MEMORANDUM

TO:	**UTILITIES ADVISORY COMMISSION**	1
FROM:	**UTILITIES DEPARTMENT**	
DATE:	**June 6, 2012**	
SUBJECT:	**Request for Feedback Concerning the Dark Fiber Optic Backbone Network**	

REQUEST

The purpose of this report is to update the Utilities Advisory Commission (UAC) on reports related to the expansion of the existing dark fiber network and the resulting staff recommendations on additional telecommunications services for the community. Staff is asking for UAC feedback on the reports and the staff recommendations.

Information is also provided regarding a Letter of Intent between the City of Palo Alto and the Palo Alto Unified School District (District) to provide dark fiber service connections to eighteen (18) District sites.

SUMMARY

Staff is seeking feedback from the UAC regarding the following recommendations for the fiber network and the Fiber Optics Fund reserve (fiber fund reserve):

1. Commercial Dark Fiber Service:
   Staff recommends continuing the current business model for licensing dark fiber service connections to commercial customers.

2. Citywide Ultra High-Speed Broadband System Project:
   Staff recommends discontinuing efforts to evaluate and implement phased initiatives to build out the fiber network for residential Fiber-to-the-Premise (FTTP) using the fiber fund reserve.

3. Municipal Wireless Network:
   Staff recommends initiating an evaluation to determine if the City should use the fiber fund reserve to finance the construction and operation of a wireless network which leverages and augments the City's fiber network.

BACKGROUND

Commercial Dark Fiber Service

The City's 41-mile fiber network has become a financially successful enterprise licensing dark fiber service connections to a wide variety of businesses and institutions in Palo Alto. There are currently seventy eight (78) commercial dark fiber customers. The fiber network also supports the communication needs of City utility infrastructure, information technology systems for City

departments at multiple facilities, and other critical municipal infrastructure such as traffic signals. Commercial customers and the City (as a fiber customer) currently license 197 dark fiber service connections. The licensing of dark fiber service connections has resulted in a fiber fund reserve of approximately $12.7 million (the reserve includes a $1.0 million Emergency Plant Replacement fund). According to the Fiscal Year 2013 Proposed Budget, the fiber fund reserve is projected to increase by $2.1 million.

Citywide Ultra High-Speed Broadband System Project

Council asked staff to evaluate ways to use the fiber fund reserve to build out the fiber network based on a phased approach with minimal financial risk to the City.

Based on the Council's primary goals and objectives[1] for the Citywide Ultra High-Speed System Project, in 2011 staff presented to the UAC and the Council Finance Committee a "conceptual plan" for FTTP which proposed two phases:

Phase 1: construction of fiber optic hub sites at the nine electric substations to establish core distribution centers for fiber optic and wireless transport vendors (approximate cost $1.0 million).
Phase 2: expanding network access from the hub sites to eighty eight (88) neighborhood nodal access points as a potential platform for FTTP, in addition to supporting other uses related to wireless communications (approximate cost $5.0 million).

The rationale for the phased approach in the conceptual plan is to deploy fiber infrastructure that *may* provide an economic incentive to attract a private sector investor/operator to build out the "last mile" for residential and commercial FTTP. If there was no interest from the private sector in a FTTP build-out, the infrastructure could possibly be used to support a wireless network.

Since the conceptual plan for FTTP was presented, staff has also evaluated a "user-financed" business model for residential FTTP which will be summarized later in this report.

DISCUSSION

As stated in the summary, staff recommends discontinuing efforts to evaluate phased initiatives to build out the fiber network for residential FTTP service using the fiber fund reserve. The basis for this recommendation is the competitive market conditions that exist in Palo Alto for broadband services and the low prospects that a private sector FTTP operator would be willing to build a "last-mile" system to all residential areas of Palo Alto.

Market research indicates that a third citywide terrestrial broadband network in Palo Alto, built by the City or a third party FTTP provider, or built by a third party provider in a partnership with the City, would find it extremely difficult to acquire sufficient market share to succeed – especially if the City did not want to expose itself to some financial risk beyond just licensing dark fiber to a potential FTTP system builder.

