DATE: August 23, 2016 **STAFF:** Seonah Kendall, Economic Policy & Project Manager Mike Beckstead, Chief Financial Officer	**WORK SESSION ITEM** **City Council**

SUBJECT FOR DISCUSSION

Broadband Plan Update - Business Model and Feasibility Analysis.

EXECUTIVE SUMMARY

The purpose of this item is to provide City Council an update on the Broadband Plan and review the recent findings of the updated Broadband Market Demand Study, Broadband Feasibility Analysis by Business Models, Baseline Financial Feasibility, and next steps.

GENERAL DIRECTION SOUGHT AND SPECIFIC QUESTIONS TO BE ANSWERED

This is an overview of the different business model structures, financial feasibility and next steps.

BACKGROUND / DISCUSSION

On November 3, 2015, 83% of Fort Collins voters supported Ballot Issue 2B, which overturned Senate Bill 05-152 removing legal barriers for the City's involvement, direct or indirect, in providing telecommunication services. This vote allows the City and citizens to consider and pursue the best broadband solutions based on the needs and desires of our community. It is important to note that the November election did not commit the City to provide broadband services in Fort Collins, nor does it mean that such services would be available immediately.

Additionally, in late 2015, the City of Fort Collins engaged Uptown Services LLC, a Colorado consulting firm, to provide six deliverables related to the City's exploration of broadband services:

- Asset Report and Map(s)
- Broadband Service Market Demand Report
- Target Broadband Standards Report
- Feasibility Analysis - by business model
- Strategic, Financial, Operational and Technological Risk and Opportunities Report - by business model
- Broadband Strategic Plan Synopsis and Recommendation Report

This update will focus on the updated market demand study, business model alternatives, sensitivity analysis, baseline financial feasibility model and next steps.

City Broadband Strategic Objectives

The Broadband Plan overall objective is to bring high speed Internet to the City of Fort Collins, while making an informed decision through evaluation of risk and opportunities. Additional benefits include competitive pricing (market pricing at $70/month or less for 1 Gbps and an affordable Internet tier), universal coverage across the City, underground service for improved reliability, and providing services within a reasonable timeframe.

Fort Collins Market Demand Study Update

In March 2016, Comcast announced the 2016 scheduled rollout of its 1 Gbps-capable DOCSIS 3.1technologies to residential and business users in Atlanta, Nashville, Chicago, Detroit and Miami. Estimated full rollout is anticipated by the end of 2017. Comcast's promotional price for 1 Gbps DOCSIS 3.1 is $70/month for a 3-year contract or $139.95/month on a non-contract basis. The City's consultants, Uptown Services, had already

performed the initial Fort Collins Market Demand Study which serves as inputs to model the City's financial feasibility analysis. The statistically-valid initial study estimated demand and take-rate (i.e., potential subscribership rate) assumptions by sector. However, with the Comcast announcement, there were concerns of the potential loss of "first market advantage" in Fort Collins. Thus, Uptown completed a second market demand study (from the initial 400 respondents) to understand the price sensitivity of the Fort Collins market and the potential lost market share.

The original pre-DOCSIS 3.1 survey indicated that there is high purchase intent by residents, estimating a take-rate of 38.8%. The survey describes residential and small-to-medium sized business market (or "mass market") needs are lower prices, increased Internet speed and improved reliability.

The updated study surveyed 100 of the original 400 respondents and tested three post-DOCSIS 3.1 scenarios:

- 1Gbps provider at $70/month (City loses first mover advantage)
- City offers 1Gbps at $50/month and Comcast offers DOCSIS 3.1 1Gbps at $70/month (baseline pro forma)
- City and Comcast both offer 1 Gbps at $70/month (to evaluate elasticity)

Currently, Comcast has 57% of the current Internet market share in Fort Collins; Century Link has 37%, satellite and other methods account for 6% of the market. If Comcast was to provide 1 Gbps before a rollout of any other 1 Gbps fiber-to-the-premise (FTTP), the market disbursement would be: Comcast - 62%, Century Link 33%, satellite and other methods at 5% of the Fort Collins market. In essence, Comcast would add 5 points in market share and lock in 22% of the Fort Collins Internet subscribers with a $70 Gig tier. This results in a drop of FTTP Internet penetration from 38.8% to 30.2% for pro forma analysis purposes. Additionally, voice service penetration would drop from 28.6% to 8.4% if Comcast was to roll out DOCSIS 3.1 before a FTTP system build out.

Business Model Alternatives and Sensitivity Analysis

Each market and business model presents a unique combination of opportunities and challenges. City staff and Uptown Services modeled the outcome of each business model from a quantitative perspective to allow for a back-to-back comparison for each scenario. Three broadband business models were explored: municipal utility/retail, wholesale and franchise.

- **Municipal-owned Retail**

Municipal utility/retail model is similar to the model that Longmont, CO is providing. The municipality would build and maintain the physical fiber infrastructure network to pass all premises. The municipality acts as the Internet and voice service provider and manages all customer acquisition and services (video is optional).

- **Public/Private Partnership**

Examples of public/private partnerships (or "wholesale model") are Huntsville, Alabama (Google Fiber) and Westminster, Maryland (Ting). Each wholesale model is unique to the community and private partner. The structure of wholesale terms and risk allocation has improved within municipal broadband with lessons learned from legacy wholesale agreements. The general basis is that the municipality builds and maintains the physical fiber network to pass all premises. The private partner or "retailer" is responsible for all other functions/costs such as customer acquisition, connection, Internet service provider and customer service. The municipality is compensated via monthly per passing (connected or not) and/or per connected premises fees. Success is dependent upon private partner. Additionally, many municipalities have required a non-exclusive franchise agreement that allows additional potential parties to utilize the network.

- **Franchise**

A franchise model is similar to Google Fiber in Kansas City and Allo in Lincoln, NB. The municipality grants a 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. The private

provider builds and maintains the physical infrastructure and acts as the Internet provider who manages all customer acquisition and services. A disadvantage for a municipality is that there is less control of quality, availability and technological advances. Additionally, companies such as Google Fiber has moved away from this type of model and moved toward a public/private partnership.

	Municipal Retail	Wholesale (alternative)	Franchise
Capital Expenditures (CapEx) (Years 1 - 5)	$110M	$85M	$0
CapEx (Years 6 - 15) - upgrades/maintenance	$15M	$3M	$0
Total CapEx	$125M	$88M	$0
FTE	33	5	0
Project Break Even	15 Years	12 - 18 Years	N/A

Uptown Findings

A retail model is financially feasible-even in the post-DOCSIS 3.1 environment. Total funding requirement for a retail model is $125M with the project becoming net cash positive in 15 years. Recent terms announced in other communities are not attractive for the wholesale (or public/private partnership) due to the higher risk on municipalities and low pass per premise fee paid to the municipalities (does not become net cash positive within 15 years). Fort Collins pass per premise fee requirement needs are higher due to higher costs associated to undergrounding infrastructure. However, using an alternative scenario with an ideal pass per premise fee, a wholesale model could be feasible. Total funding requirement for a wholesale model is $88M.

Baseline Financial Feasibility Models

The feasibility analysis methodology creates a market-driven demand planning tool that is flexible and will allow for various options and strategies rather than a detailed business plan of a single option. Uptown Services, with City staff, has created a baseline financial analysis using the municipal broadband (retail) model.

Key assumptions included in the baseline financial feasibility model are:

- Post-DOCSIS 3.1 rollout in Fort Collins
    - 30.2% penetration rate
- Build-out in 5 years (1 year of engineering, 3 - 4 years of installation);
- Construction cost of $984/premise passed (based on sample design),
- Hiring of 33 FTEs and the purchase of assets such as property, plant and equipment for a full-service Internet provider.

The cost per passing (CPP) is the most significant assumption used in the model. The CPP was calculated by sample design-staff identified 7 subdivisions representative of the community for Uptown to use to identify costs associated. Single family homes were weighted based on parcels per zoning district and include labor, materials and a 15% contingency for the initial infrastructure build out. Multi-Density Units and commercial sampling were not completed. MDU cost is estimated to be 50% of single family costs. Weighted CPP is $984/passing.

In conclusion, the baseline financial feasibility model is viable, becoming net cash positive by year 15.

Next Steps

Based on the findings of the financial and strategic analysis, the broadband core team will engage citizens, businesses and City Council to present findings, goals and strategies of the broadband plan. Additionally, City staff will begin exploratory discussions with potential partners and incumbents about the different business models. As additional information becomes available, financial feasibility analysis will be revised. Following this work and community outreach, staff anticipates having a recommendation outlining a long-term broadband plan and recap of community outreach for the Council work session scheduled for December 13, 2016.

ATTACHMENTS

1. Broadband Feasibility Analysis (PDF)
2. Broadband Assessment of Risk and Opportunity Report (PDF)
3. Powerpoint presentation (PDF)

FTTP Feasibility Study

for

The City of Fort Collins

Task 4 Report: Feasibility Analysis

August 2016

Uptown Services, LLC
Dave Stockton & Neil Shaw, Principals

CONTENTS

Potential Business Structures

Overview

WHOLESALE AND FRANCHISE MODELS

- Franchise Model
  - City 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
  - City executes conduit lease agreement (optional) providing long term access rights to City conduit
  - City does not fund the FTTP system*
- Wholesale Model
  - City 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

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

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 ROLES

Function	Operational Responsibility	Longmont Model	Westminster Model	Huntsville Model
Private Partner		NA	Ting	Google Fiber
Total Premises		40,000	7,000	105,000
Network Services		Data: City Voice: CLEC Video: Not Offered	Data: RSP Video & Voice: RSP or 3rd Party	Not Specified
Network Assets	Backbone, Feeder, and Distribution Conduit/Fiber	City	City	
	FTTP Electronics		RSP	
	Fiber Drop		City	RSP
	ONT and Inside Wiring		RSP	
Network Maintenance	Fiber & Conduit		City	
	Electronics		RSP	
	Outage Response		City	Not Specified
Bandwidth	Backbone Interconnection		RSP	
Software	OSS/BSS		RSP	
	Fiber Management		City & RSP	
Marketing & Promotion	Advertising, Sales, Branding		RSP or 3rd Party	
	Community Engagement		City & RSP	Not Specified
	End User Pricing		RSP	
Customer Operations	Help Desk, Service Calls, Billing		RSP or 3rd Party	
	Customer Installs and Disconnects		RSP	

WESTMINSTER MARYLAND

- 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)

WESTMINSTER MARYLAND (CONT.)

- 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

TING (WESTMINSTER PROVIDER)

- 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:

HUNTSVILLE ALABAMA

- City Role
  - Provide access to “excess fibers” beyond what Huntsville Utilities requires
  - FTTP system design, subject to review and approval by Google Fiber
  - Obtain all required permits
  - Construction, and maintenance of the fiber network. City retains title to the network.
- Network Point of Demarcation
  - Dark fiber ports originating at a colocation structure
  - Dark fiber ports terminating at a Multiport Service Terminal or Network Access Point
- Services
  - Not specified in Fiber Network Agreement
- Financial Terms
  - Premise Passed Fee: $5/month per MST port
  - Premise Passed Fee: $100/month per NAP port
  - Backbone Fiber Strands: $3,500/month each
  - Fees apply whether business or residential connection

HUNTSVILLE ALABAMA (CONT.)

- Construction Timeframes & Milestone Targets
  - Completion of Phase 1 is due 6 months after design acceptance
  - All construction completed 3 years from Phase 1 design acceptance
  - Targeted total premises passed of 105,000 premises upon network completion
  - Missed milestone penalties
    - If fewer than 95k premises passed at network completion, 1% of the total lease fee will be credited for each day of delay
    - If fewer than 75k premises passed at network completion, Google may terminate agreement
- Google Fiber (GF) can terminate the Fiber Lease Agreement under multiple conditions
  - If the City cannot correct design deficiencies within 30 days of GF submitting revisions
  - If the City cannot provide a video franchise agreement within 3 months of the Lease Agreement, or the video franchise is revoked during the Lease Agreement term
  - If the City fails to construct and deliver Phase 1 of the network on time
  - If the City fails to construct the complete network on time

LINCOLN NEBRASKA

- City Role
  - Access to all City conduit via 25 year lease
  - No investment by the City
- No guarantee of coverage/premises passed – only best effort
- End user prices
  - Retail pricing not specified
  - Affordable Internet tier will be offered
- Ability to Compete against Comcast?
  - Experience as an independent telco in NE – not an overbuilder
  - 1G priced at $90 MRC

PRO FORMA MODELING OVERVIEW

Structure	Model	Network Services	Pre DOCSIS3.1	Post DOCSIS3.1
Retail	"Longmont Model"	Data & Voice Services per Task 2 Report	**Pre-DOCSIS VIEW** Penetration (Res / Bus) • Internet: 38.8% / 45% • Voice: 28.6% / 41% • Video: 24.6% / 0%	**BASELINE (Post-DOCSIS)** Penetration updated per follow-up survey • Res Internet: 30.2% • Res Voice: 8.4% (at peak) • Bus: No Change **BASELINE + VIDEO** • Res Video: 19.1%
Wholesale	"Westminster Model"	Dark fiber lease Fees based on premises passed and connected	**WESTMINSTER** Penetration = Baseline • Residential: 38.8% • Commercial: 45.0% Westminster contract wholesale rates	**WESTMINSTER -50%** Penetration @ 50% of Baseline • Residential: 15.1% • Commercial: 45.0%
	"Huntsville Model"	Dark fiber lease Fees based on premises passed	**HUNTSVILLE** Penetration is irrelevant Huntsville contract wholesale rates	N/A
Franchise	Lincoln	Long term conduit lease (optional)	Financial analysis not required (No City investment)	

Pro Forma Analysis

Retail Model

BASELINE MODEL OVERVIEW

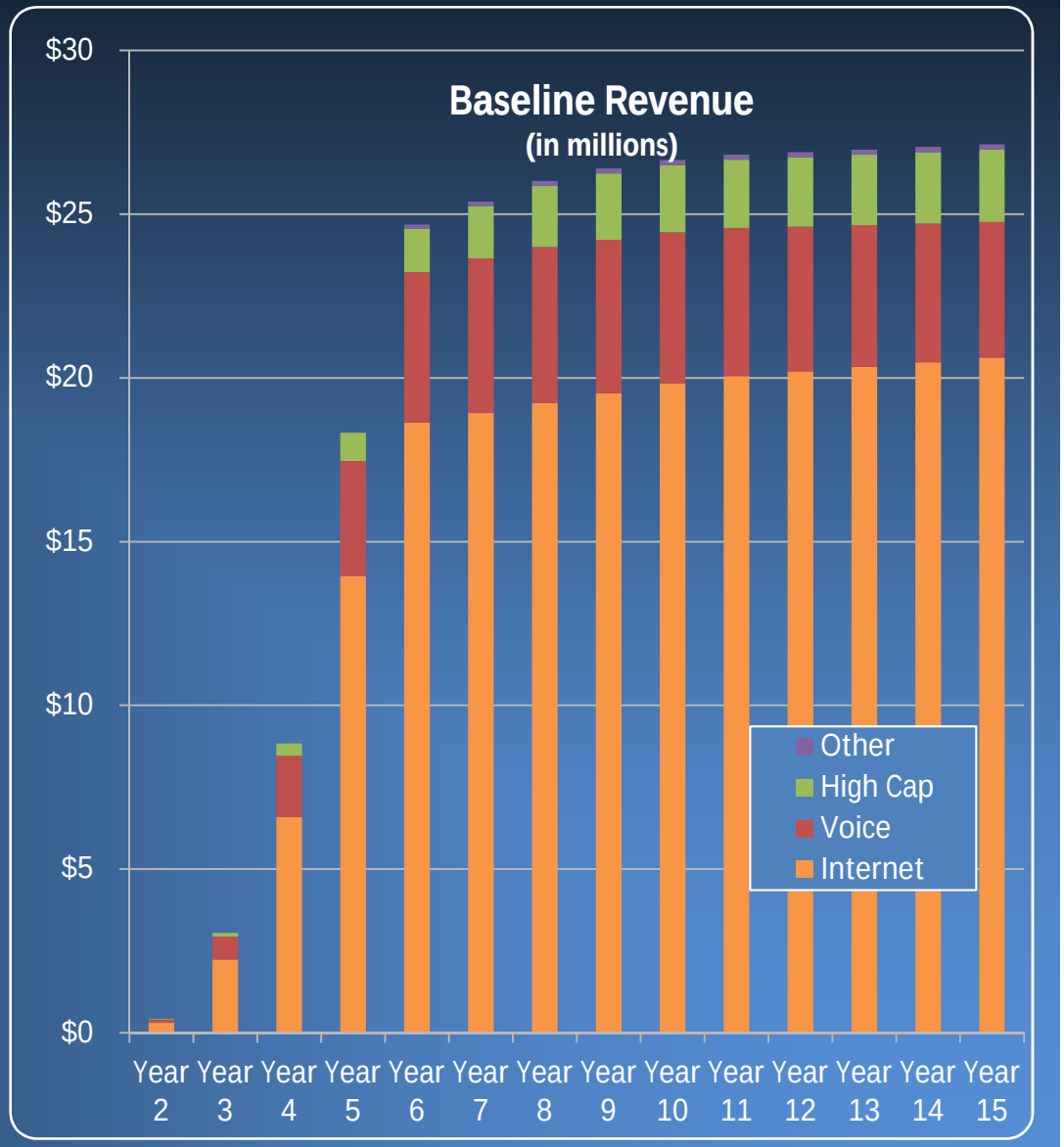
- Reflects specific Ft. Collins market conditions
  - Quantitative market research
  - Sample designs to evaluate and cost out construction options and methods
  - Salaries, wages, and overhead
- Retail Business Structure
  - Wholesale options evaluated as separate models
- Based on Longmont and Other Municipal FTTP Deployments
  - Headcount and contractor costs
  - Recent bids for equipment and construction labor
  - Bids and proposals for software, CLEC partner terms
- Assumes Comcast deployment of DOCSIS3.1 and reduced penetration impact (details provided in the Task 5 Report)
- Capital budget uses estimated cost/passing + 15% contingency
- Long term debt interest rate at 3.0% includes 75 basis point contingency

UPTOWN SERVICES, LLC

REVENUES

KEY INPUTS

- Premises
  - Residential: 62,000
  - Commercial: 8,000
  - % Complex: 5%
- Year 5 Penetration
  - Internet: 30.2%
  - Voice (eroded): 8.4%
- Residential Internet
  - Affordable Internet: $10.00
  - 25Mbps Tier: $39.95
  - 1Gbps Tier: $49.95
  - WiFi Upgrade: $7.95
- Commercial Internet
  - 25Mbps Tier: $59.95
  - 50Mbps Tier: $69.95
  - WiFi Upgrade: $9.95
- Voice
  - Residential: $25 net wholesale
  - Commercial: $14 net per line
- Install Fees
  - Residential: $30 (Year 6)
  - Commercial: $50 (Year 8)



BANDWIDTH SOURCING

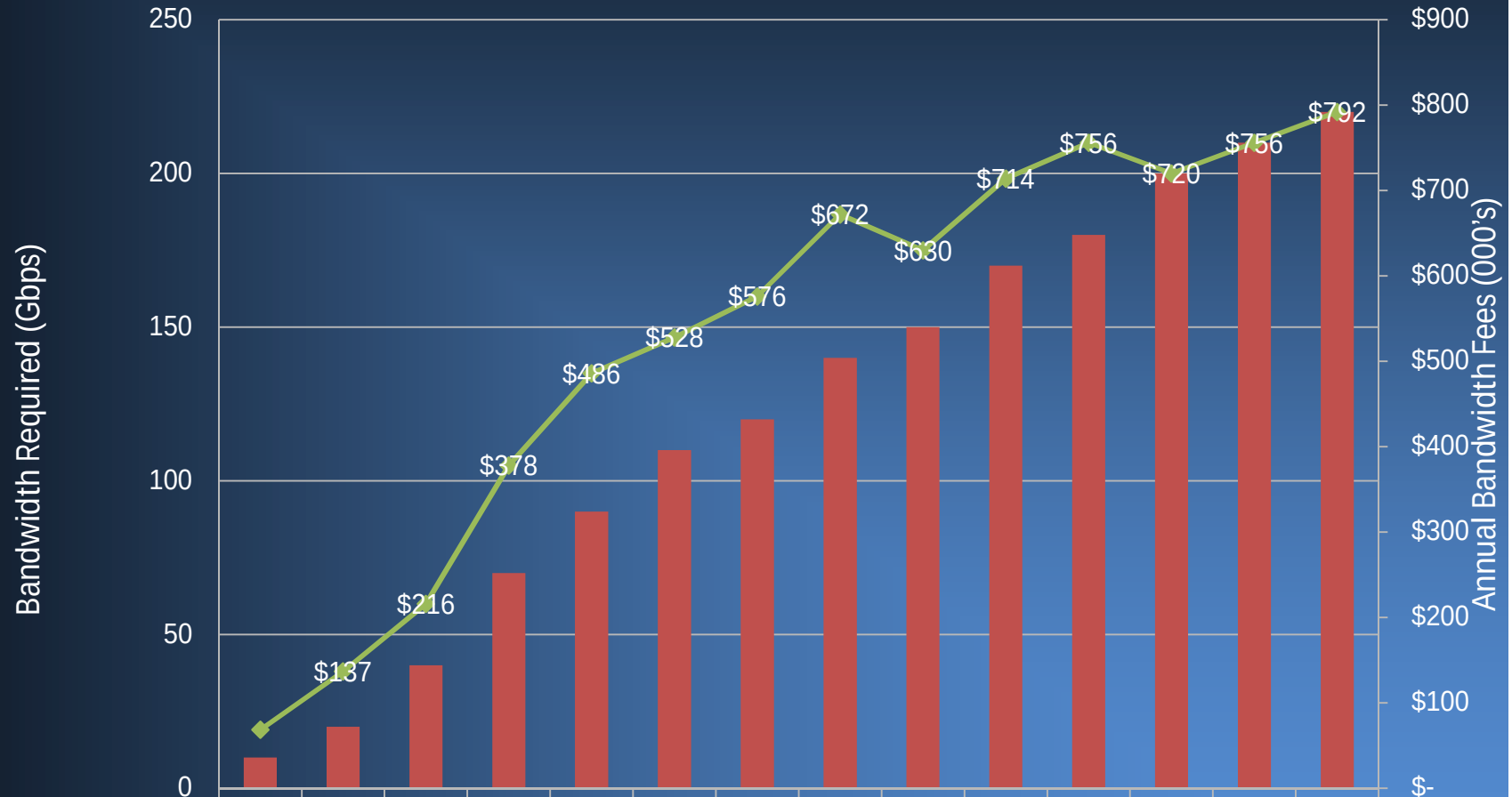
There are 2 strategy options for the City to acquire the necessary bandwidth to provide Internet access service:

