIEW: NET CASH (\$M)



| Outcome | Baseline | Tax Subsidy (10 Years) |
|----------------------------|--|-----------------------------------|
| Business Model | Town is Retailer | |
| 1G Price / Dispersion | \$60 / 89% | |
| Internet Penetration | Year 5: 37.0% / Year 10+: 40.4% | |
| Voice Penetration (eroded) | Year 5: 16.9% / Year 10: 12.7% / Year 15: 8.4% | |
| Sales Tax Contribution | - | \$8.4M |
| Long Term Debt | \$11.4M | \$10.4M |
| Working Capital | \$4.6M | \$1.4M |
| Total Funding | \$16.0M | \$20.2M |
| Net Cash – Year 15 | (\$8.1M) | (\$4.9M) |
| Net Cash – Year 20 | (\$4.4M) | \$1.3M |
| Project Break Even | >20 Years | 19 Years |