[1] Goals: (1) Provide each customer with access to a minimum bandwidth of 100 megabits per second (Mbps) symmetrical service, (2) network capable of delivering at least data, video and telephony services, and (3) Eventual City ownership of the system. Objectives: (1) An "open access" system, (2) Network Neutrality and (3) Minimal financial risk to the City.

The market already has two dominant incumbent broadband service providers (AT&T and Comcast) in addition to other Internet service providers and direct broadcast satellite service providers (DISH Network and DirecTV). AT&T and Comcast are experienced operators backed by significant technical and financial resources. They have a strong track record of product development and marketing of broadband services. Their entrenched presence and past track-record of aggressive tactics to retain their market share represent a formidable obstacle to any new facilities-based service provider gaining significant market share unless it can rapidly enter the entire citywide market with an enhanced product at a comparable or lower price point for service.

Based on current market conditions for broadband services in Palo Alto, staff concludes there is no fiscal basis to use the fiber fund reserve to pursue implementation of the phased conceptual plan for FTTP.

Analysis of User-Financed Fiber-to-the-Premise

To determine if there is an alternative approach for citywide FTTP, staff assessed the feasibility of a model that relies on homeowners to pay on a voluntary basis for some or all of the cost to build-out the City's existing dark fiber backbone network into residential neighborhoods. The name for this business model is "user-financed" FTTP.

The attached reports, "Fiber-to-the-Premise Study" (Attachment A), and "Market Analysis Report: User-Financed FTTP Model" (Attachment B), are provided to elicit feedback from the UAC regarding an analysis of the user-financed approach to implementing residential Fiber-to-the-Premise.

Conceptually, the user-financed FTTP system envisioned for this analysis would only provide Internet connectivity and bandwidth, at speeds chosen on an individual basis by subscribers (e.g. symmetrical 100 Mbps service for $100 a month). Homeowners would voluntarily finance system build-out costs by paying a one-time upfront connection fee that could range from $1,000 to $3,000 or more. The City would provide a wholesale transport-only service to one or more retail Internet service providers (ISPs) on an "open access" basis and the homeowner would directly pay the ISP for Internet connectivity. The City would be responsible for building and maintaining the core network while leaving customer service, provisioning, technical support and billing to the ISP. Subscriber revenues would be split between the City and the ISPs.

Under an open access user-financed model, build-out of the dark fiber network to a residential neighborhood would be dependent on a certain threshold of households being willing to pay for a fiber connection in order to justify the build-out cost. A low "take rate" in terms of homeowner willingness to pay the one-time connection fee in a neighborhood would make the build-out to a neighborhood cost prohibitive.

To assist staff with the analysis of the user-financed FTTP model, two consultants were retained: RKS Research & Consulting (RKS) and Tellus Venture Associates (TVA).

The scope of work for RKS was to conduct a community survey to measure consumer receptiveness to an open access user-financed model for residential FTTP.

The scope of work for TVA was to provide a financial and operational analysis that defines the user-financed FTTP business model, technology assumptions, capital and operating costs, deployment scenarios and the effect subsidies would have on the model if the fiber fund reserve was used to supplement the cost to build and operate an FTTP system.

Community Telephone Survey

RKS and staff developed a telephone survey that asked questions of homeowners residing in single family homes. The goals for the survey are outlined below:

1. Measure consumer receptiveness to an open access user-financed approach for residential FTTP.
2. Measure willingness to invest in a fiber connection.
3. Determine price points for a fiber service connection and monthly subscription rates.
4. Assess broadband competition in Palo Alto:
    a) Switching behavior (i.e. reasons for changing providers)
    b) Provider ratings.

The methodology used for the survey:

1. 401 residential telephone interviews (homeowners only).
2. Interviews were conducted in December 2011 (15 minutes average length)
    a) City of Palo Alto Utilities was indentified as the sponsor.