A. Contract for delivered bandwidth to the City network headend 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

The direct access solution is more efficient, even at launch, given the scale of the Fort Collins FTTP system with a composite cost of $1.63/Mbps ($1.06 for transport and $.57/Mbps for bandwidth)

	Direct Access Configuration
Transport	Lease 2 10G transport circuits to 910 15th Street in Denver • A Location is 300 Laporte Ave • Z Location is Meet Me Room at 910 POP • Provider "A": 10G circuit for $13,126 MRC/$0 NRC and 3 year term • Provider "B": 10G circuit for $8,070 MRC/$200 NRC and 3 year term
Access	Lease 2 backbone connections at 910 15th for 10G capacity (CDR) on each • Provider "A": 10G Bandwidth for $7,900 MRC/$0 NRC and 2 year term • Provider "B": 10G circuit for $3,400 MRC/$0 NRC and 5 year term • Lease IP addresses (IPv4). Budget at 40¢ each.
Other Fees	X-Connect: $250 MRC per circuit x 2 = $500 MRC

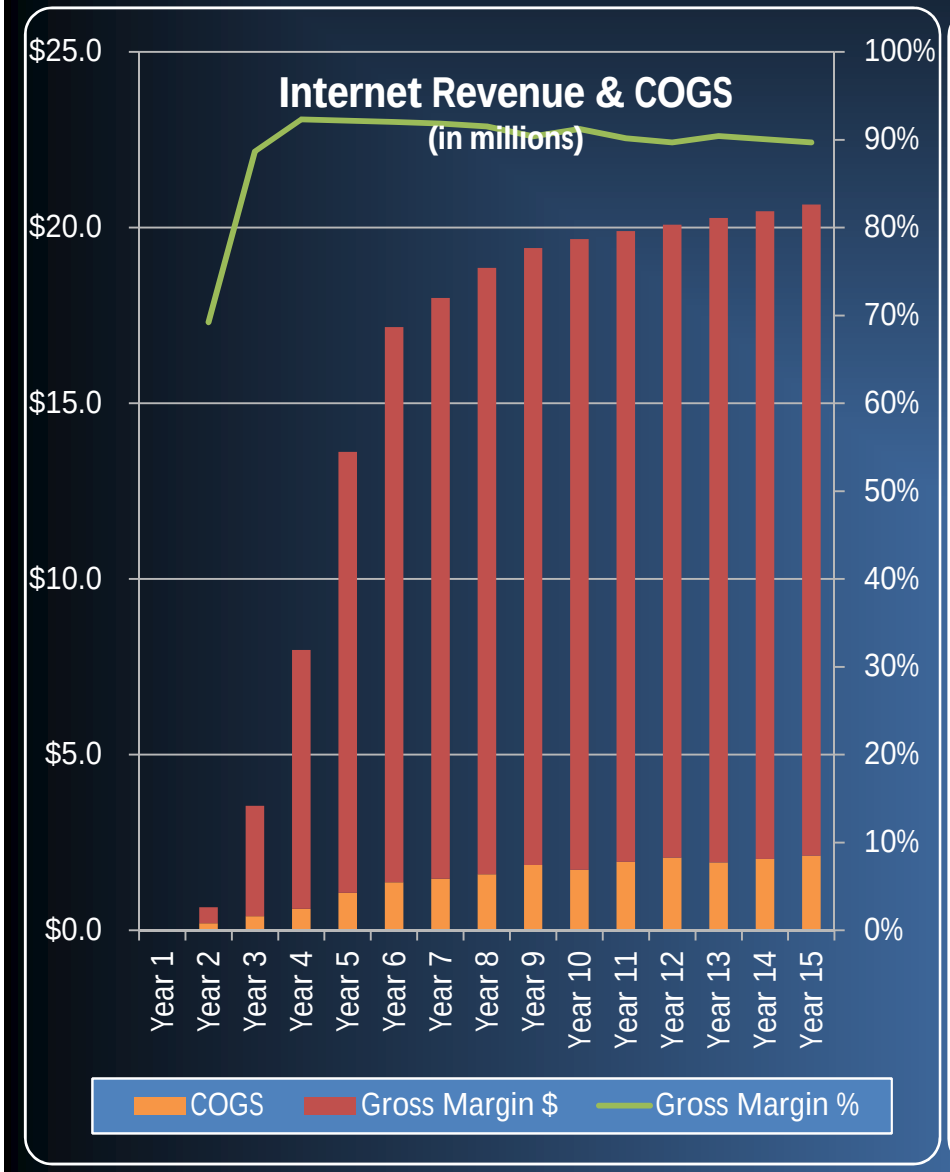
BANDWIDTH FORECAST

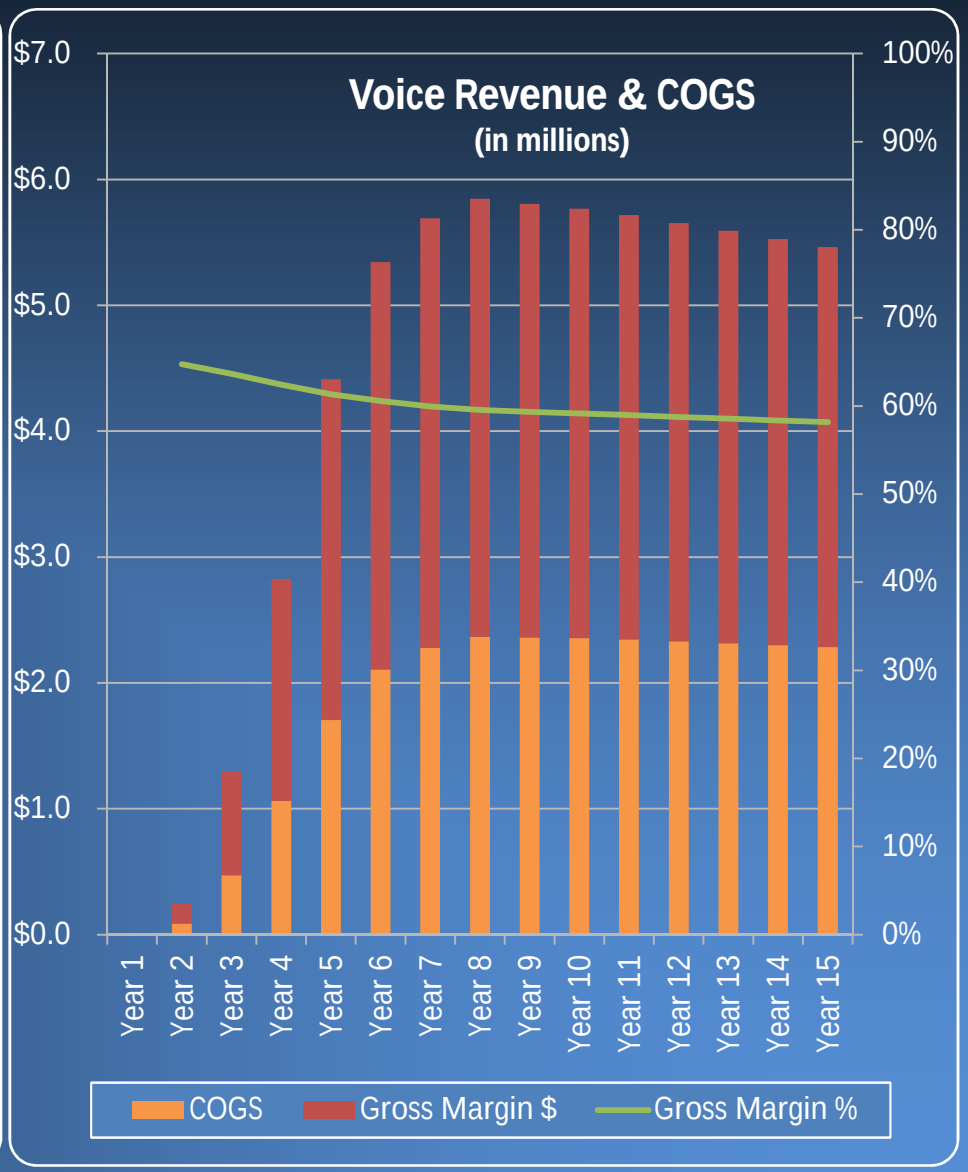


	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10	Yr11	Yr12	Yr13	Yr14	Yr15
Bandwidth Required (Gbps)	10	20	40	70	90	110	120	140	150	170	180	200	210	220
Annual Bandwidth Fees (000's)	$68	$137	$216	$378	$486	$528	$576	$672	$630	$714	$756	$720	$756	$792
Bandwidth $/Sub	$19.11	$7.18	$5.05	$5.47	$5.85	$6.27	$6.81	$7.91	$7.29	$8.23	$8.68	$8.09	$8.47	$8.83

UPTOWN SERVICES, LLC

BASELINE COGS & GROSS MARGIN



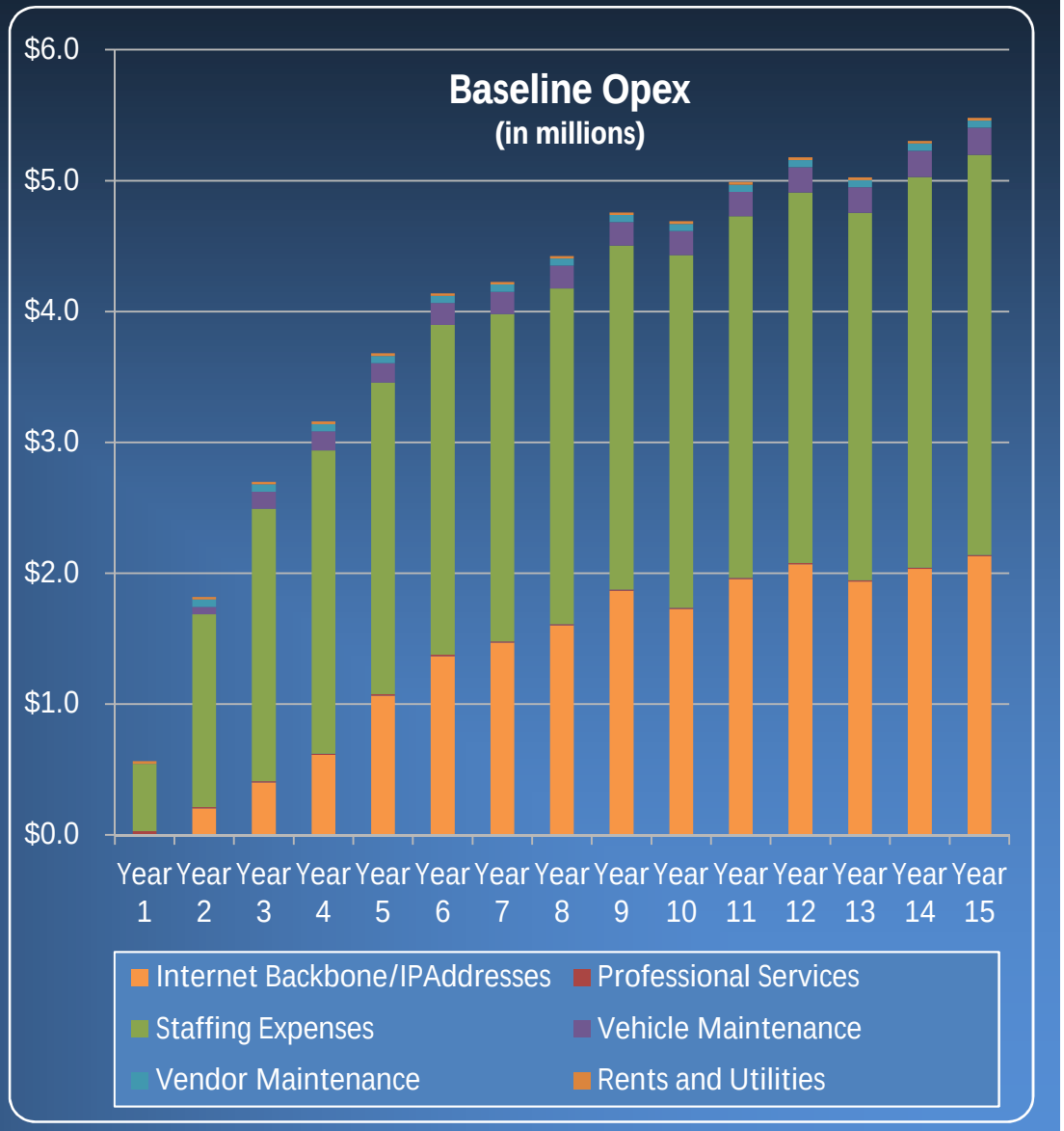


UPTOWN SERVICES, LLC

OPERATING EXPENSE

KEY INPUTS

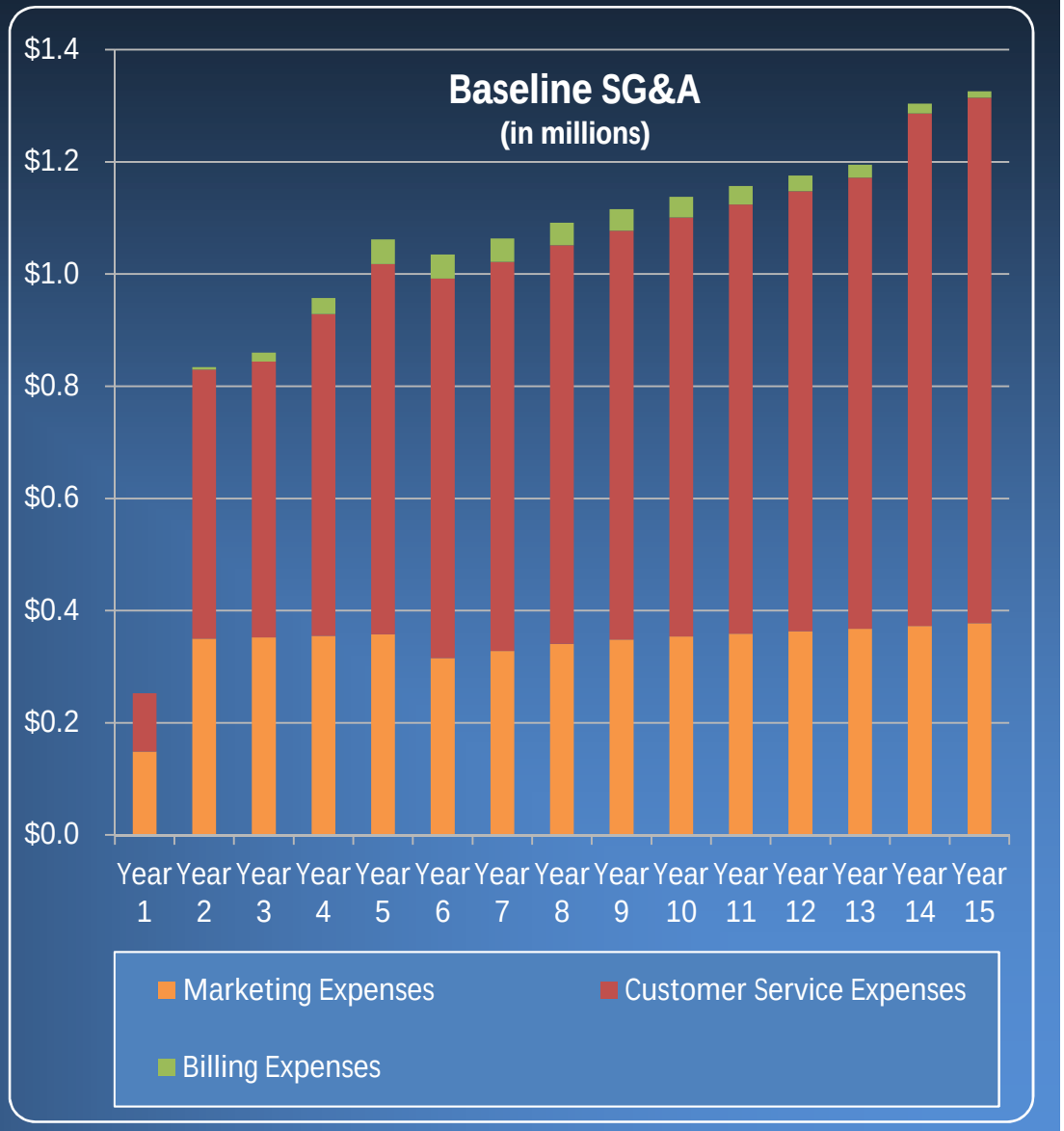
- Bandwidth/IP Addresses
  - 2 transport circuits to Denver POP (quoted)
  - Bandwidth & x-connect fee at POP (quoted)
  - Allocated bandwidth starting at 1.5M (res) and 750K (com) per user
  - IPv4 lease fee of $.40/address/mo.
- Staffing
  - Headcount per detail slide (excludes customer care as SG&A)
  - 2.5% annual wage increase
  - 30% benefits loading
- Vehicle Maintenance
  - 15k miles annually per vehicle
  - $.75/mile growing at 2.5%
- Professional Services
  - Implementation: Capitalized
  - Legal/Acct: $30k (Yr1)/$10k
- Other Opex
  - Vendor maintenance of $55k/year for OSS/BSS and FTTP electronics
  - $20k/year for utilities



SALES, GENERAL, & ADMINISTRATIVE

KEY INPUTS

- Marketing
  - Year 1: $100k
  - Years 2-5: $250k
  - Year 6+: 1% of revenues
- Customer Service
  - Commercial Acct Reps: 2 FTE
  - CSRs: 4 FTE (Year 2)
  - CSRs: 6 FTE (Years 5+)
  - 2.5% annual wage increase
  - 30% benefits loading
- Billing
  - 80% of residential and 50% of commercial using paperless billing
  - Paper bill cost of $.75/each/month and growing 3% annually



FTE LEVELS: MANAGEMENT EMPLOYEES

- Dedicated FTTP System Full Time Equivalents (FTE)
  - System GM
  - Marketing Coordinator
  - MDU Account Manager
  - Commercial Account Rep
  - Sales Engineer
  - Headend Technician
  - Data Technician
  - Field Ops Supervisor

- Positions funded at City wage scale midpoints and 30% benefits loading and 2.5% annual salary increase

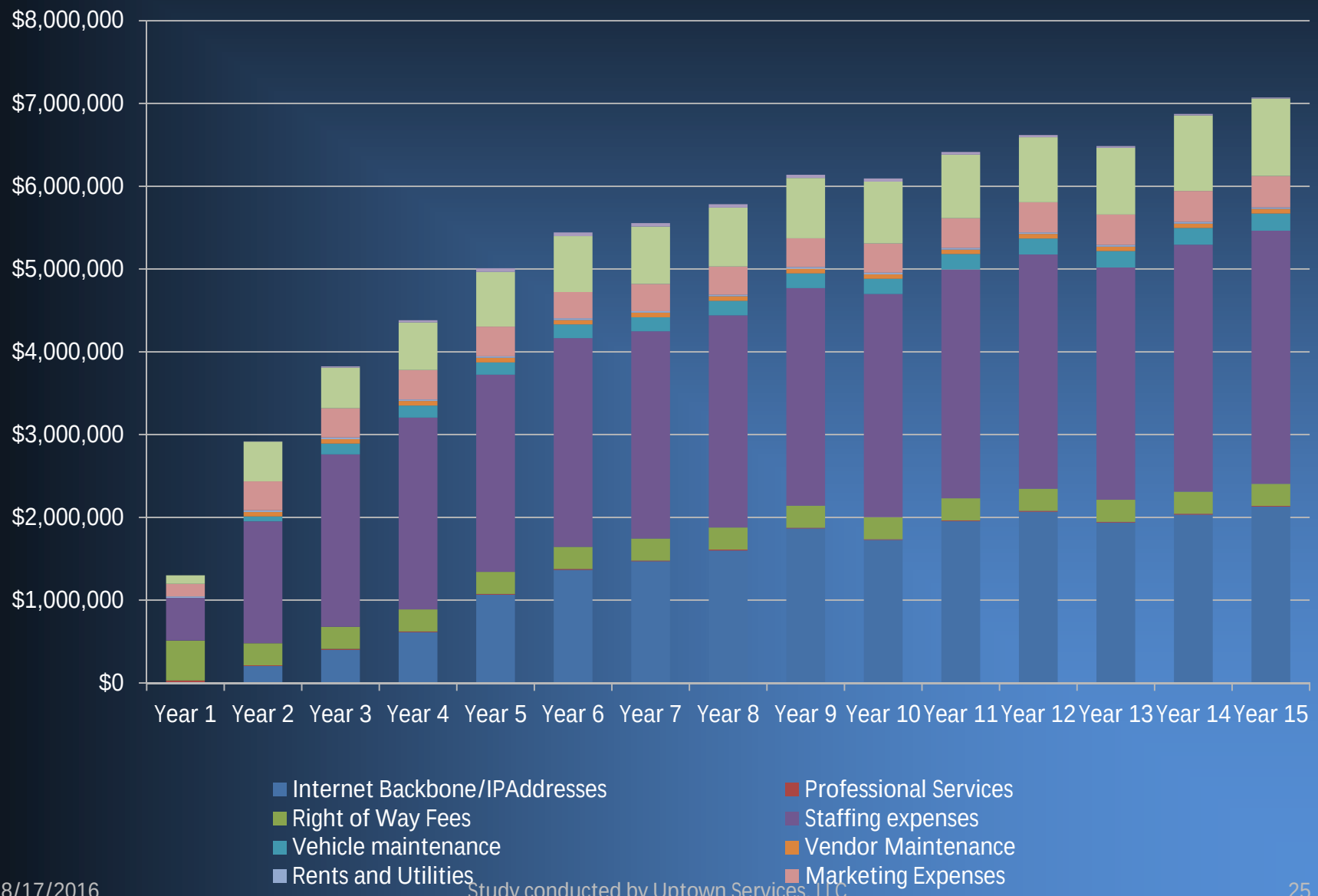
FTE LEVELS: DEDICATED FRONTLINE EMPLOYEES

- 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 each for CSR and TSR positions to ensure phone coverage
- Install Technicians
  - Installs are 2-phase with pre-install followed by separate premise install
  - All pre-installs completed by a contractor at fixed rate ($200) for Years 1-5, and then insourced
  - Premise installs are completed by internal FTE, except in Year 4 (25%) and Year 5 (50%) by a contractor at fixed rate ($250) to maintain Install Tech headcount at long term levels
  - Each Install Tech can complete 3/day growing to 4/day by Year 5
- 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)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
System GM	$135,000	1	1	1	1	1	1	1
Marketing Coordinator	$75,000	.5	1	1	1	1	1	1
MDU Account Manager	$75,000	1	2	2	2	2	2	2
Comm. Acct Rep	$80,000	1	2	2	2	2	2	2
Sales Engineer	$80,000	1	1	1	1	1	1	1
Headend Tech	$95,000							
Data Tech	$105,000	1	2	2	2	2	2	2
Field Ops Supervisor	$80,000			1	1	1	1	1
CSRs	$50,000		4	4	5	6	6	6
TSRs	$60,000		4	4	5	6	6	6
Install Techs	$55,000		3	7	6	5	6	5
Maintenance Techs	$65,000		1	1	2	2	2	2
Service Techs	$60,000		1	3	4	4	4	4
Total Headcount		**5.5**	**22**	**29**	**32**	**33**	**34**	**33**

RETAIL MODEL: BASELINE OPEX BY YEAR



CAPITAL

- Network Construction
  - OSP Construction: $950 composite cost per meter passed
  - Subsequent plant extensions: $450/meter passed
  - Backbone/Feeder Construction: $100/meter passed
  - Year 10 Network electronics upgrade: $75/premise passed
- Facility Capital Costs
  - Broadband Offices & Shop Location: 8,800 Sf (Offices) and 9,500 Sf (Shop)
  - $5.6M (retail) or $1M (wholesale) via Facilities Quote
- Other Capital Costs
  - Implementation support: $480k or $240k (wholesale)
- Back Office Systems (OSS/BSS)
  - OSS/BSS: $300k
  - Fiber Management & Network Management: $250k
- Fixed Equipment
  - Backbone electronics and core HE switch: $600k
  - Internet systems back office: $125k
  - Field Tech Equipment/Tools: $250k

CAPITAL (CONT.)

- Vehicles
  - Service Vans Per Install Technician: 1.0
  - Heavy Service Trucks Per Maintenance Technician: 0.5
  - Service vans: 13 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% of Years 1-5 3 at $200 each
  - Premise Installs: 25% of Year 4 and 50% of Year 5 at $250 each
- Optical Network Terminals (ONTs)
  - Residential/Business ONT (non-WiFi): $140 each
  - Residential/Business ONT (80211.ac WiFi): $240 each
  - Year 7 ONT upgrade: $700k ($40/ea.)
- Fiber Drop & Powering
  - Fiber drop and connectors: $75 each
  - Power cord and UPS: $52 each ($12 for non-voice install without UPS

CAPITAL (CONT.)

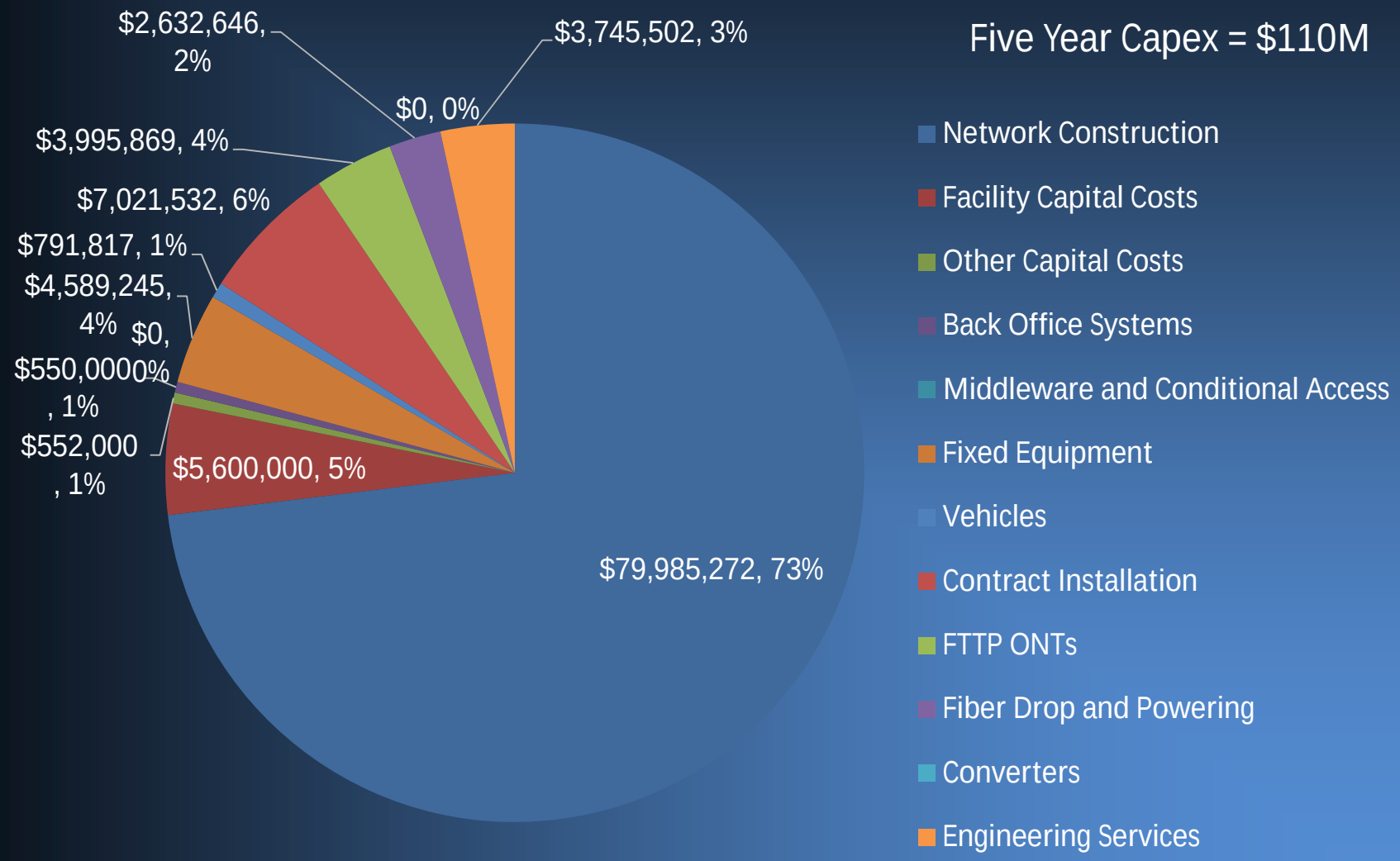
- Engineering and Integration
  - Walk out & strand mapping: $250 per mile
  - Make ready engineering: $0 per mile
  - FTTP design: $3,000 per mile
  - Construction management services: $4,000 per mile
  - As-built drawings: $250 per mile
  - Backbone/Feeder design: $75k flat fee

- Locates
  - Year 1 budget of $216k in capex
  - Ongoing annual operating expense of $266k to staff 4 locators

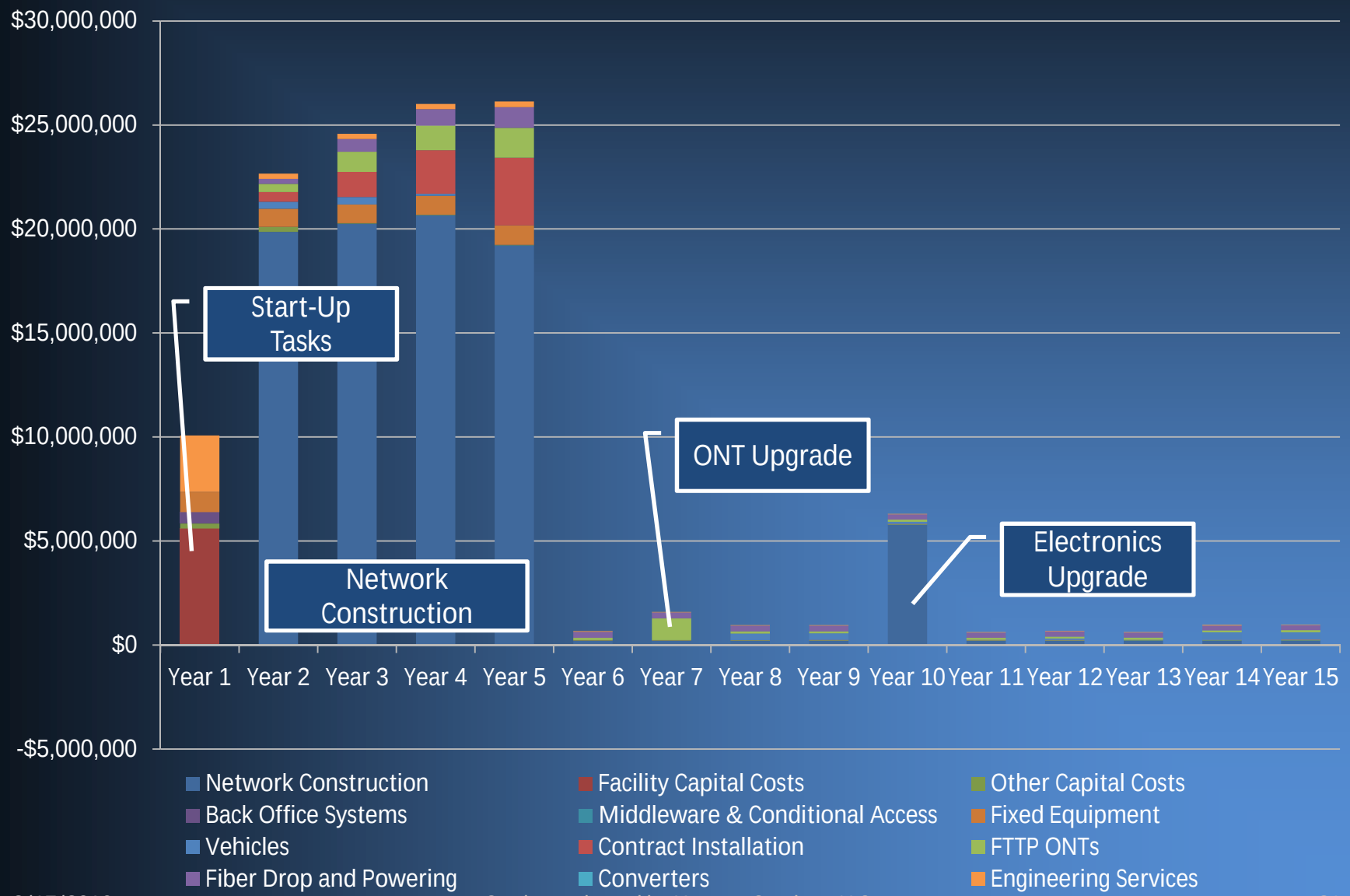
PROJECT FINANCING

- Long term financing
  - Two rounds of financing (Years 1 and 4)
  - Three years interest only
  - 12 years of level payments
  - 2.0% issuance, $0 reserve requirement
  - Interest rate – 3.75% for Year 1 issue and 4.75% for Year 4 issue
- Short term financing
  - Provides for cash needs not covered by long term financing
  - Balance accumulates over first five years including interest
  - 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 = 1.5% of gross revenues
  - 2% interest on cash reserves
  - Discount rate = 5% for present value calculations
  - 10 billable months in year2

BASELINE CAPEX – YEARS 1-5

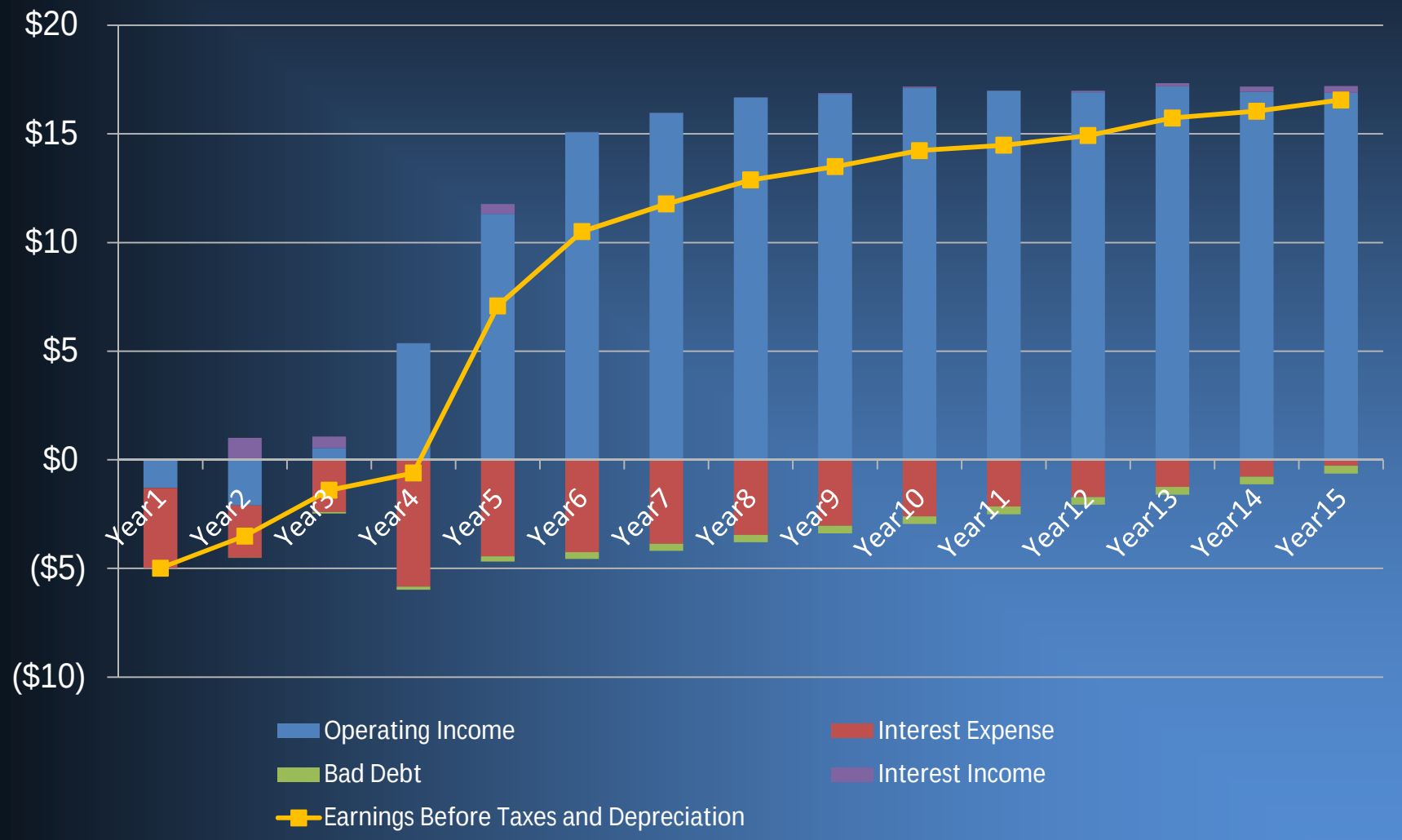


RETAIL MODEL: BASELINE CAPEX BY YEAR

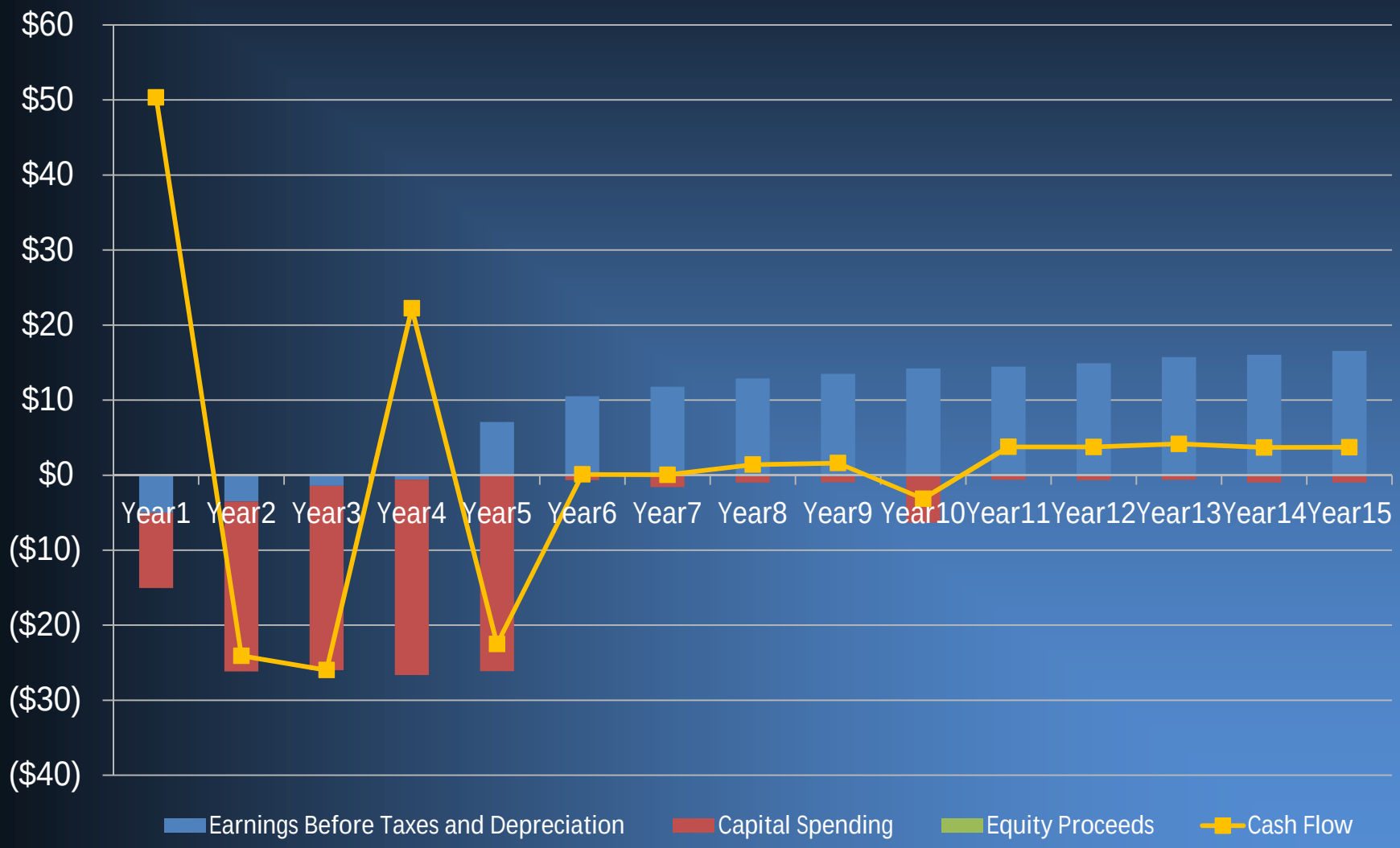


UPTOWN SERVICES, LLC

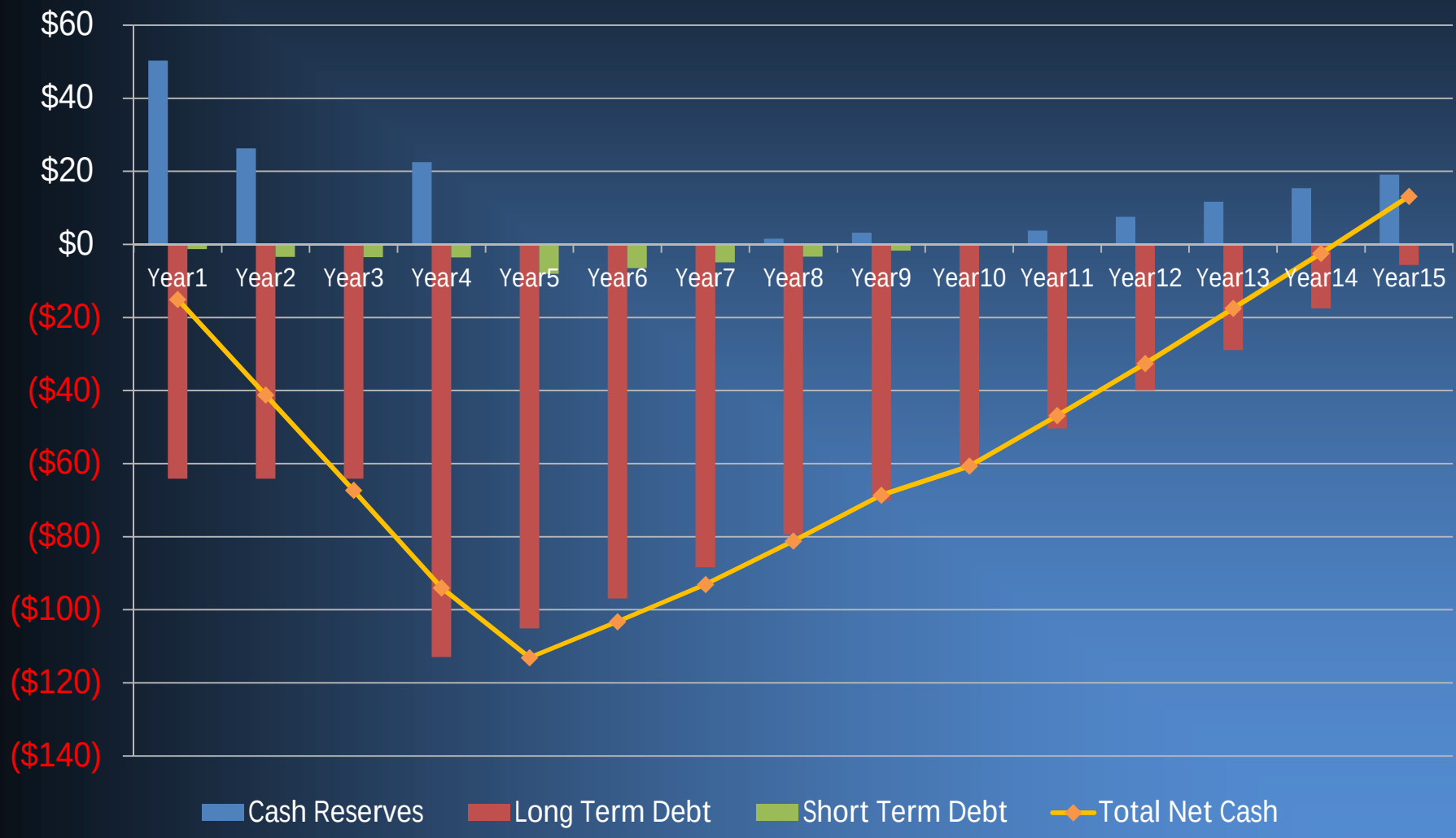
BASELINE EBITDA ($M)