The high-level findings of the survey are summarized below:

1. 55% of Palo Alto homeowners are aware that the City owns and operates a fiber optic network.
2. 76% support extending the network into residential neighborhoods.
3. Regardless of whether homeowners support or oppose the FTTP build-out, 61% believe the City should provide broadband services to compete against existing broadband providers.
4. When survey respondents who support extending the network were told that the cost to build out an FTTP system to all residential neighborhoods was estimated to be between $40 and $60 million, support decreased to 38%. An equal amount of respondents (38%) said they were unsure if they would support the build-out when told of the cost.
5. When supporters of FTTP were asked if they would be willing to support extending the fiber network into their neighborhood based on the user-financed model (survey respondents were made aware that the one-time connection fee could be as much as $3,000 or more per household, and the fee for Internet connectivity could range from $50 to $250 per month depending on Internet connection speed), 23% said they would support the idea of extending the fiber network to residential neighborhoods. 68% said they did not support the idea of extending the fiber network into neighborhoods based on the user-financed model. 9% were not sure.
6. Among the 23% of homeowners who support the idea of the build-out based on the user-financed model, 14% of all survey respondents said they would be willing to invest in a fiber connection. Among the 68% who do not support the build-out based on the user-financed concept, an additional segment of 19% of all survey respondents would be willing to invest in a fiber connection.

7. While there is significant support for extending the City's dark fiber network to residential neighborhoods, there is a small amount of support for the user-financed model. Supporters pushed back on their price expectations for the one-time connection fee falling well below the $3,000 threshold of an initial one-time investment: three in ten homeowners are not willing to pay more than $1,000 for the initial investment, and 35% would pay no more than $2,000. Just 4% of all homeowners fall in the $3,000 or more investment range.
8. Among homeowners who support extending the fiber network into their neighborhood based on the user-financed model and are willing to pay a one-time connection fee, 69% would be more likely to support the option if payment could be made in installments (e.g. $25 per month over a 10 year period).
9. Homeowners willing to invest in a fiber connection are generally younger and more affluent residents.

RKS Market Assessment

AT&T and Comcast share most of the broadband market in Palo Alto, with both providers offering triple-play (voice, video and data) services. Most customers appear to be satisfied with services received from these providers, so there would be major hurdles to overcome if a City FTTP system was built, including pulling already satisfied customers from other providers. To successfully pull customers from existing providers with an open access user-financed model, a City FTTP system would have to move beyond marketing the infrastructure as a selling point and build a strategic vision that adds value and return on customer investment.

The survey indicates that among AT&T and Comcast customers, few have switched to another provider in the past two years. Among those switching, the primary motivator was a promotion that likely lowered price. Switching based on better quality of service was the second most cited reason, but price appears to be the primary motivator. Given homeowners' stance on price, if the City initiated an open access user-financed FTTP service, it must anticipate that homeowners will assess the service not just based on the value a fiber connection would add to the home, but also on what is currently available at a similar price. The City cannot expect that a large number of homeowners will switch to its offering just because it provides a competitive service. The City must view and approach the FTTP option as a retail product with several well-established and credible competitors all vying for the same limited customer base.

RKS's research affirms that residents view City of Palo Alto Utilities (CPAU) as a respected and competent provider of core utility services. A measurable number of homeowners are interested in adding telecom to the list of services they can purchase from CPAU, but a commitment to invest in a fiber connection is very limited.

In summary, RKS's research shows that there is significant interest in the City extending its fiber network into residential areas, but there would be major hurdles to overcome implementing a user-financed business model, including structuring a realistic competitive price that effectively pulls a sufficient number of satisfied customers from other providers.

Tellus Venture Associates Market Analysis Report

Tellus Venture Associate's (TVA) scope of work asked for an analysis of the user-financed business model. The methodology used by TVA to determine the feasibility of a user-financed model was:

1. Collect existing research and proposals regarding the design, construction and operation of an FTTP system for the City of Palo Alto.
2. Collect additional information regarding City costs, revenues and operating parameters.
3. Evaluate the existing information and build a summary business model to evaluate which operational approach (e.g. fully City operated vs. open access, fully user-financed vs. hybrid user/operations financed, block by block vs. citywide deployment) would have the greatest likelihood of success.
4. Assess the independent market research conducted by RKS.
5. Build a full pro forma business model incorporating the market demand information and evaluating the most promising approach.
6. Test this base business model using a variety of financial assumptions and demand scenarios.

Staff provided several existing studies, proposals, requests for proposals and supporting information regarding FTTP systems in Palo Alto and other cities. TVA did further supplementary research, including using the results from the RKS survey. This information was sufficient to evaluate the relative likelihood of success for the various operational approaches and to build a preliminary financial model.