BASELINE CASH FLOW ($M)



BASELINE NET CASH ($M)



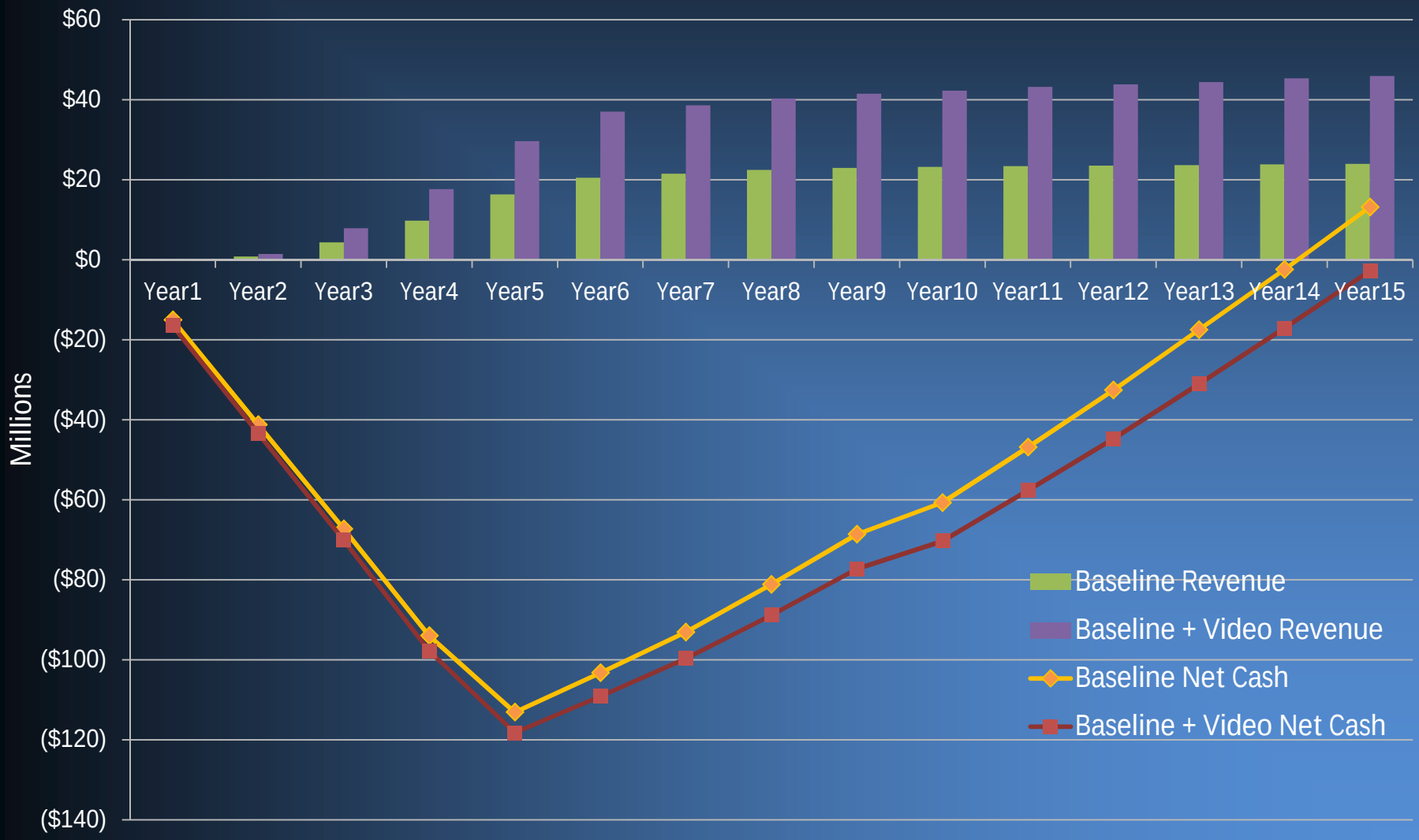
Triple Play with Video

Baseline + Video

BASELINE + VIDEO

- Incremental Opex Requirements
  - NCTC membership fee: $62k in Year 1
  - Leased circuit to LiveVU POP for video feed transport: $8k/month
  - LiveVU license fee: $1.75 per video subscriber/month
  - Headend Technician: 1 additional FTE
  - CSR:Subscriber Ratio: Drops from 1:2,000 to 1:1,500 (Year 1) and 1:4,000 to 1:3,000 (Year 5)
  - Service Call Truck Rolls: Drops from 4/Tech/Day to 3/Tech/Day (Year 1) and 6/Tech/Day to 4/Tech/Day (Year 5)
  - OSS/BSS: Increases from $300k to $350k
  - Install Contractor: Premise install cost increases from $250 to $300
- Incremental Capex Requirements
  - Video hub site facility cost: $400k
  - Video hub site electronics: $455k (LiveVU terrestrial delivery)
  - Headend design and integration: $30k
  - HD and HD/DVR set tops: $100 and $225 each respectively
  - Middleware (initial license fee): $275k
  - Middleware (per video subscriber): $52 per year
  - Conditional Access (initial license fee): $25k
  - Conditional Access (per video subscriber): $22 per year

FINANCIAL OUTCOME: BASELINE VS BASELINE+VIDEO



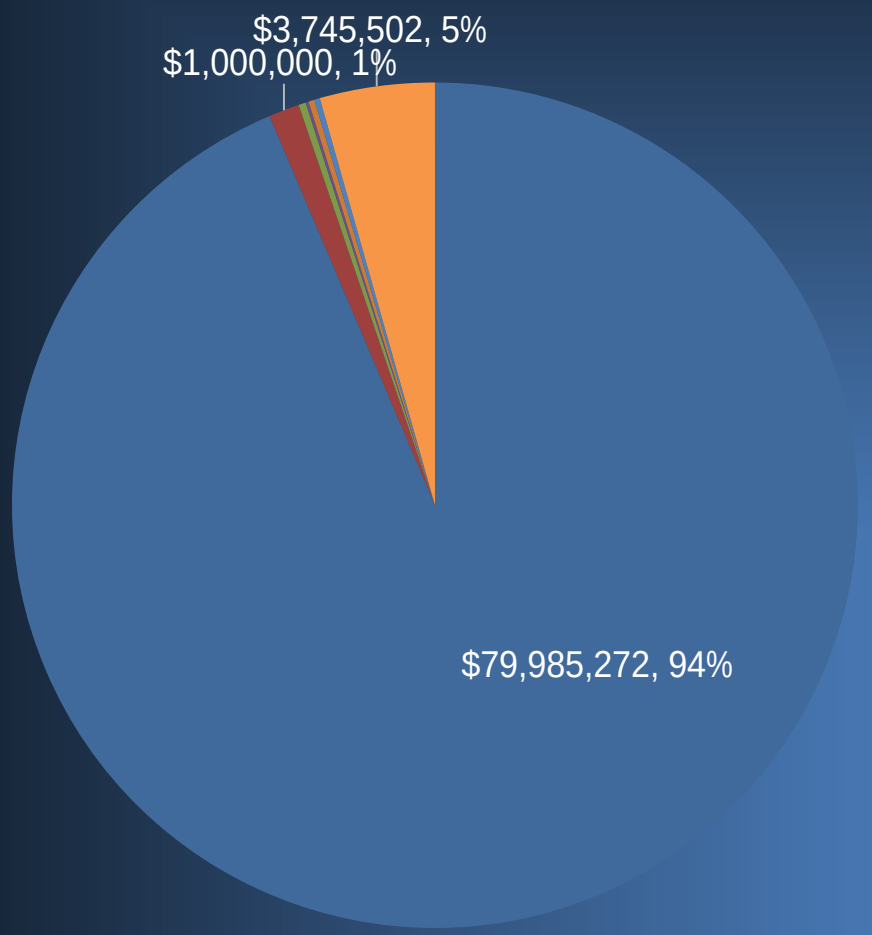
Pro Forma Analysis

Wholesale Models

WHOLESALE MODEL OVERVIEW

- Shares funding, revenue and operating costs with retailer partner. Typical outcomes:
  - Capital requirement reduced to 80% of retail
  - Opex requirement reduced to 10-20% of retail
  - Revenue reduced to 25-40% of retail
- Financial feasibility requires both parties to meet financial return obligations
  - Municipal: Debt service of the bond(s)
  - Retailer: Sufficient ROI for shareholders
- Wholesale financial terms are key, and depend on financial 'mechanics' (Task 5 Report)

WHOLESALE CAPEX – YEARS 1-5



Five Year Capex = $85M

- Network Construction
- 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 Services

WHOLESALE MODEL CAPEX BY YEAR

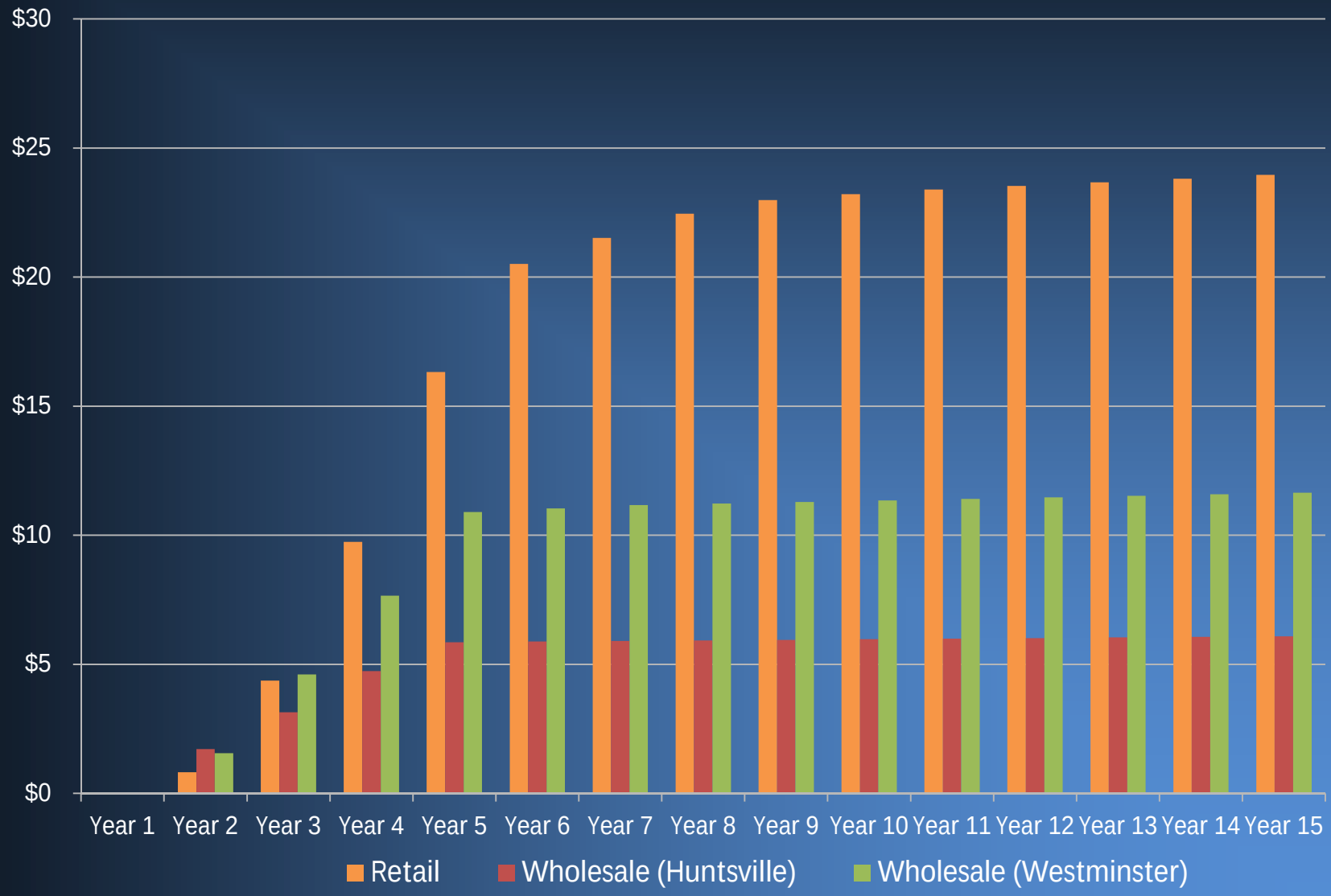
INCREMENTAL BROADBAND FTE REQUIRED

Position Title	Salary (unloaded)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
		Retail Model/Wholesale Fiber Lease						
System GM	$135,000	1	1	1	1	1	1	1
Marketing Coordinator	$75,000	.5	1	1	1	1	1	1
MDU Account Manager	$75,000	1	2	2	2	2	2	2
Comm. Acct Rep	$80,000	1	2	2	2	2	2	2
Sales Engineer	$80,000	1	1	1	1	1	1	1
Headend Tech	$95,000							
Data Tech	$105,000	1	2	2	2	2	2	2
Field Ops Supervisor	$80,000			1	1	1	1	1
CSRs	$50,000		4	4	5	6	6	6
TSRs	$60,000	3	4 / 3	4 / 3	5 / 3	6 / 3	6 / 3	6 / 3
Install Techs	$55,000		3	7	6	5	6	5
Maintenance Techs	$65,000		1 / 1	1 / 1	2 / 1	2 / 2	2 / 2	2 / 2
Service Techs	$60,000		1	3	4	4	4	4
Total Headcount		**5.5 / 3**	**22 / 4**	**29 / 4**	**32/ 4**	**33 / 5**	**34 / 5**	**33 / 5**

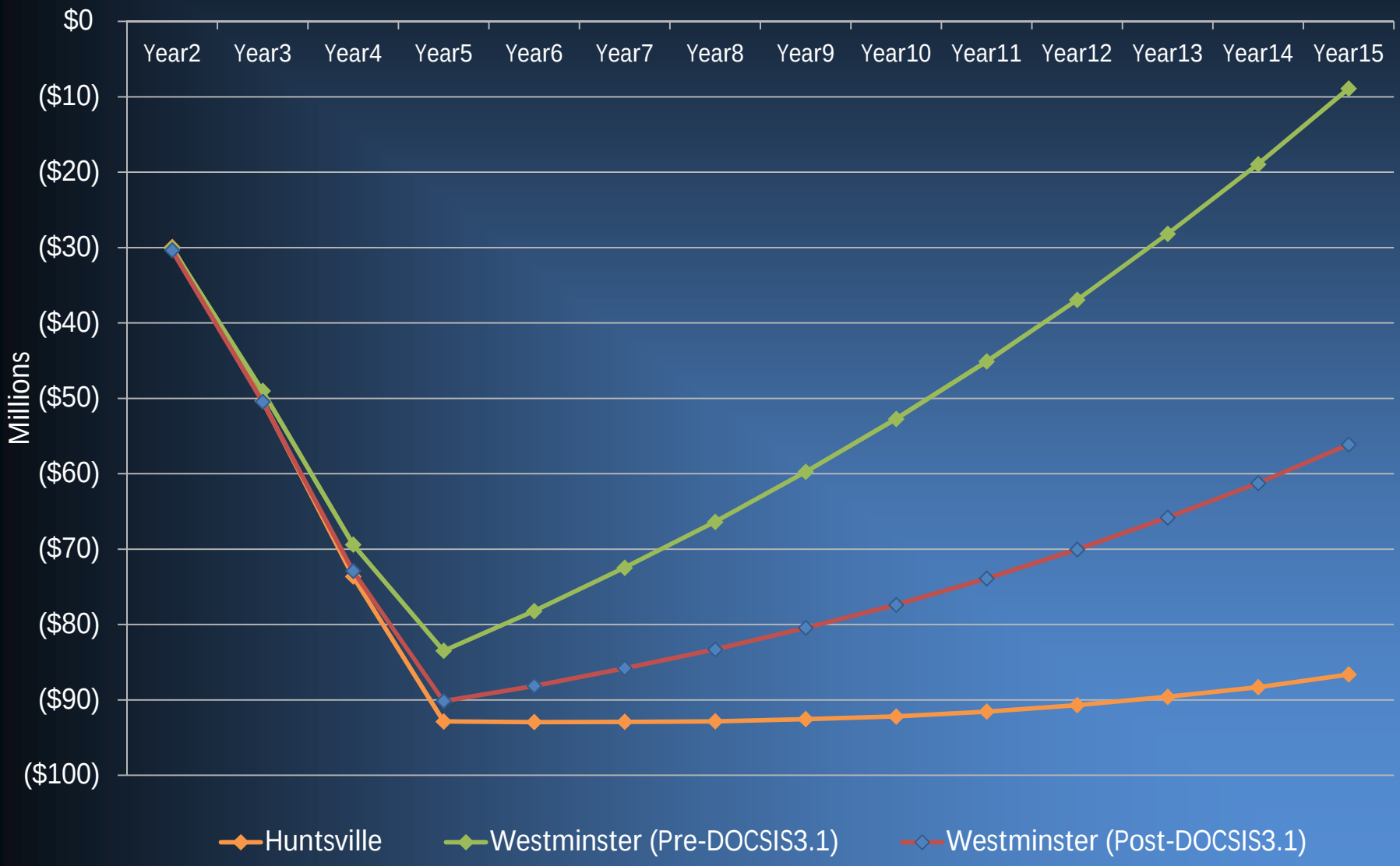
WHOLESALE MODEL OPEX BY YEAR

UPTOWN SERVICES, LLC

WHOLESALE MODEL REVENUES BY YEAR



NET CASH: WHOLESALE MODELS



WHOLESALE MODEL ANALYSIS FINDINGS

- The structure of wholesale terms and risk allocation has improved within municipal broadband with lessons learned from legacy wholesale agreements
- Three overall wholesale/franchise models have emerged as contemporary examples:
  - Wholesale: City funds the build and charges retailer monthly fees per premise passed and/or per connection
  - Wholesale: City funds the build and leases dark fiber to the retailer
  - Franchise: City provides franchise (with or without conduit IRU) and retailer funds the incremental build costs
- The current wholesale models are not strategically or financially viable for Ft. Collins under the terms of the actual agreements reviewed
  - Lease rates are too low to pay off the long term debt from the fiber build
  - Retailer price levels of $90 Gig will not be competitive in a DOCSIS3.1 environment
  - Retailer is not bound to serve all premises and can cherry pick service areas
  - Possible Exception: Google Fiber funded by Alphabet and not the City*

* Noting that the Google Fiber-funded deployed markets average almost 2.6M population.

Pro Forma Analysis

Conclusions

FINANCIAL OUTCOMES

Outcome	City as Retailer (Post DOCSIS3.1 Baseline)	City as Wholesaler Huntsville Model	City as Wholesaler Westminster Model
Internet Penetration	30.2%		
Voice Penetration	8.4%		
Cost Per Premise Passed	$983 (incl. 15% Cont.)		
Equity Investment	-		
Long Term Debt	$117.3M	$93.2M	$93.2M
Operating Losses (Working Capital)	$8.1M	$83.0M	$20.9M
Total Funding	**$125.4M**	**$176.2M**	**$114.1M**
Net Cash - Year15	$13.1M	- $86.6M	- $26.1M
Project Break Even	**15 Years**	**> 15 Years**	**> 15 Years**

FTTP Feasibility Study

for

The City of Fort Collins

Task 5 Report: Assessment of Risks & Opportunities

August 2016

Uptown Services, LLC
Dave Stockton & Neil Shaw, Principals

SCOPE OF RISK

Uptown sees the following primary risk areas for the municipal FTTP system being considered :

1. Comcast DOCSIS3.1 Upgrade
2. Market and Operating Risks
   - Technology costs
   - Market substitution (Voice and video)
   - Economic trends (premise growth, interest rates)
   - Construction cost overruns

The risks associated with DOCSIS3.1 were evaluated using market research and pro forma revisions.

Market and operational risks were evaluated using sensitivity analysis

DOCSIS3.1

FOLLOW-UP SURVEY DESIGN FRAMEWORK

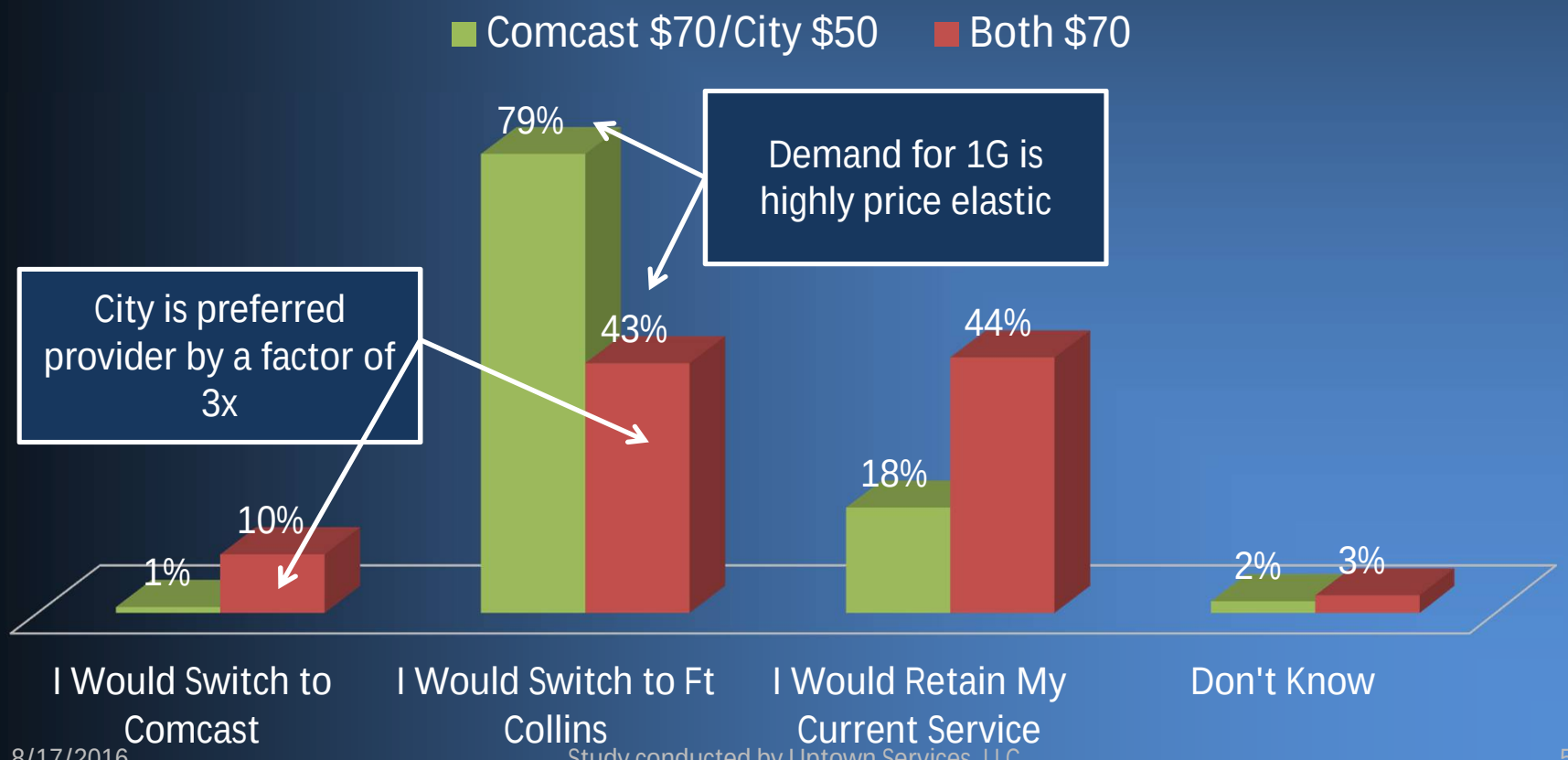
- Total sample size of 100 respondents out of original 400
- Respondents screened to ensure
  - Decision-maker for telecommunications and entertainment services in the home and live within city limits
  - Currently using Internet in the household
  - Respondents with immediate family members employed by any of the following were excluded:

    The City of Fort Collins
    CenturyLink
    Comcast
- Demographics were recorded (age, income, rent/own) but results not weighted for age
- Three post-DOCSIS3.1 scenarios tested:
  - Comcast sole 1G provider at $70 MRC
  - Comcast and City 1G both at $70 MRC
  - City 1G at $50 MRC and Comcast 1G at $70 MRC

MARKET IMPACT OF DOCSIS3.1 WITH FTTP

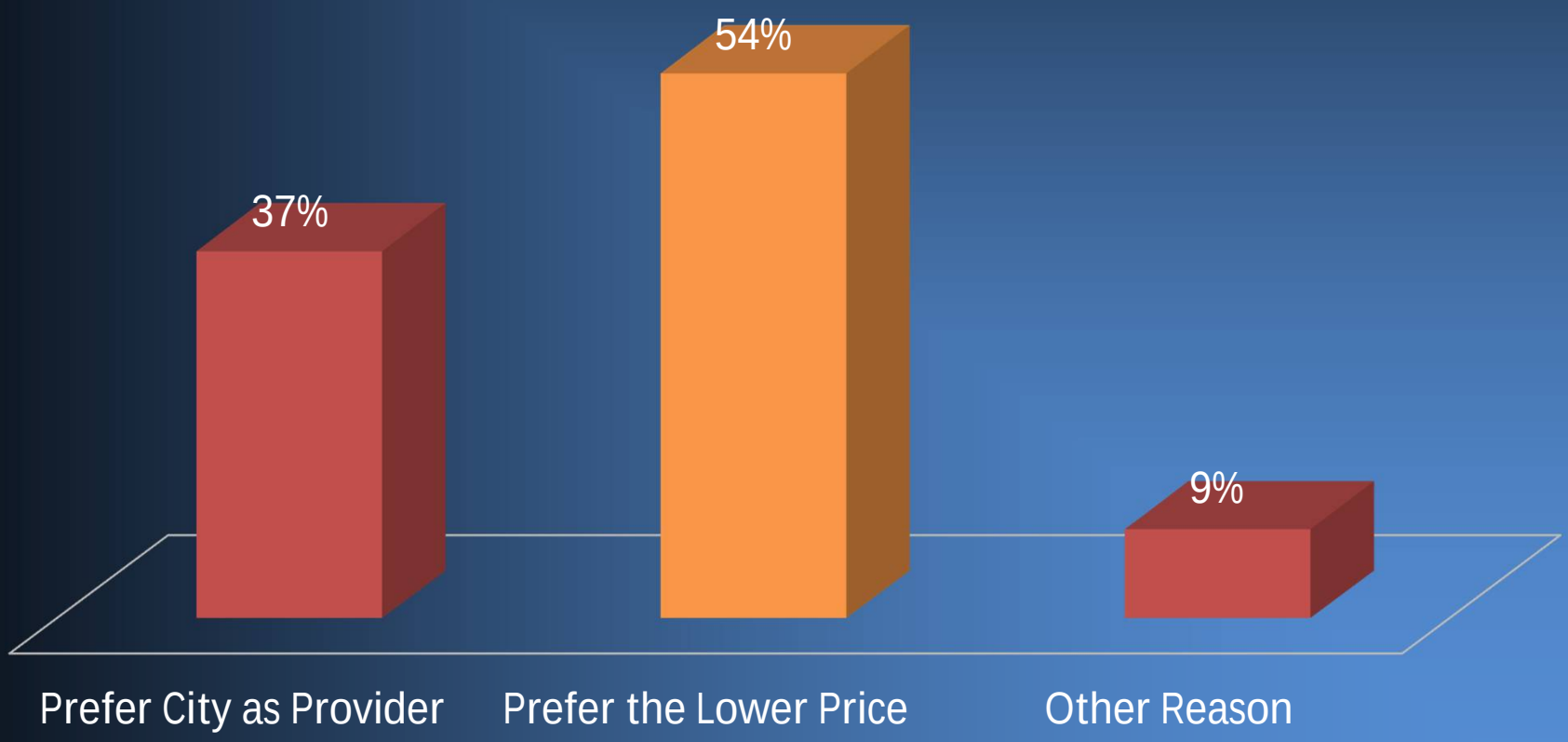
Participants were asked if they would – or would not – switch to a different Internet service if both of the following services were provided in the future. The new service options would be the following two Internet services, both offering 1 Gbps speed…

Q4-5: "If these services were available to your home, and offer the same speed, which of the following statements best describes your likelihood to switch?"



MOTIVATION TO SELECT CITY 1G VS COMCAST 1G

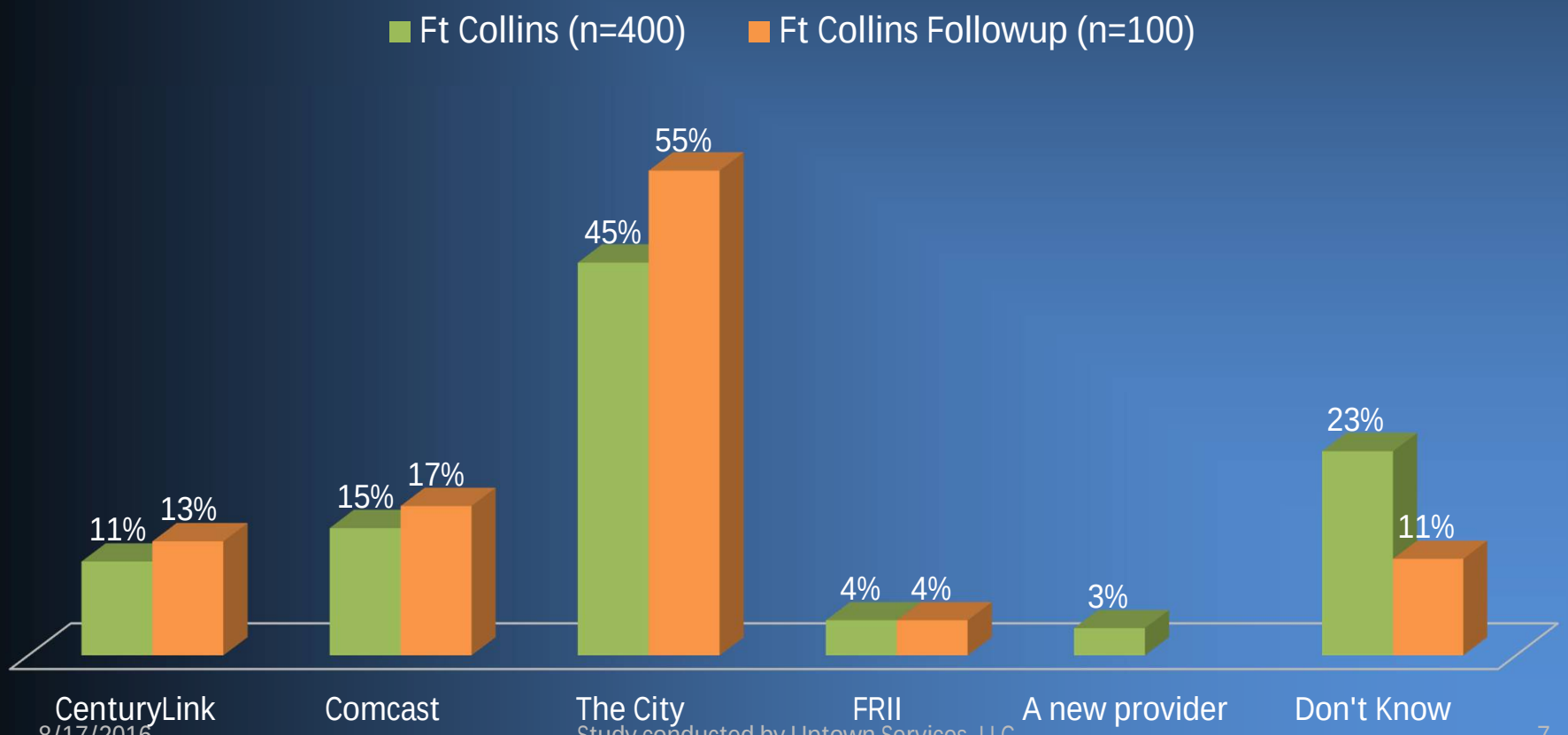
- Original Survey Question 8: "In stating that you would switch to the City's 1G Internet service, what is the primary reason you would switch?"



PROVIDER PREFERENCE

- The majority of respondents, when given the choice, would prefer to receive high speed Internet from the City…

Q28: "Among the following list of potential providers, who would you prefer to receive high-speed Internet service from?"

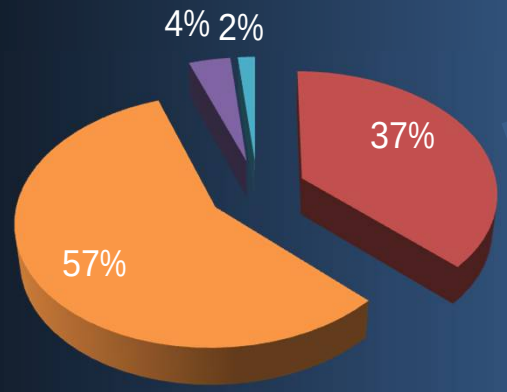


MARKET IMPACT OF DOCSIS3.1 WITHOUT FTTP

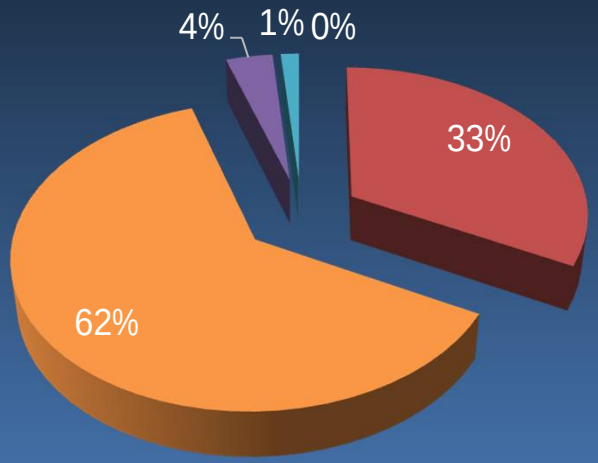
What if Comcast implements DOCSIS3.1 and is the sole provider of residential Gig service?

- Add 5 points to market share
- Upsell 22% of subscribers to 1Gig

Current Internet Market Share
(Households)

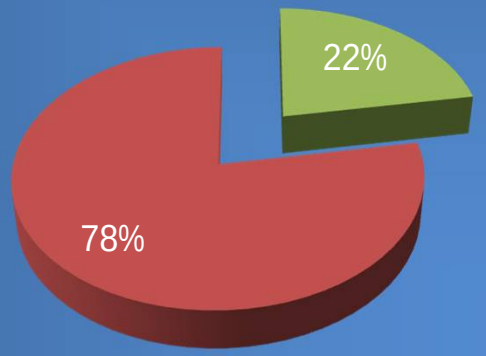


Internet Market Share Post DOCSIS3.1
(No FTTP & Comcast 1G @ $70)



FTTP System
CenturyLink
Comcast - All Tiers
Satellite
Other

Comcast Internet Dispersion
(Comcast 1G @ $70)



1 Gbps
All Other Tiers

CALCULATION OF PENETRATION POST-DOCSIS3.1

2016: Pre-DOCSIS3.1 2/1/2016 (n=400)

Current Incidence

No Internet	3	1%
Dial-Up	0	0%
DSL/FiOS	141	35%
Cable	218	55%
Satellite	15	4%
Fixed Wireless/Other	6	2%
DK Type	17	4%
	400	100%

No Internet	3	1%
Comcast	218	55%
Not Comcast	179	45%

Intent to Switch to FTTP @ 10% Less

	Comcast	Not Comcast	All
Market Share	**55%**	**45%**	
Definitely Switch	47.0%	33.4%	39.8%
Probably	26.7%	36.1%	29.9%
Might/Might Not	17.3%	17.8%	19.3%
PN/DN/DK	9.0%	12.7%	11.0%
Penetration	**42.6%**	**36.0%**	**38.8%**

2017: Post-DOCSIS3.1 6/1/2016 (n=100)

Intent to Upgrade to 1G @ $70 MRC

	Comcast	Not Comcast	All
Definitely	27.4%	8.8%	
Probably	32.3%	14.7%	
Might/Might Not	21.0%	14.7%	
PN/DN/DK	19.3%	61.8%	
Penetration	**31.0%**	**12.0%**	**22.3%**

Intent to Switch to FTTP @ 10% Less After DOCSIS3.1

	Comcast	Not Comcast	All
Definitely	32.4%	29.4%	
Probably	18.4%	31.8%	
Might/Might Not	11.9%	15.7%	
1G Upgraded	**31.0%**	**12.0%**	
PN/DN/DK	6.2%	11.2%	
Penetration	**29.4%**	**31.7%**	**30.2%**

DOCSIS3.1 RISK EVALUATION

- Determined that Comcast would add 5 points in market share and lock in 22% of Internet subscribers with a $70 Gig tier (3 year contract term)
- This results in a drop of FTTP Internet penetration from 38.8% to 30.2% for the pro forma analysis. Baseline case revised accordingly.
- Once FTTP is launched, Comcast's $70 Gig service is not competitive with FTTP service at $50/month due to strong provider preference and price elasticity

END USER INTERNET PRICING WITH DOCSIS3.1

	Comcast DOCSIS 3.1	'Longmont Model' (City is RSP)	'Westminster Model' (Ting is RSP)	'Huntsville Model' (Google is RSP)
Residential	Comcast 1G / 35M Monthly: $140 **MRC: $70** **NRC: TBD** **Term: 3 Years**	1G / 1G Charter Member **MRC: $49.95** **NRC: $0** **Term: Monthly**	1G / 1G **MRC: $98*** **NRC: Up to $200**	1G / 1G **MRC: $70***** **NRC: $0** **Term: 1 Year**
Commercial	**TBD**	1G / 500M **MRC: $799.95** **NRC: $0**	1G / 1G **MRC: $148**** **NRC: Up to $400**	Custom Quote
Affordable Internet	10M MRC: $9.95 Income Qualifier: Yes	**Not Offered**	5M / 5M MRC: $28* **NRC: Up to $200** Income Qualifier: No	5M / 1M MRC: $0 NRC: $300 Income Qualifier: No

* Internet service is $89/month and ONT rental is $9/month or purchase for $200.
** Internet service is $139/month and ONT rental is $9/month or purchase for $200.
*** Based on Austin, TX pricing.