It was determined that an open access system financed by a combination of upfront investment (user and/or City funding) and operating revenues, and offered on a citywide basis would have the greatest likelihood of success. Although the City has certain advantages in constructing an FTTP system and maintaining and operating the core network, third party ISPs would be better suited to running the "consumer-facing" side of the business. Reasons for this assessment include:

1. Having more than one ISP available would increase the service options available to residents.[2]
2. Private companies have more options and greater flexibility in putting together user-financing packages. The City would have to use more cumbersome methods such as assessment districts and liens which require new ordinances and, potentially, voter approval.
3. Existing providers have already incurred the fixed costs necessary to support a consumer Internet service business and have developed the in-house resources and personnel necessary to implement it. On the other hand, the City would have to pay all the start-up and staffing costs involved in operating a consumer-facing system and would have a smaller subscriber base to support it.
4. Financial analysis showed that a fully user-financed system constructed on a block by block basis would require subscription rates three times greater than the most optimistic reading of the RKS data would support, and ten or more times the rates supported by more prudent interpretations.
5. Comparison of research and actual operating results from other cities, such as San Francisco and Alameda, likewise indicate that the necessary subscription rate would be unachievable even under the most optimistic assumptions.

[2] Although a particular level of bandwidth services available from an ISP isn't estimated or identified in the analysis, it can be assumed to be sufficient to support telephone or television at some level. These additional services are not included in the financial analysis and are assumed to be purchased separately, if at all, by individual subscribers from their ISP of choice providing Internet connectivity on the system. The City would not share in revenue from additional services, or be exposed to the costs and risks.

As a result, a full pro forma business model was developed using base case parameters of:

1. Full, citywide deployment to the most advantageous extent supported by the RKS data.
2. An upfront connection fee of $3,000 and a $100 per month subscription fee.
3. The City receives 100% of the connection fee and 50% of the subscription fee.
4. No annual subscriber growth.
5. No subsidy from the City's existing Fiber Optics Fund reserve.
6. A middle-of-the-road interpretation of the RKS subscriber demand data.
7. Optimistic assumptions about construction and operating costs incurred by the City.

This model showed that a system built on these parameters would have an annual operating deficit that grows from $300,000 per year to more than $500,000 per year after 20 years, and would have a net loss of $39 million after 20 years, including the cost of financing the initial and ongoing deficits.

Several different alternate scenarios were then evaluated:

1. Base case at price point combinations of $1,000 upfront/$75 per month, $2,000/$100 and $5,000/$100.
2. Optimistic and pessimistic interpretations of the RKS data, at all four price point combinations ($1,000/$75, $2,000/$100, $3,000/$100, $5,000/$100).
3. Annual subscriber growth rates of 5% and 2% using optimistic and middle-of-the-road subscriber demand estimates (respectively), at all four price point combinations.
4. City subsidies of $10 million and $12 million upfront and $1 million and $2 million (respectively) on an ongoing annual basis, with annual subscriber growth rate assumptions of zero, 2% and 5%, at all four price point combinations.

Several of these alternatives showed positive operating income at various points over 20 years, but the only scenarios that showed a positive net value after 20 years were at the analytical extremes: low upfront and monthly fees and optimistic interpretation of subscriber demand data combined with a 2% or better annual growth rate and at least $10 million in upfront and $1 million in ongoing annual subsidies. Scenarios assuming middle-of-the-road subscriber estimates, low upfront and monthly fees and optimistic annual growth rates also showed a positive net value after 20 years if the City provided a subsidy of $12 million upfront and $2 million a year on an ongoing basis.

TVA concluded that "a fully user-financed citywide fiber-to-the-premise system is not possible to achieve in Palo Alto. An opt-in FTTP system can be built using a combination of upfront user fees and City financing, but there is very little probability of the debt incurred being repaid through operations. Ongoing subsidies would be required, almost certainly in excess of the surpluses generated by the CPAU dark fiber system."