Business Model & Partnership Risk

BUSINESS STRUCTURE RISKS

- 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
  - Retailer is not bound to serve all premises and can cherry pick service areas
  - Retailer performance may not achieve original City goals with FTTP

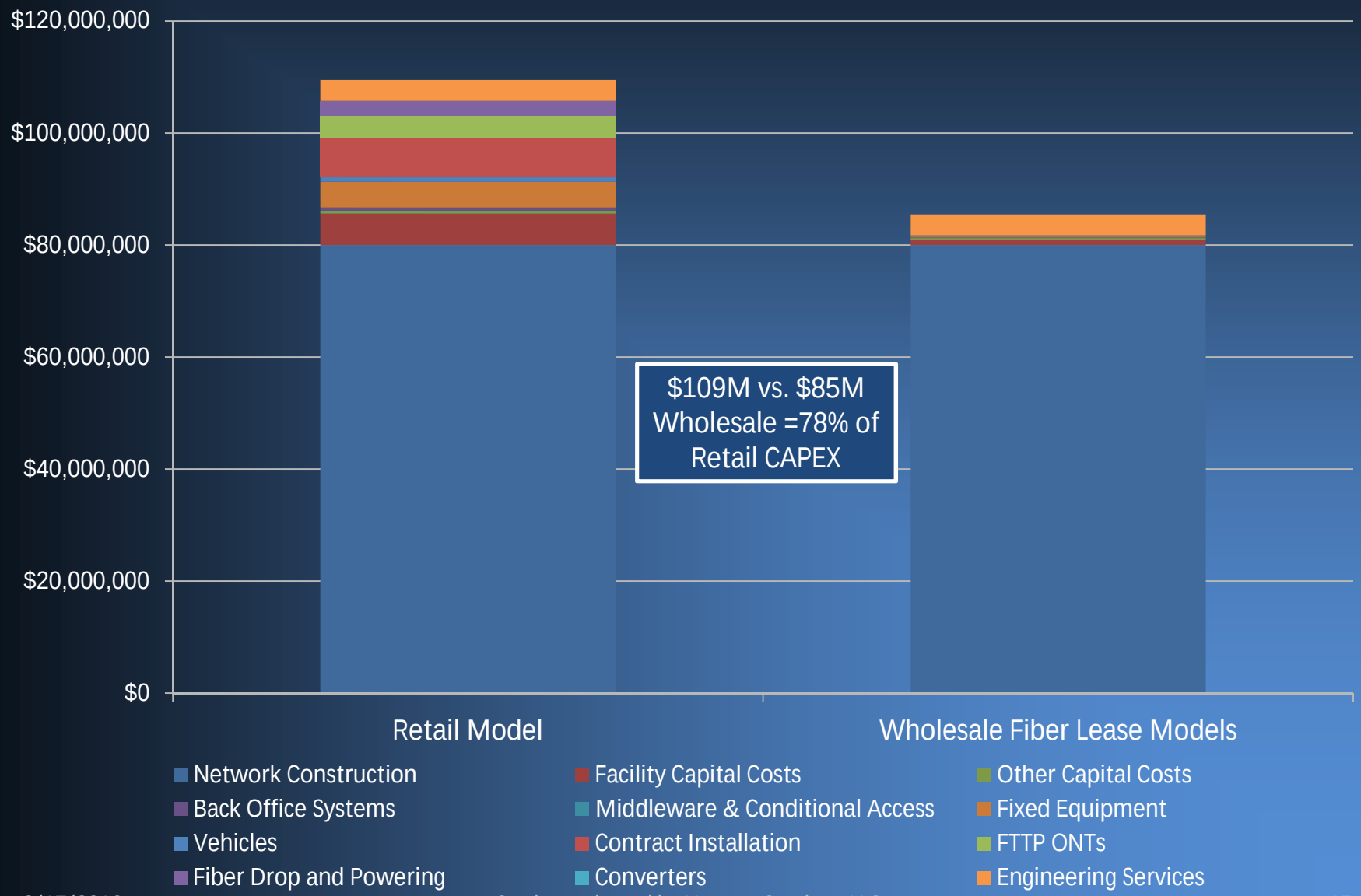
UPTOWN SERVICES, LLC

SUMMARY OF TERMS

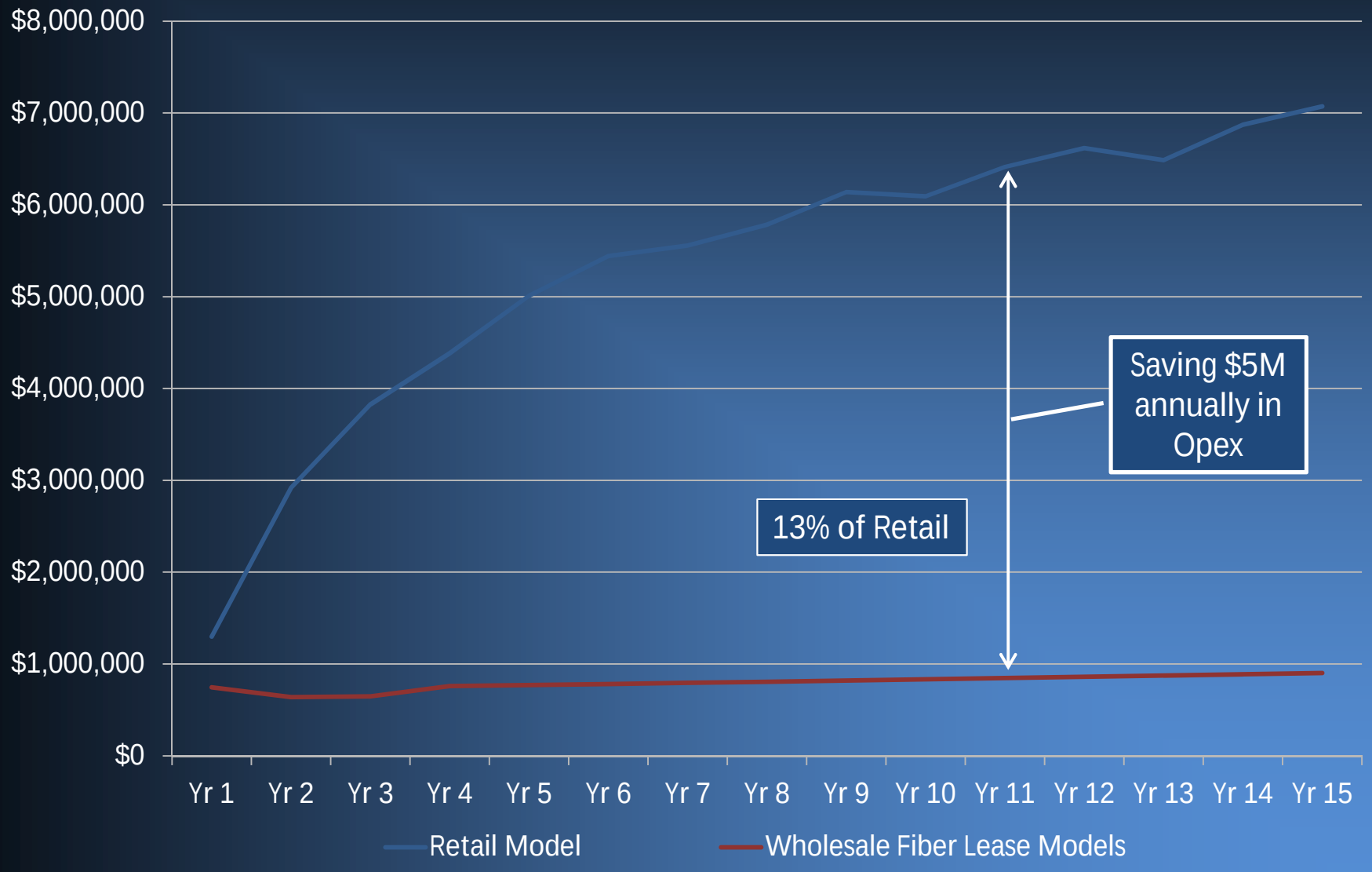
	Westminster 7,000 Households	Huntsville 67,000 Households	Lincoln 104,000 Households
Model Structure	Wholesale Dark Fiber Lease	Wholesale Dark Fiber Lease	Franchise Conduit Lease
Retailer	Ting	Google Fiber	Nelnet (acquired Allo Communications)
Retailer Background	Virtual Wireless Network Operator since 2012 Entered FTTP in 2015	1st launch in 2012 and now serving 120k subs in 5 urban markets	Nelnet: Education Loan Servicing Allo: Telecom provider since 2003
Wholesale Rates	• **Premise Passed Fee: $6/mo.** • **Connected Premise Fee: $17/mo.**	• **Premise Passed Fee: Averages $5/mo.** • Backbone Fiber Strands: $3,500/mo. each	Retailer pays conduit lease of $3/mo. per customer
Deployment Status	Launched Aug. 2015	Not Launched Contract Date: Feb. 2016	Not Launched Contract Date: Nov. 2015
Current End User Pricing (Res)	**Gig: $89/mo. + $200 for ONT* (not guaranteed)**	Gig: $70/mo. (not guaranteed)	**Gig: $90/mo. (not guaranteed)**
Service Coverage	100% anticipated (City builds)	100% anticipated (City builds)	**Unknown – Not Required (Nelnet builds)**

* Or $9/mo. ONT lease

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

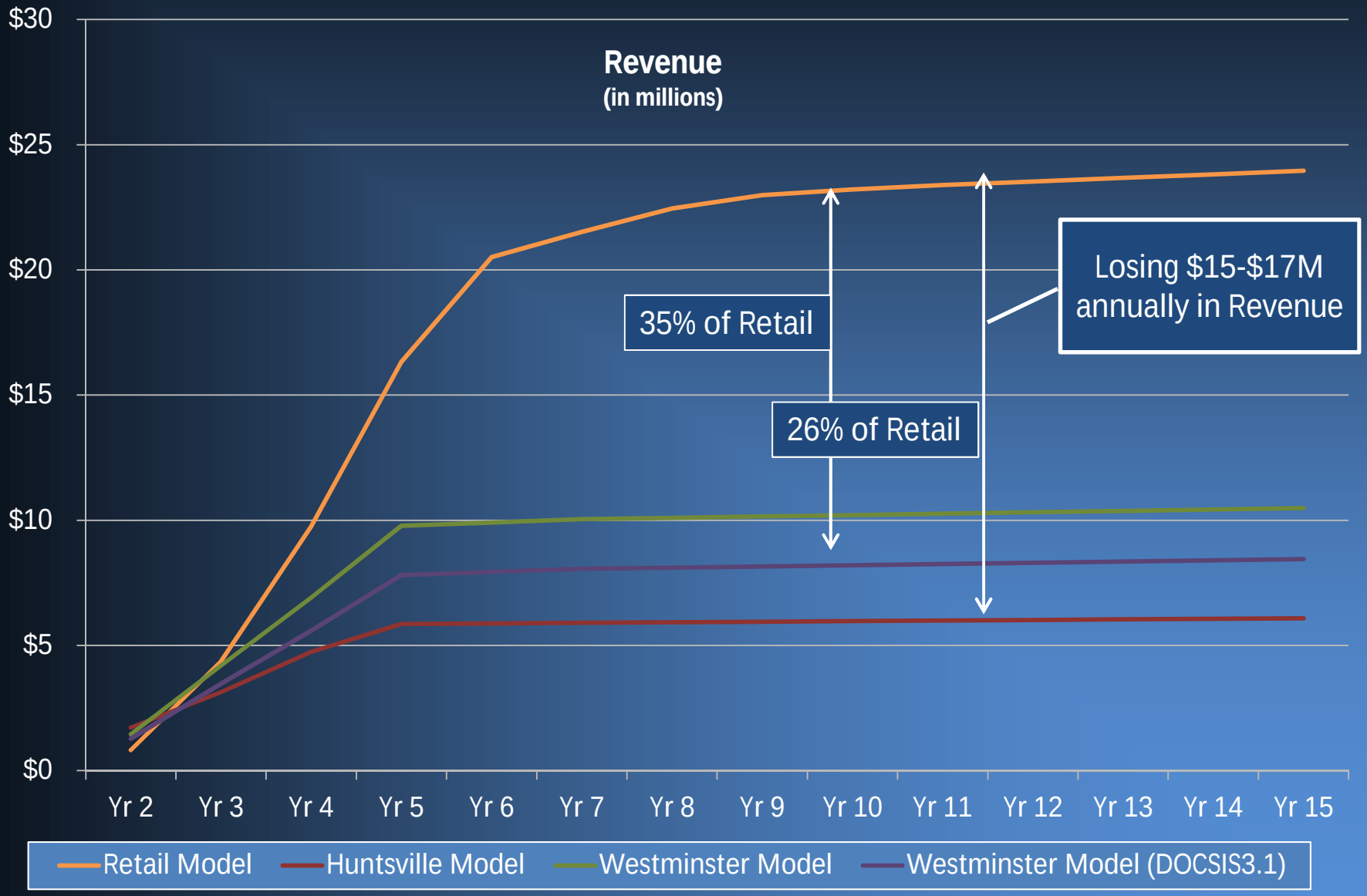


OPEX: RETAIL VS. WHOLESALE



UPTOWN SERVICES, LLC

REVENUES: RETAIL VS. WHOLESALE



RISK FACTORS BY MODEL

Risk Factor	Degree of Risk			Ability to Mitigate
	R	W	F	
Lower Penetration Due to DOCSIS3.1				Retail model pro forma is feasible with penetration reduced by 22% (Internet & Voice). Interdependent with Price Advantage Risk.
Lower Penetration Due to Brand Preference				Aside from Google Fiber, brand preference is very low for an alternative provider new to the market.
Lower Penetration Due to Loss of Price Advantage				Significant questions about the ability of retailers, other than Google Fiber, to compete using $90+ Gig Internet.
Higher Opex Due to Increased Staffing Costs				Pro forma salary and FTE levels are robust, but many muni FTTP systems exceed staffing budgets
Higher Capex Due to Construction Cost Overrun				Retail model pro forma is feasible at up to 25% construction cost overrun.
Higher Debt Service Due to Higher Interest Rates				Interest rate thresholds identified. Cannot eliminate all risk with uncertain bond issue #2 interest rate
Lower Community Support Due to < 100% Availability				Franchise model would require minimum density threshold

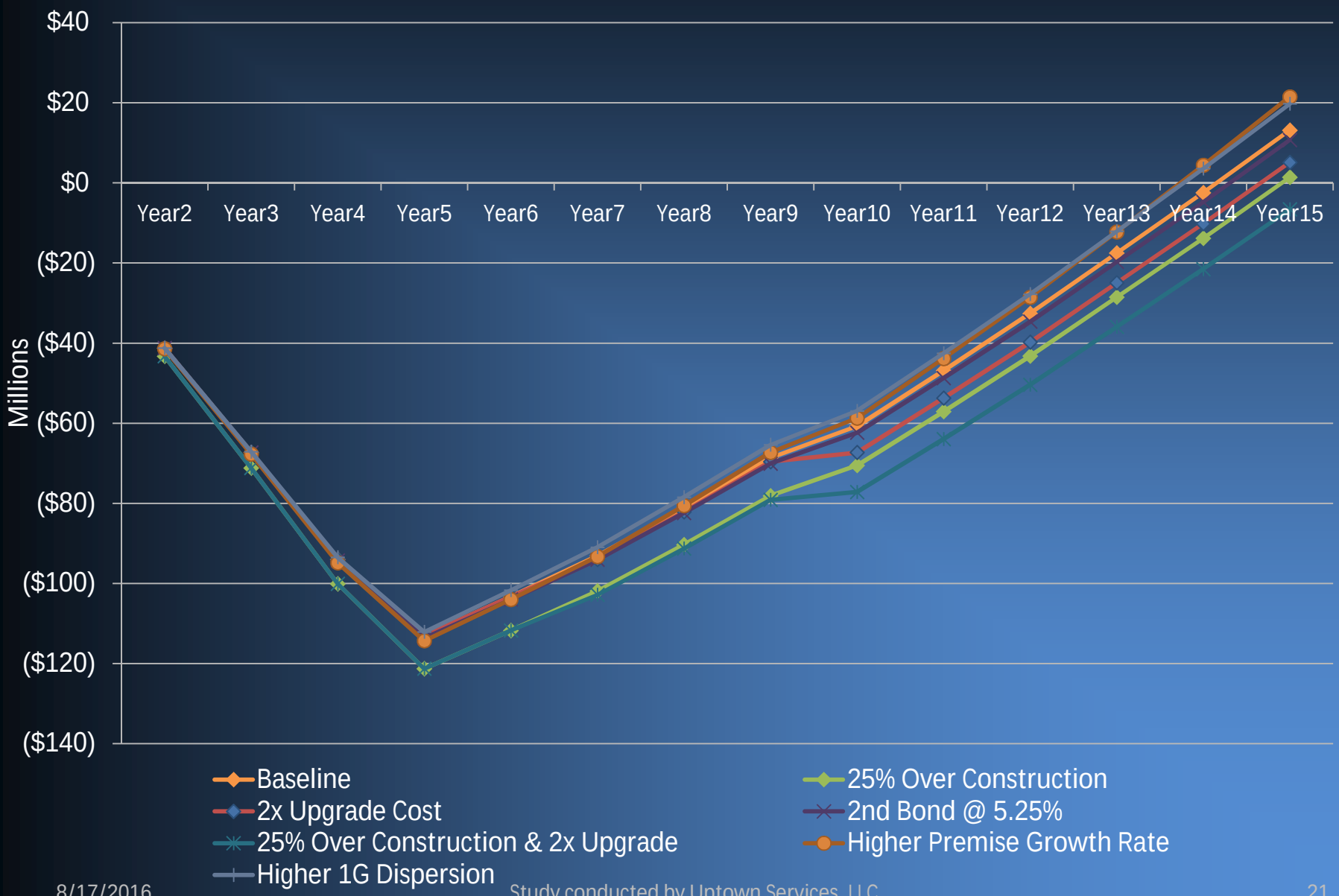
LEGEND: R = Retail Model W = Wholesale Model F = Franchise Model

Sensitivity Analysis

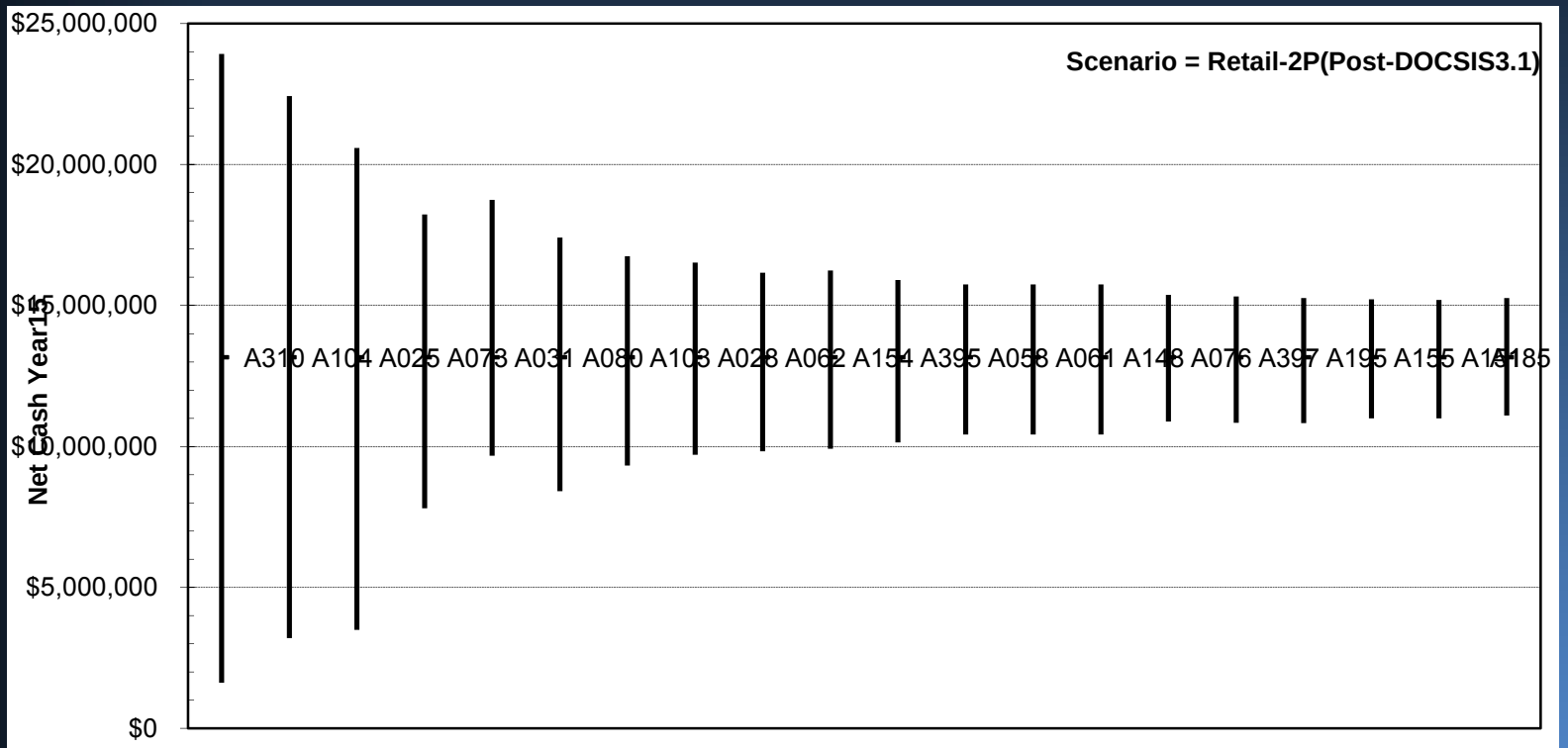
SENSITIVITY ANALYSIS

- Core team identified issues:
  - Higher network upgrade cost (Year 7 & 10)
  - Higher construction cost
  - Higher construction cost & higher network upgrade cost (Year 7 & 10)
  - Higher bond interest rate
  - Higher Internet dispersion in 1G Charter Member
  - Higher premise growth rate
- Model identified issues:
  - Identification of Top 10 most sensitive variables

NET CASH SENSITIVITY ANALYSIS



MODEL-IDENTIFIED MOST SENSITIVE VARIABLES



ID	Title	Best	Worst	ID	Title	Best	Worst
A31	Blended Cost per Meter Passed - During Build	$1,082	$885	A39	Bond Rate - Series 1	4.1%	3.4%
A10	Residential Internet Tier2 - Year1	$54.95	$44.96	A05	Business Package 1		
A02	Residential Internet Access Penetration			A06	Lines per Business Package	4.2	3.4
A07	High Capacity Services Penetration of Med-Large			A14	Business Package 1 Per Line - Year1	$15.40	$12.60
A03	Tier2 Year 10 - Res			A07	DIA Year 10 - Bus		
A08	Percentage of all Businesses	5.5%	4.5%	A39	Bond Rate - Series 2	5.2%	4.3%
A10	Residential Internet Tier1 - Year1	$43.95	$35.96	A19	Bandwidth Minimum Capcity Trigger		
A02	Tier1 Year 10 - Res			A15	Direct Fiber High Cap ARPU	$3,300	$2,700
A06	Commercial Internet Access Penetration			A15	Tier1 Bus Price	$65.95	$53.96
A15	DIA ARPU	$1,650	$1,350	A18	Residential Average Bandwidth - Year1	1,650	1,350