Staff concludes that there is no reasonable fiscal basis for the City to pursue a user-financed FTTP system to serve residential neighborhoods on a citywide basis. Even if the fiber fund reserve is used to finance initial construction, millions of dollars – likely tens of millions – of borrowing would be required. Because of the optimistic assumptions necessary to project a positive outcome over even a long period of time, the likelihood of success will be low and the interest rate required by lenders will be correspondingly high, higher in fact than the 5% rate

used in the TVA model. From a financial perspective, embarking on an FTTP project would involve an unreasonable degree of risk. The risk for the City is even greater than the risk identified in cities such as Alameda, California and Provo, Utah prior to construction of residential broadband systems. These enterprises ultimately resulted in financial failure and either bondholder losses and lawsuits or direct, supplemental taxpayer subsidies.

Additionally, Staff does not support spending the fiber reserve generated by the City's dark fiber network on providing service to a small fraction of residents who, according to the RKS data, are likely to be among the City's most affluent households.

Municipal Wireless Network

As broadband technology evolves, reliable, high data rate mobile Internet access over dedicated wireless networks has become critical infrastructure for local governments. As a result, many cities have invested in dedicated wireless networks to support a wide variety of mobile government applications that field staff can access with tablets, laptops and smartphones.

Wireless networks built on top of dark fiber networks can provide many benefits to a city, including, supplementing public safety networks (e.g., wireless network for disaster response and recovery), reducing the need to purchase cellular data services from commercial providers for mobile municipal workers, support of utility infrastructure (e.g. communication platform for Smart Grid applications), in addition to providing amenity-grade or subscription-based public Internet access.

Staff recommends initiating an evaluation to determine if the City should use the fiber fund reserve to build and operate a dedicated wireless network. The recommended approach for this process is:

1. Perform a "needs" assessment and identify key user groups within the City (e.g. Information Technology, Public Safety, Utilities, Public Works, public access) that would use a wireless network.
2. Assess operational requirements for each user group.
3. Determine network design priorities and technology choices (WiFi, WiMAX, cellular and public safety bands), and integration with the fiber network and internal IT networks.
4. Identify business models.

Palo Alto Unified School District

On March 19, 2012, the City of Palo Alto and the Palo Alto Unified School District signed a Letter of Intent to extend dark fiber service connections to eighteen of the District's facilities. The project will provide dark fiber service connections to the District's Business Office, fifteen (15) Palo Alto-based schools, and two schools located on the Stanford campus. The proposed date of completion of the project is on or after July 1, 2013.

The City has provided the District with a preliminary cost estimate of $424,716 for the one-time dark fiber interconnection fee (i.e. construction cost) for all eighteen facilities, but the actual cost will be determined after the advance engineering work is completed and a final design is submitted for acceptance by the District. The City has agreed in principle to bear one-half of the interconnection fee at its own cost and expense, and the District will reimburse the City for the other one-half in 120 monthly payments over a ten year period. The basis for the City paying one-half of the interconnection fee is that the extension of dark fiber service connections to

District facilities will significantly increase the footprint of the fiber network throughout the City and for service to customers beyond the District. The District will pay one hundred percent (100%) of the total base monthly dark fiber license fees which are estimated to be $8,187. The Letter of Intent is attached to this report (Attachment C).

NEXT STEPS

Upon receiving comments and feedback from the UAC, staff will prepare a City Managers Report with recommendations for Council consideration.

RESOURCE IMPACT

The work performed by RKS Research & Consulting and Tellus Venture Associates was undertaken at a cost of $20,092 and $12,375 respectively, for a total cost of $32,467.

ATTACHMENTS:

A. Consultant Report (RKS Research & Consulting): "City of Palo Alto Fiber-to-the-Premise Study (Residential Customers)."
B. Consultant Report (Tellus Venture Associates): "Market Analysis Report - User-Financed FTTP Model."
C. Letter of Intent between the City of Palo Alto and the Palo Alto Unified School District for Dark Fiber Services

PREPARED BY:

JIM FLEMING
Management Specialist

REVIEWED BY:

TOMM MARSHALL
Assistant Director, Engineering

APPROVED BY:

VALERIE O. FONG
Director of Utilities

ATTACHMENT A

CITY of PALO ALTO

City Of Palo Alto

Fiber To The Premise study

(Residential Customers)

January 2012

RKS
RESEARCH & CONSULTING

(www.RKSresearch.com)

CITY of PALO ALTO

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Goals/Methodology/Topics

RKS RESEARCH & CONSULTING

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Study Goals/Methodology

- Goals:
  - Measure consumer receptiveness to an "open-access" user-financed approach to residential Fiber-to-the-Premise (FTTP)
    - Willingness to invest
    - Price points
    - Current Provider
      - Switch Behavior
      - Provider Ratings
- Methodology:
  - 401 Residential telephone Interviews (Homeowners Only)
  - Conducted December 2011 (*15 minutes average length*)
    - Palo Alto provided sample and identified as sponsor

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Snap Shot Interest in Palo Alto FTTP

Snap-Shot of Homeowners	Yes	No	Not Sure
Should Network Be Extended to Residential?	**76%**	12%	12%
Support if increased home value?	**67%**	21%	12%
Support with Cost of $40-$60 Mill.?	38%	24%	**38%**
Support if $3,000 and Monthly Fee?	23%	**68%**	8%
Support $25/mo. installments over 10 years	**69%**	26%	5%
How Many Homeowners Will Pay In Your Neighborhood?	10% *(Most)*	27% *(Some)*	41% (Few/Hardly)
Should CPAU Compete with Comcast/ATT?	**61%**	26%	12%

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Base is all homeowners (401).

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Awareness & Support Of A FTTP Option

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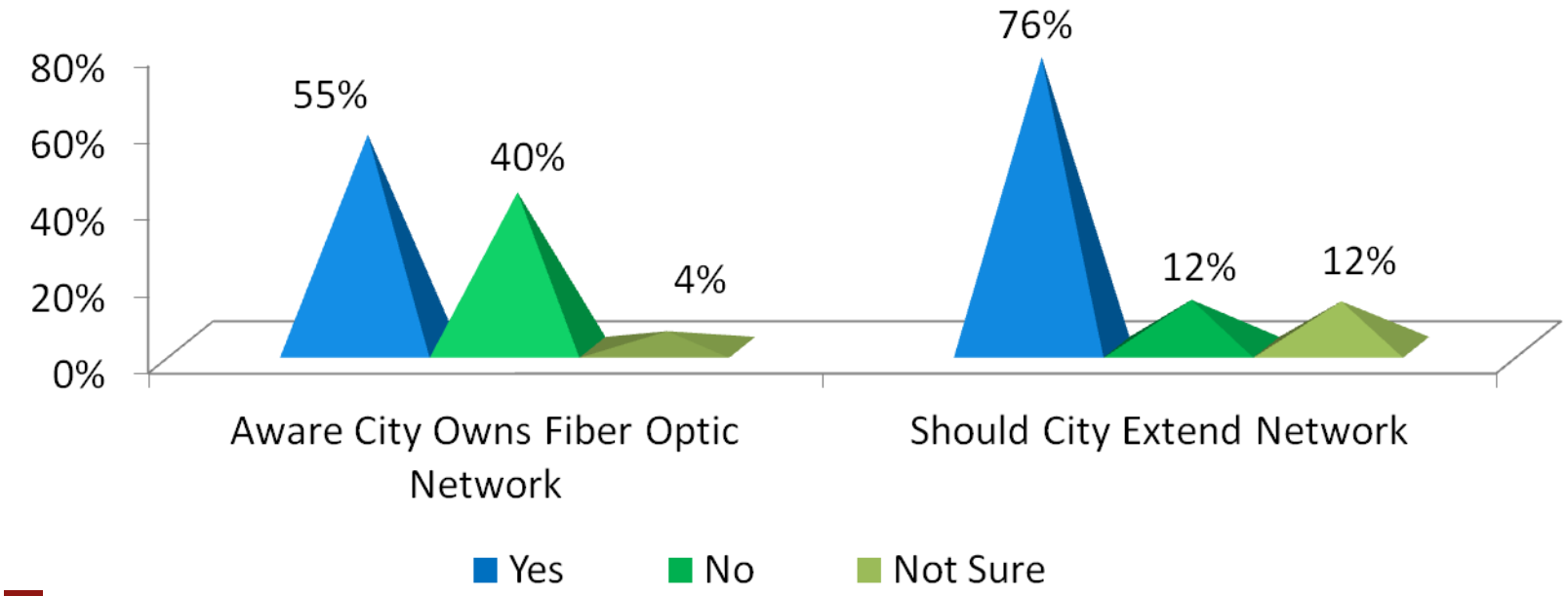
Half Are Aware of The Fiber Optic Network, Most Believe The City Should Extend The Network

Over half of Palo Alto homeowners are aware that the city owns a fiber optic network, and three-fourths - 76% - support extending the network into residential neighborhoods.