Conclusions

STUDY CONCLUSIONS

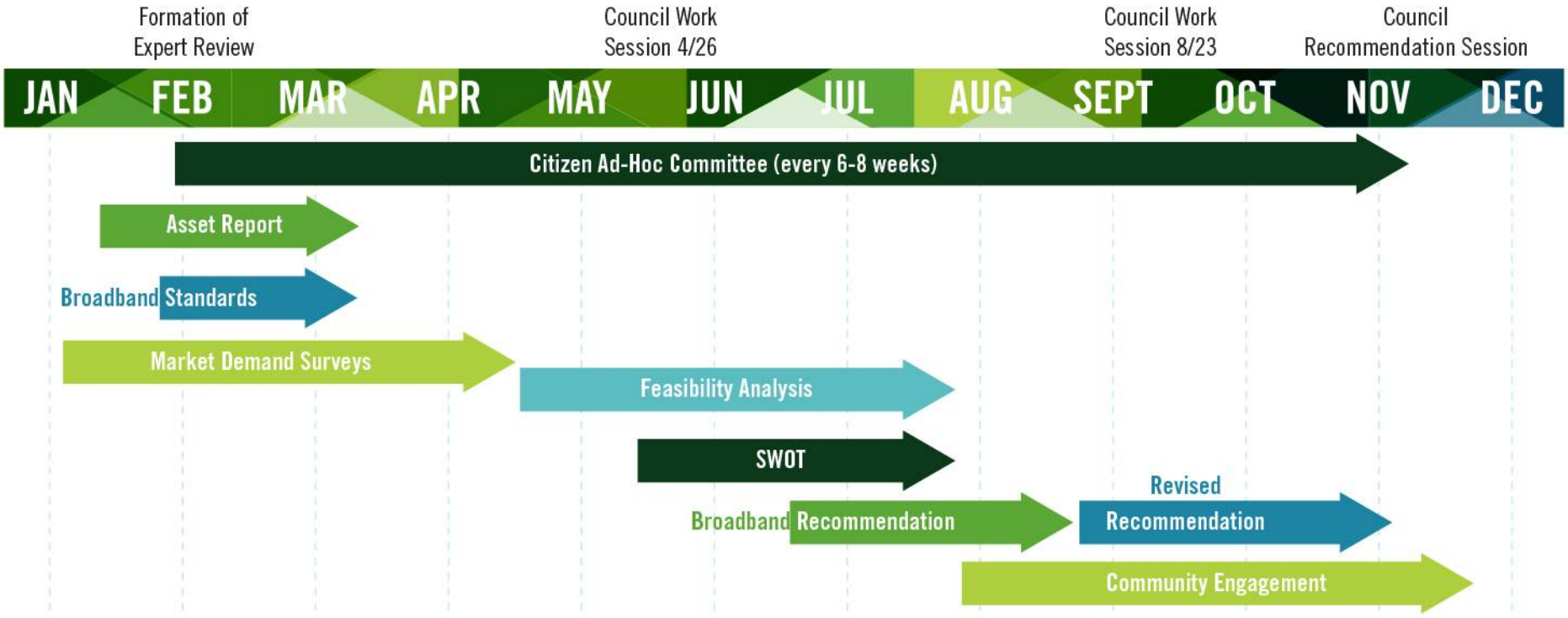
- Retail model is financially feasible - even in a post-DOCSIS3.1 environment
  - Total funding requirement is $125M
  - Project is net cash positive in 15 years
- The retail model remains feasible under most sensitivities:
  - Construction overrun of 10%: 15 year net payback
  - Bond issue #2 50 basis point higher interest rate: 15 year net payback
  - Construction overrun of 10% & 2x Upgrade Cost: > 15 year net payback
- Wholesale and/or franchise partner discussions could be pursued but will require much improved terms
  - Franchise model: Google Fiber (funded by Alphabet) is ideal with community-wide coverage commitment, but scale will be an issue
  - Wholesale Model: Viable financial terms in port-DOCSIS3.1 environment are unlikely


City of Fort Collins
UPTOWN
Broadband Strategic Plan Alternatives –
City of Fort Collins

City Broadband Strategic Objectives

- Review of Timeline & Strategic Objectives
- Updated Market Demand Study – DOCSIS 3.1
- Business Model Alternatives & Sensitivity Analysis
- Baseline Financial Model – Broadband Utility
- Next Steps

2016 Timeline



City Broadband Strategic Objectives

Goal of Project:

- Bring high speed internet to the City
- Make an informed decision and fairly evaluate alternative risks

Additional Benefits:

- Competitive pricing
  - Market pricing at $70/month or less for 1G
  - Affordable Internet tier
- Full coverage across City – no winners or losers
- Have system up and running within a reasonable time
- Underground service for improved reliability
- Share risk and ensure financial stable partner if one is desired

Feasibility – Analysis Complete

Primary Market Research

- Follow-up residential survey to evaluate DOCSIS3.1 with known Comcast pricing

Sample Designs

- Full design of seven ‘neighborhood type’ areas totaling 1,274 passings
- Evaluation of centralized vs. distributed splitter design

Business Model Evaluation

- Definition of possible business structure models and division of responsibility
- Secured the executed contracts for the most relevant and current wholesale model examples
- Comprehensive financial evaluation of each using the actual terms

Financial Analysis

- Inputs based upon research findings, deployment actuals, and city staff input
- Full vetting of financial model by city financial staff

City Broadband Strategic Objectives

- Review of Timeline & Strategic Objectives
- Updated Market Demand Study – DOCSIS 3.1
- Business Model Alternatives & Sensitivity Analysis
- Baseline Financial Model – Broadband Utility
- Next Steps

Market Demand Study Update

Completed in March 2016

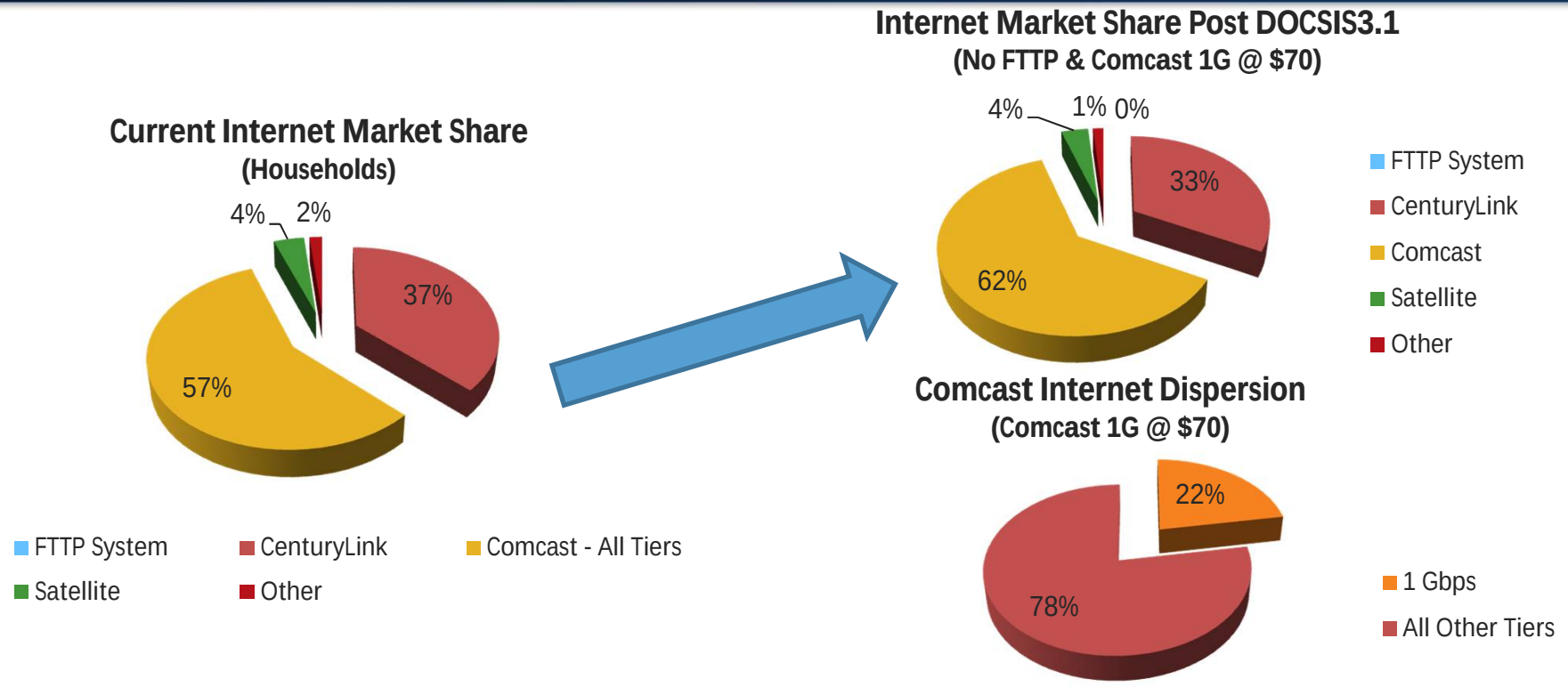
- Residential - 400 telephone surveys
- Residential/SMB Needs – **lower prices, higher reliability, increased speed**
- Large Businesses/Institutional Partners – current providers largely meet needs

Comcast Announcement of DOCSIS 3.1

Three post-DOCSIS 3.1 scenarios tested:

- DOCSIS 3.1 1G provider at $70/month (City loses first mover advantage)
- City 1G at $50/month and Comcast 1G at $70/month (baseline pro forma)
- Comcast and City both offer 1G at $70/month (to evaluate elasticity)

Study Findings – DOCSIS3.1 Prior to FTTP



Post DOCSIS 3.1 Survey Findings

The study accounts for Comcast DOCSIS 3.1 rollout before a fiber-to-the-premise (FTTP) system build out.

	Original Market Study	Post DOCSIS 3.1
Internet (residential)	38.8%	30.2%
Voice (residential)	28.6%	8.4%

If First to Market, Take Rate Estimate – 38.8%
If Competing with Comcast in the Market, Take Rate Estimate – 30.2%

City Broadband Strategic Objectives

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Business Models

Municipal Utility - Retail Model (Longmont)

- City builds and maintains the physical fiber network to pass all premises
- City provides Internet and voice services directly to customers (video is optional)

Wholesale Model (Huntsville & Westminster, Maryland)

- City builds and maintains the physical fiber network to pass all premises
- Retailer is responsible for all other functions/costs
- City is compensated via monthly per passing and/or per connected premises fees

Franchise Model (Google Fiber in KC, Allo in Lincoln NB)

- City 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
- City executes conduit lease agreement (optional) providing long term access rights to City conduit

Study Findings – Business Structure Analysis

The structure of wholesale terms and risk allocation has improved within municipal broadband with lessons learned from legacy wholesale agreements

Three overall wholesale/franchise models have emerged as contemporary examples:

- Wholesale: City funds the build and charges retailer monthly fees per premise passed and/or per connection
- Wholesale: City funds the build and leases dark fiber to the retailer
- Franchise: City provides franchise (with or without conduit IRU) and retailer funds the incremental build costs

The current wholesale/franchise models would require changes to be viable for FC

- Lease rates are too low to pay off the long term debt from the fiber build
- Retailer price levels of $90 Gig will/may not be competitive in a DOCSIS3.1 environment
- Retailer may not serve all premises and can cherry pick service areas
- Possible Exception: Google Fiber funded by Alphabet and not the City*

* Noting that the Google Fiber-funded deployed markets average 2.9M population.

Uptown Findings

Municipal retail model is financially feasible - even in a post-DOCSIS3.1 environment

- Total funding requirement is $125M
- Project is net cash positive in 15 years

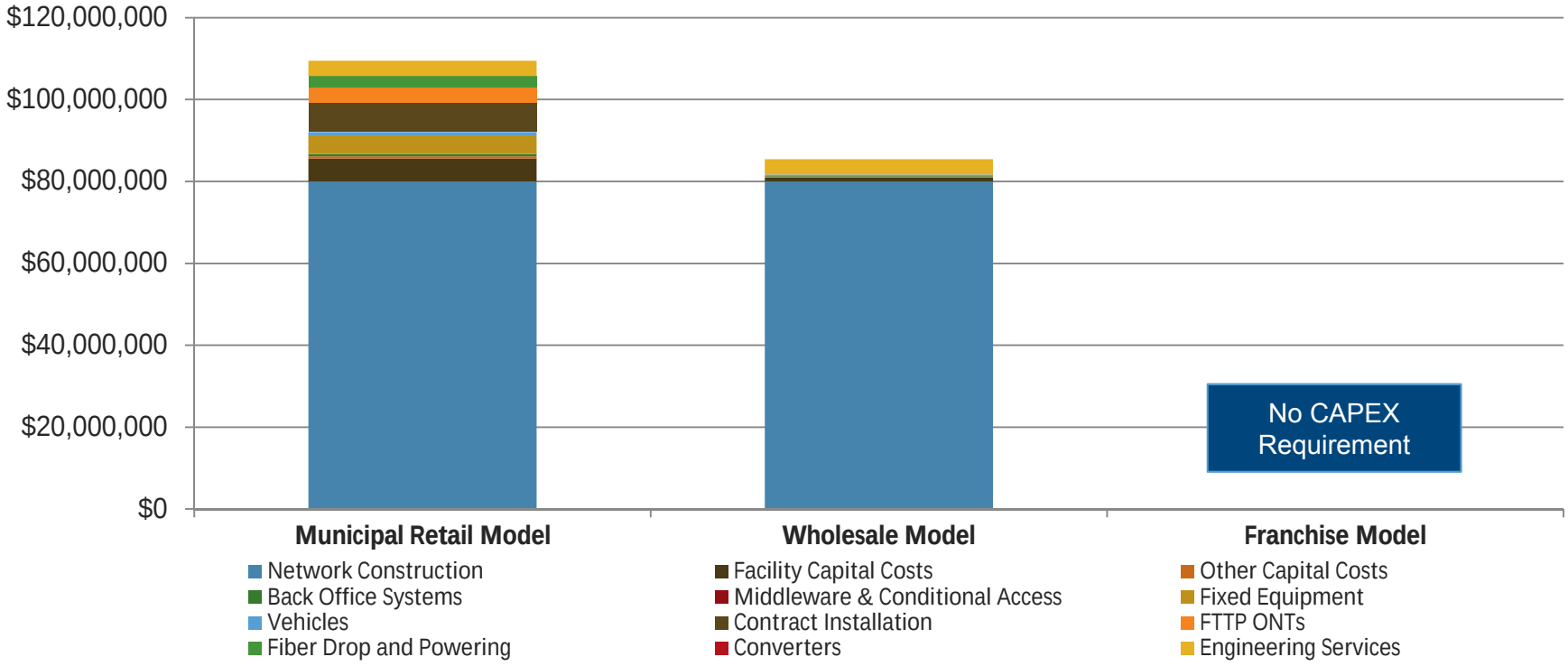
The municipal retail model remains feasible under most sensitivities

- Construction overrun of 10%: 15 year net payback
- Bond issue #2 100 basis point higher interest rate: 15 year net payback
- Construction overrun of 10% & 2x Upgrade Cost: > 15 year net payback

Wholesale or franchise model discussions could be pursued

- Wholesale Model:
  - Current terms of agreements not attractive – municipal carries the risk, success dependent on the partner
- Franchise model:
  - Google Fiber (funded by Alphabet) is ideal with community-wide coverage commitment
  - Other Providers require detailed financial/risk assessment

Capital Expenditure (CAPEX) by Business Model



Financial Feasibility – Risk Analysis

Risk Factor	Degree of Risk for City			Ability to Mitigate
	Municipal Retail	Wholesale	Franchise	
Lower Penetration Due to DOCSIS3.1				Retail model pro forma is feasible with penetration reduced by 22% (Internet & Voice). Interdependent with Price Advantage Risk.
Lower Penetration Due to Brand Preference				Aside from Google Fiber, brand preference is very low for an alternative provider new to the market.
Lower Penetration Due to Loss of Price Advantage				Significant questions about the ability of retailers, other than Google Fiber, to compete using $90+ Gig Internet.
Higher Opex Due to Increased Staffing Costs				Pro forma salary and FTE levels are robust, but many muni FTTP systems exceed staffing budgets
Higher Capex Due to Construction Cost Overrun				Retail model pro forma is feasible at up to 25% construction cost overrun.
Higher Debt Service Due to Higher Interest Rates				Interest rate thresholds identified. Cannot eliminate all risk with uncertain bond issue #2 interest rate
Lower Community Support Due to < 100% Availability				Franchise model would require minimum density threshold

City Broadband Strategic Objectives

- Review of Timeline & Strategic Objectives
- Updated Market Demand Study – DOCSIS 3.1
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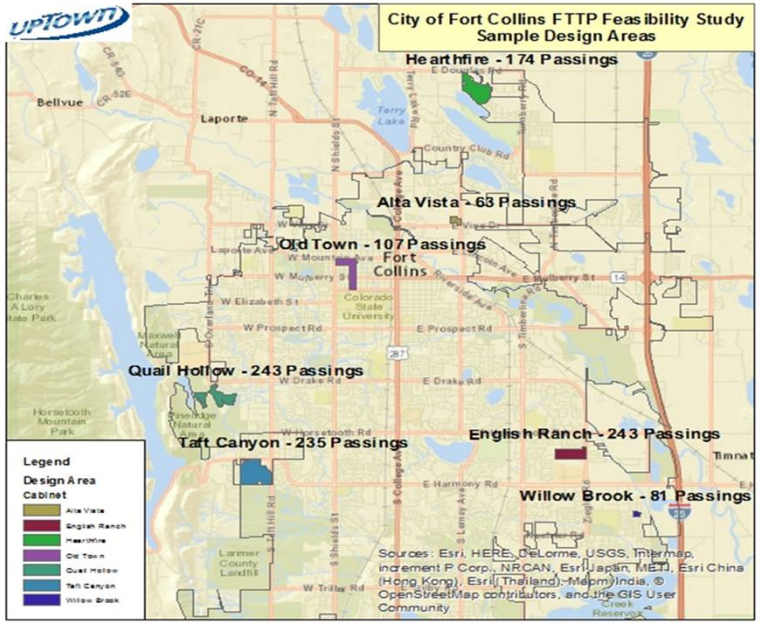
Municipal Broadband (Retail) – Key Input Assumptions

- Build out – 5 years
  - 30.2% take-rate
  - Construction cost of $984/passing (based on sample design)
- Funding requirements
  - Long term debt of $125M across 2 issues of 12 years at 3.75% and 4.75%, respectively
  - May not borrow for working capital $10M
  - TBD decision – borrow through Utility or General Obligation
- Operational Needs
  - Talent – 33 FTEs
  - Assets – equipment and technology such as trucks, billing systems, etc.

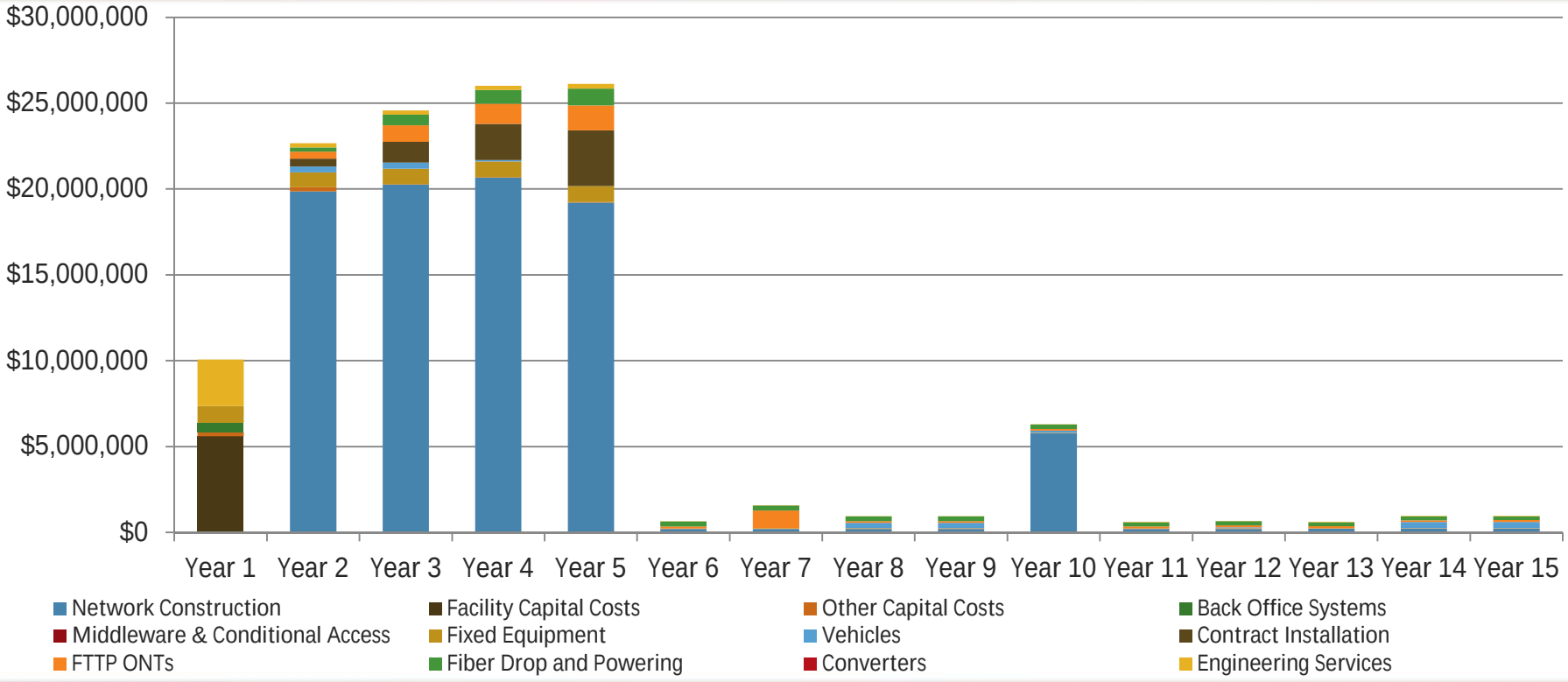
Financial Feasibility – Sample Design



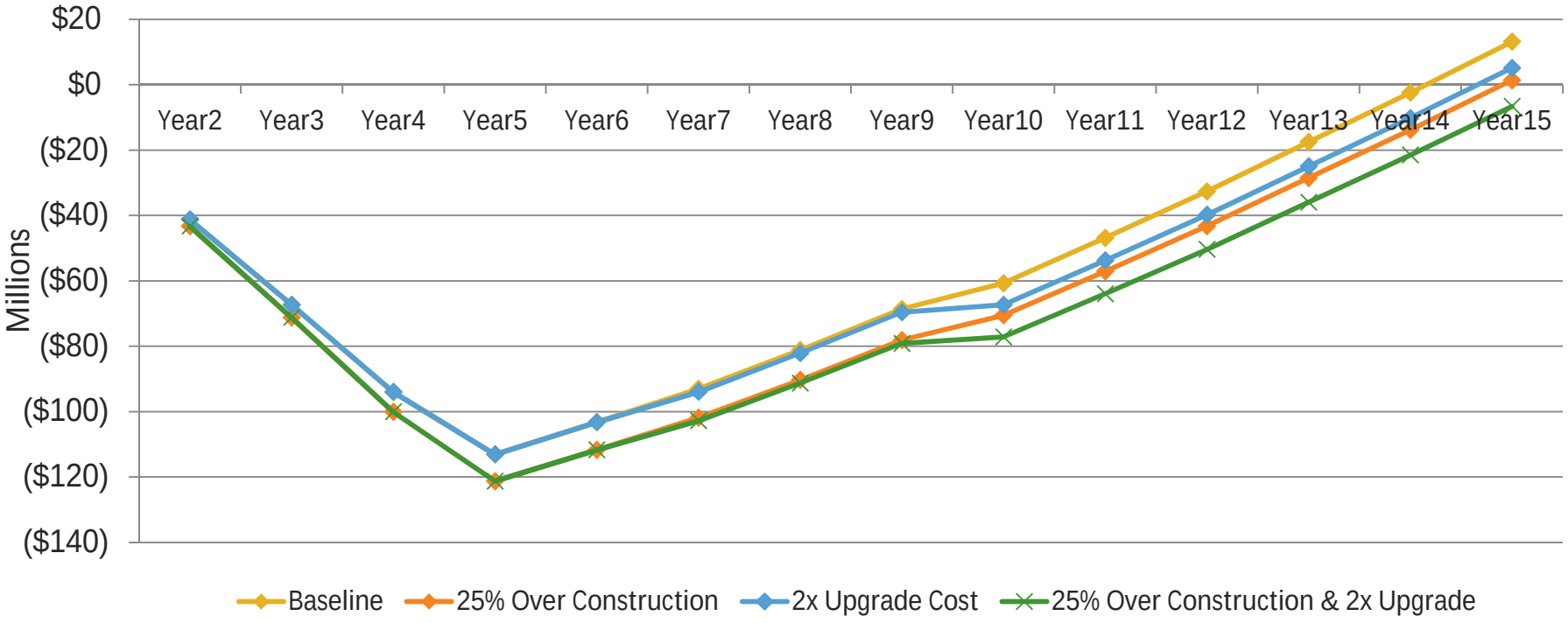
- Single family homes weighted based on parcels per zoning district
- Represented MDU and commercial sample designs were not completed
- MDU cost estimate to be 50% of single family costs
- Weighted average cost per passing includes labor, materials and 15% contingency = $984/passing for initial infrastructure build out