Support for extending the network was equally strong whether the homeowners knew the city owned the fiber network (77%) or was not aware of the fiber network (75%).



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Base is all homeowners. (Question I-1,2a)

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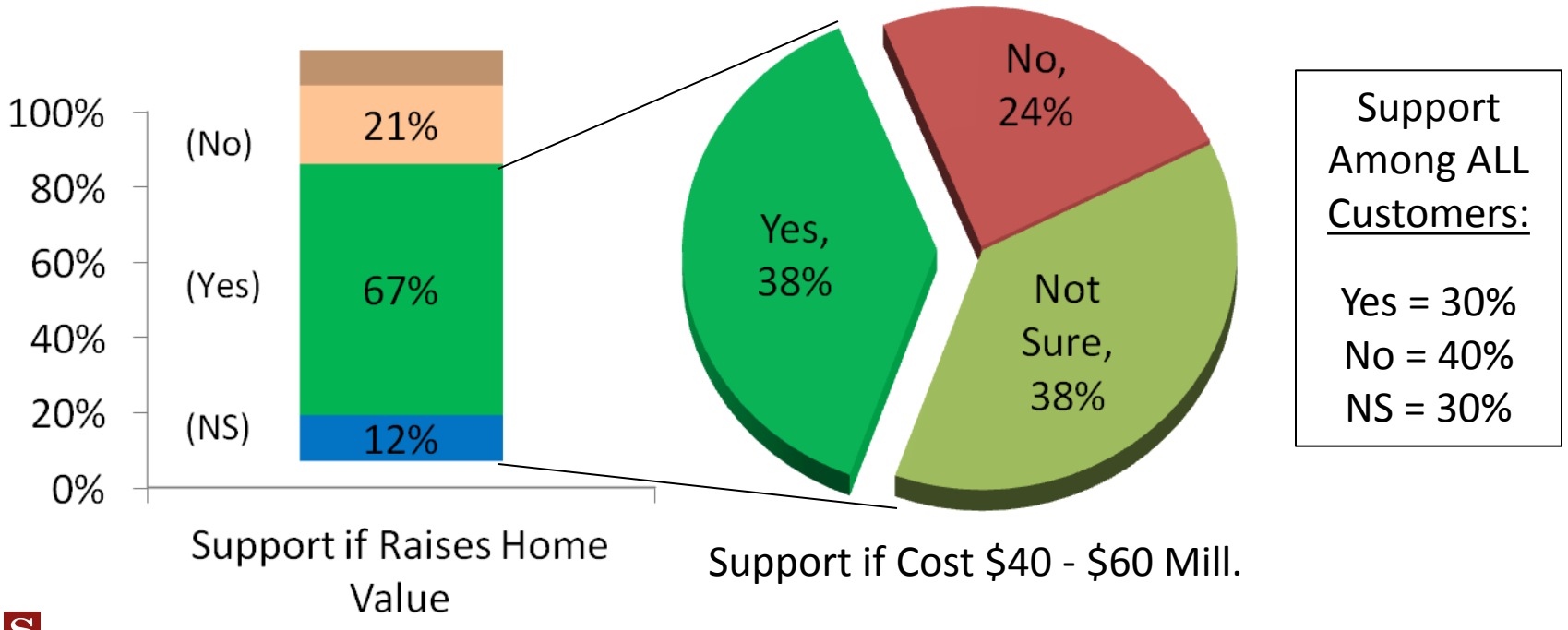
Increasing Home Value Adds Little to Support, But Four In Ten Are Not Abated By Costs

Seven in ten homeowners are likely to support the fiber network extension knowing that it would likely increase home values.

- Among these (268 homeowners) roughly four in ten (121 respondents) remain interested even after being told about the costs of the network build out.