Cost per Passing is the Most Significant Assumption Within the Model

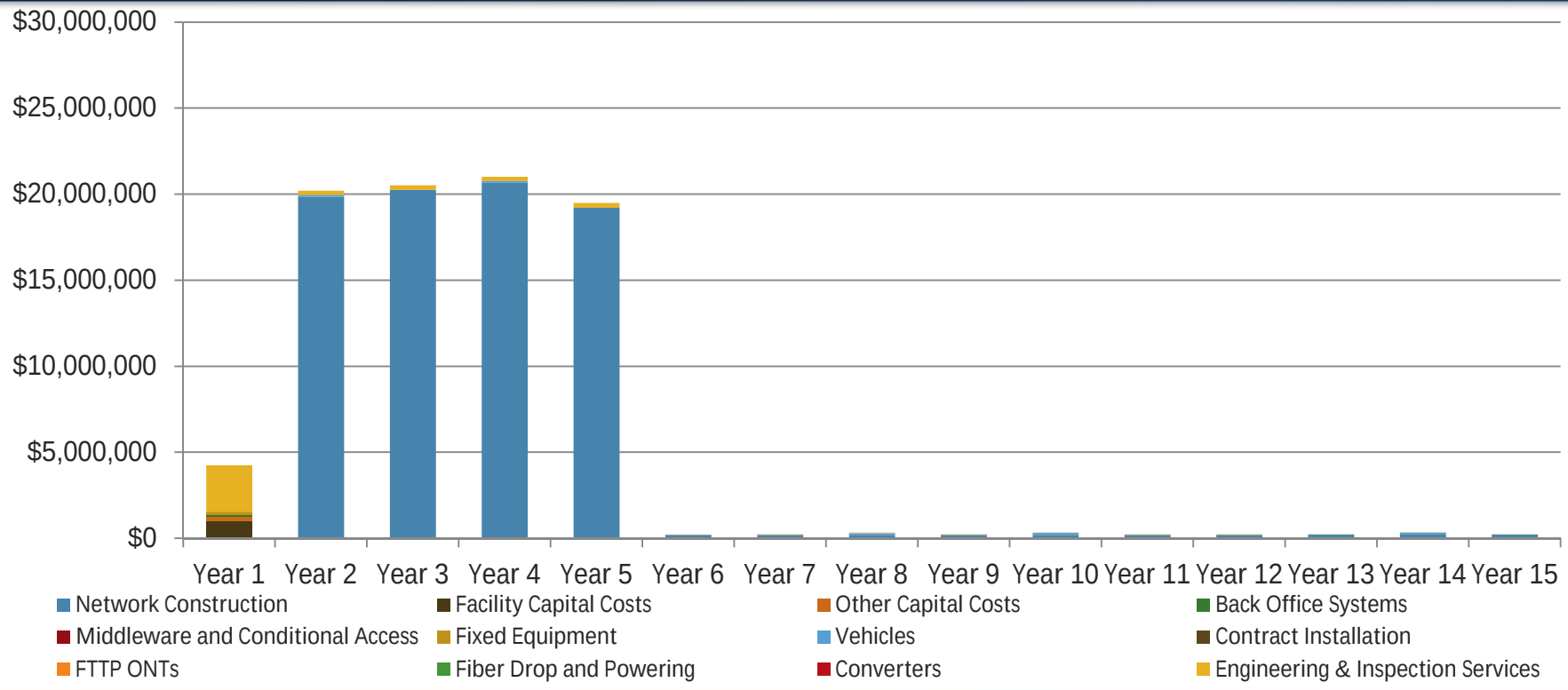
Municipal Retail - CAPEX



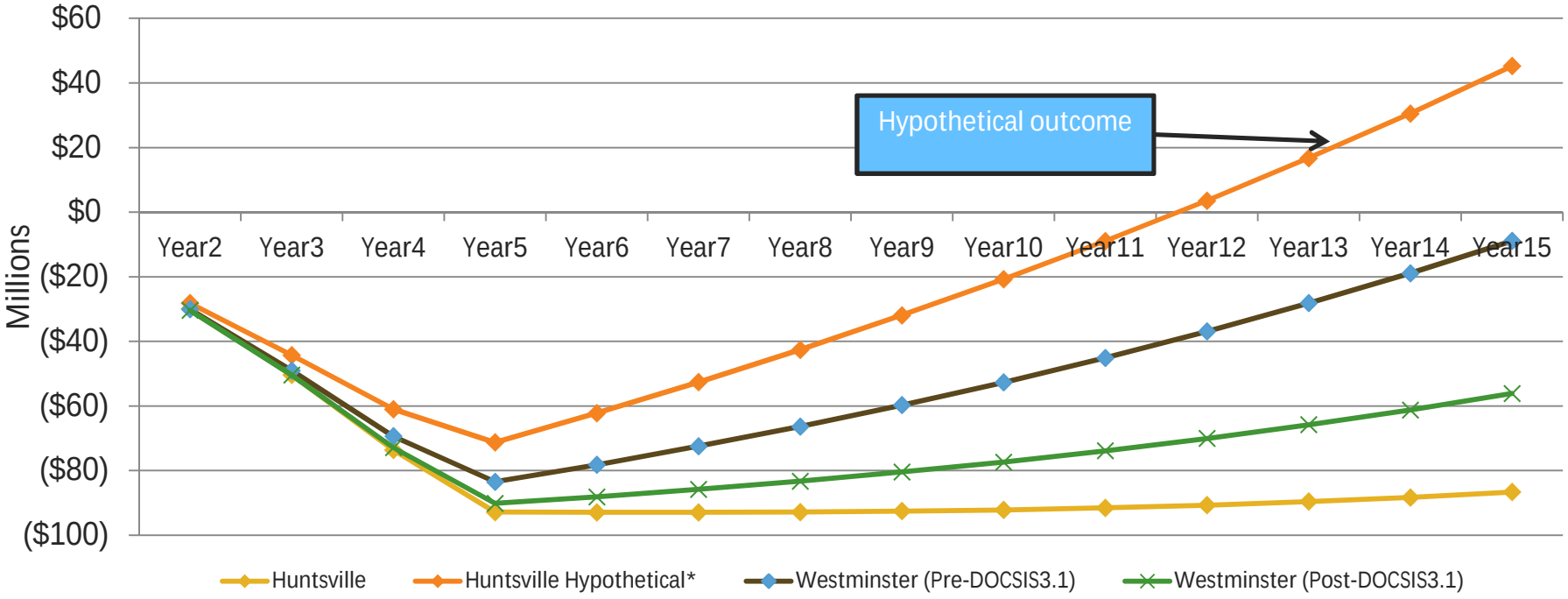
Municipal Retail - Cashflow



Wholesale - CAPEX



Wholesale - Cashflow



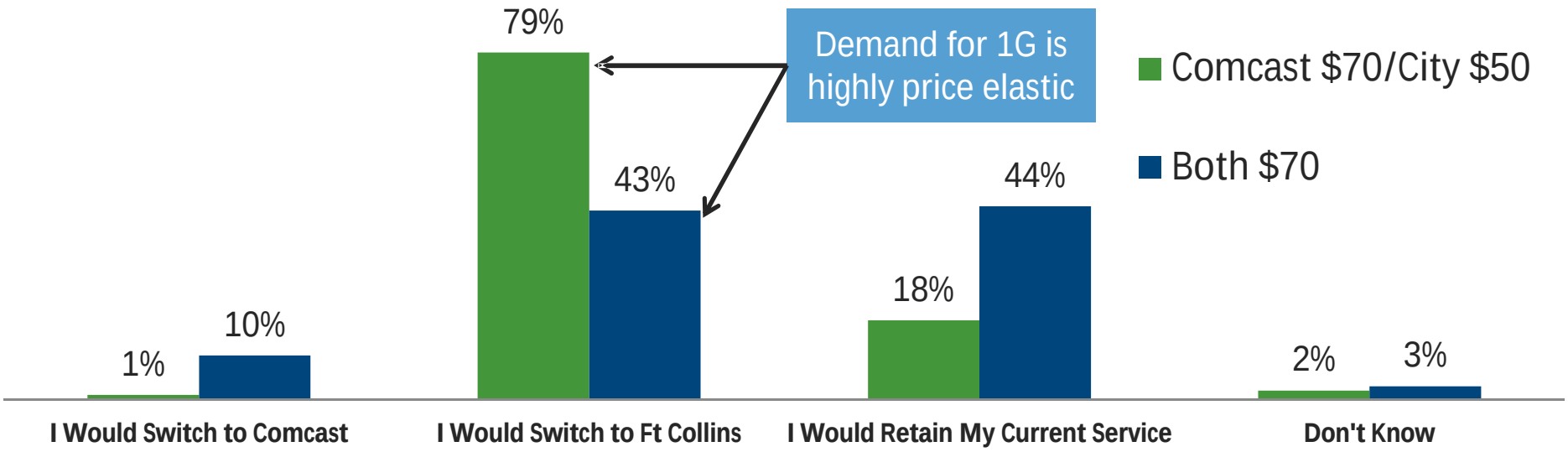
Next Steps

- **Community Outreach and Engagement on Alternatives**
- **Exploratory Discussions:**
  - Franchise Agreements
  - Other Potential Partnerships
- **Final Revisions to Financial Feasibility Model**
- **Recap of Community Outreach and Engagement and Recommendation – December 2016**

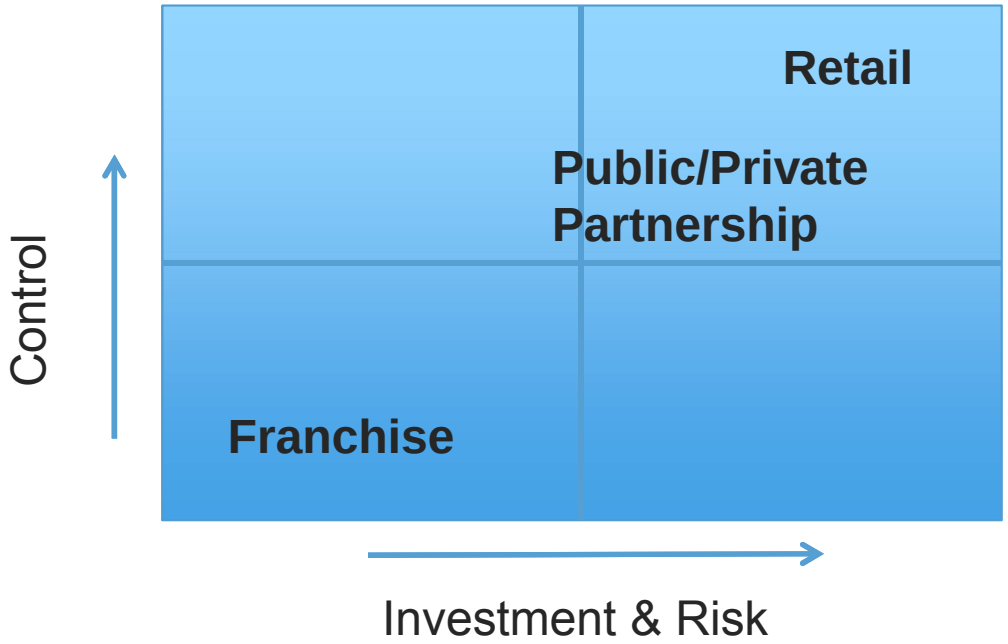
Back-Up

Post DOCSIS 3.1 Survey Findings

Q4-5: "If these services were available to your home, and offer the same speed, which of the following statements best describes your likelihood to switch?"



Business Models



Retail vs. Wholesale vs. Franchise

Model	Example	Network Services	Pre DOCSIS3.1	Post DOCSIS3.1
Retail	Longmont	Data & Voice Services per Task 2 Report	**Pre-DOCSIS VIEW** Penetration (Res / Bus) • Internet: 38.8% / 45% • Voice: 28.6% / 41% • Video: 24.6% / 0%	**BASELINE (Post-DOCSIS)** Penetration from follow-up survey • Res Internet: 30.2% • Res Voice: 8.4% (at peak) • Bus: No Change **BASELINE + VIDEO** • Res Video: 19.1%
Wholesale	Westminster	Dark fiber lease Fees based on premises passed and connected	**WESTMINSTER** Penetration = Baseline • Residential: 38.8% • Commercial: 45.0% Westminster contract wholesale rates	**WESTMINSTER -50%** Penetration @ 50% of Baseline • Residential: 15.1% • Commercial: 45.0%
	Huntsville	Dark fiber lease Fees based on premises passed	**HUNTSVILLE** Penetration is irrelevant Huntsville contract wholesale rates	N/A
Franchise	Lincoln	Long term conduit lease (optional)	Financial analysis not required (No City investment)	

Study Findings – Design Standards

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

No above ground structures

Study Findings – Construction Cost

OUTSIDE PLANT COSTS	WEIGHTED AVERAGE PER PASSING	TOTAL CONSTRUCTION COST @ 72,435 PASSINGS*
Materials	$116	$8,402,460
Labor	$739	$53,529,465
Total	**$855**	**$61,931,925**
Contingency @ 15%*	**$128**	**$9,271,680**
Total	**$984**	**$71,276,040**

Key Construction Costs

- Directional boring in landscaped areas - $10.00 per foot
- Vault, hand hole and flower pot adder - $2.00 per foot
- Pulling fiber in conduit - $0.75 per sheath foot (average for all cables)
- Splicing - $30 per splice

*(NOTE: Does not include other system costs e.g. electronics and operations)

Financial Feasibility - Baseline

Outcome	City as Retailer Internet/Voice (Baseline Pro Forma)
Internet Penetration	30.2%
Voice Penetration	8.4%
Cost Per Premise Passed	$984 (incl. 15% contingency)
Equity Investment	-
Long Term Debt	$117.3M
Operating Losses (Working Capital)	$8.1M
Total Funding	**$125.4M**
Net Cash - Year15	$13.1M
Project Break Even	**15 Years**

Study Findings – Market Analysis

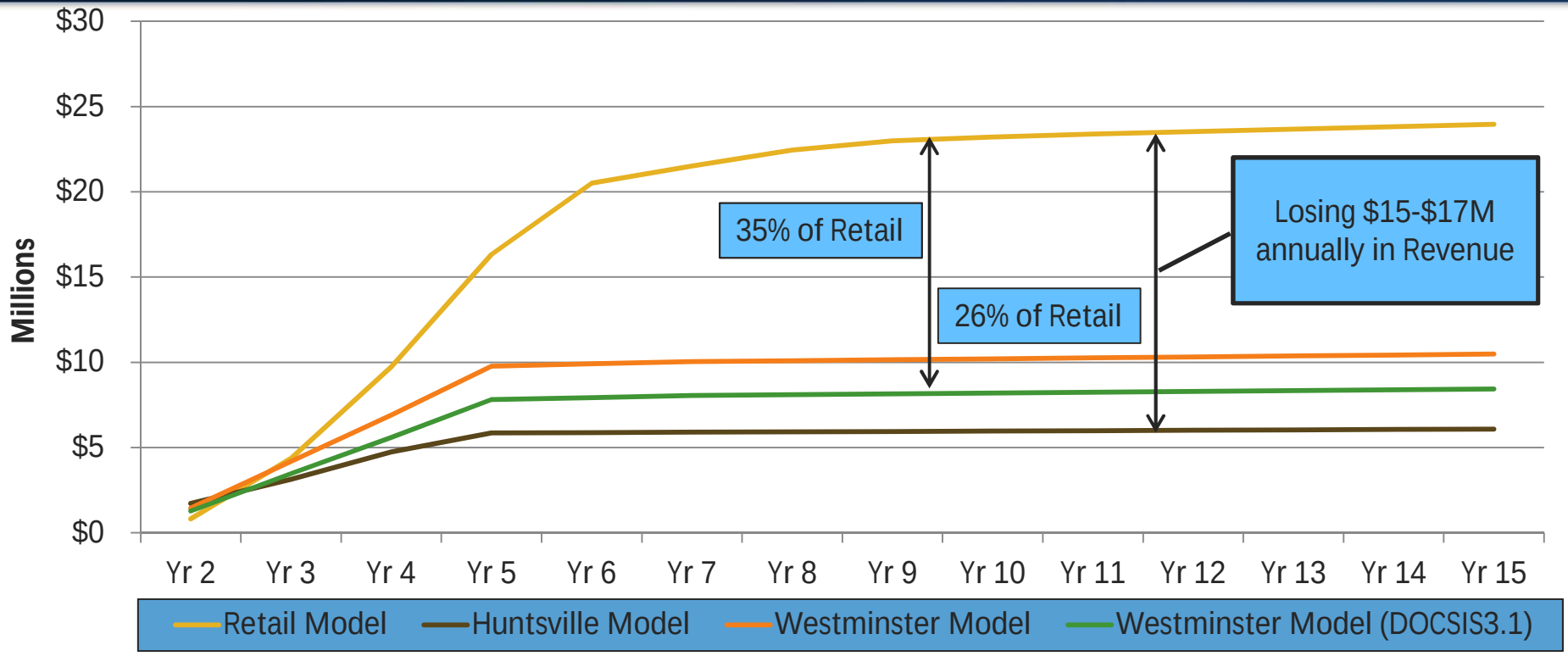
- Satisfaction for Internet and voice service benchmarks low compared to other communities
- Top market needs are:
  - Mass Market: Lower prices, increased Internet speed, and improved reliability
  - Complex Market: Lower prices and carrier-grade reliability
- Strong provider preference for the City to provide service (3x higher than incumbents and 15x higher than a new alternative provider)
- Mass market purchase intent is very high and exceeds Longmont survey metrics in the current pre-DOCSIS3.1 environment:
  - Internet: 38.8% residential penetration
  - Voice: 28.6% residential penetration
- The study must account for a Comcast DOCSIS3.1 rollout prior to FTTP system build-out and impact to pro forma market penetration:
  - Internet: 30.2% residential penetration
  - Voice: 8.4% residential peak penetration (adjusted for DOCSIS3.1 and LPC actuals)

Study Findings – Passing Cost Design Analysis

Sample Design Area	OH Miles	UG Miles	Passings	Passings per Mile	Weight	Materials per Passing	Labor per Passing	Total per Passing
Quail Hollow	0.0	3.2	243	75	30.1%	$140	$980	$1,120
English Ranch	0.0	2.5	243	96	22.6%	$132	$781	$913
Alta Vista	0.0	0.7	63	95	6.4%	$128	$792	$920
Old Town	0.0	2.2	235	98	5.7%	$126	$699	$825
Hearthfire	0.0	2.6	174	66	2.1%	$165	$1,097	$1,262
Taft Canyon	0.0	3.8	235	62	1.8%	$170	$1,187	$1,356
Willow Brook	0.0	0.6	81	143	0.0%	$98	$530	$628
MDUs*	0.0	0.0	0	0	31.3%	$73	$424	$497
Weighted Average / Total	0.0	15.6	1,274	82	100%	$116	$739	$855

- Single family weightings based on parcels per zoning district
- Representative MDU and commercial sample designs not completed
- Willow Brook design area was not deemed to be representative
- MDU costs estimated to be 50% of average single family costs

Study Findings – Revenues – Retail vs. Wholesale



Study Findings – OPEX – Retail vs. Wholesale