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Base is all customers (401) for QI2-b, 317 for QI-3 (support with Costs).

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Supportive Target Segment

- Support for the Fiber Optic build-out is strongest – as expected - among younger, more affluent Palo Alto homeowners.
  - Worth noting is that support for the build-out is much stronger among AT&T customers (60%) than Comcast customers (36%).

Demographics	Support Costs ($40 - $60 Mill.)	Will Not Support
Age	25%: Over 64 yrs old **54%: Under 54 yrs old**	**47%: Over 64 yrs** 36%: Under 54 yrs old
Income	**57%: Over $100,000**	41%: Over $100,000
Lifestyle	**71%:Employed** 26%:Retired	43%:Employed **51%:Retired**
Current Provider	**60%%:AT&T** 36%:Comcast	46%:AT&T 34%:Comcast
Aware of Palo Alto Network	54%	60%

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Note: Base = all homeowners .

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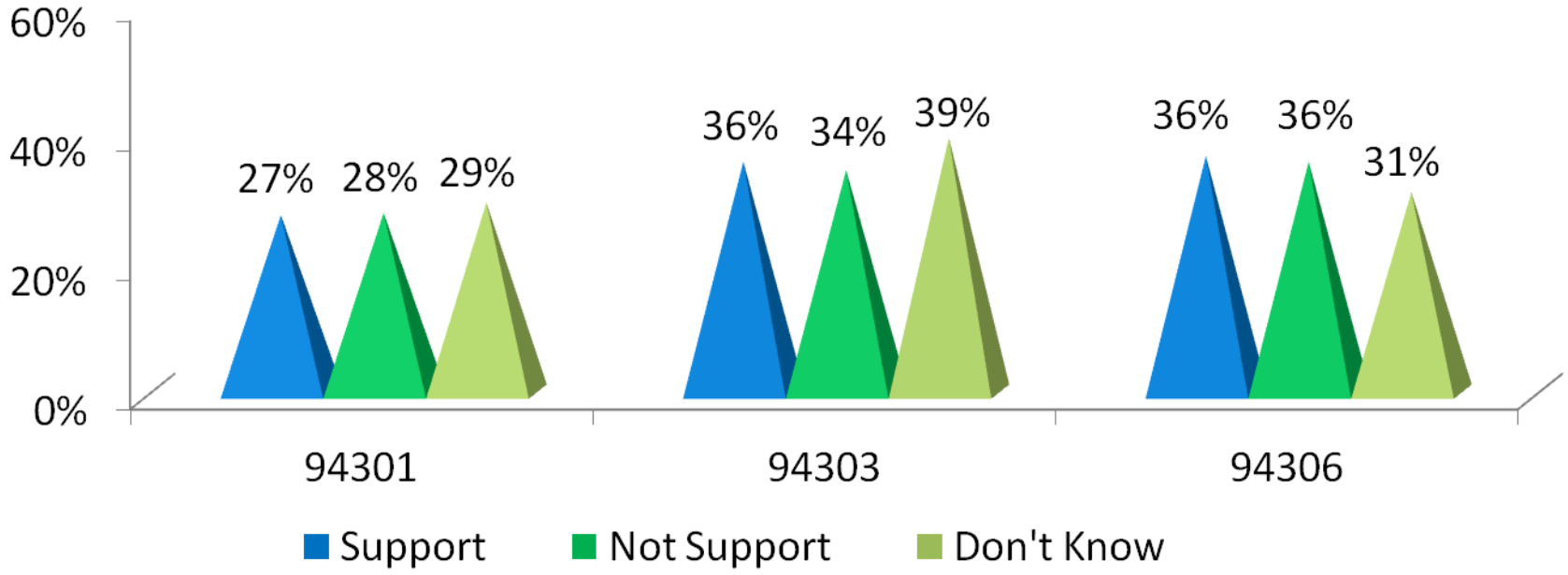
Support is Uniform Across All Zip Codes

No one zip code in Palo Alto reports significantly higher interest in the Fiber Optic build-out than another area. (*There is slightly higher support in 94303 and 94306, but the difference is not significant.)*

The data also show that support (and opposition and "Don't Knows") are equally distributed; this suggests that "buyers" are likely to be drawn from ALL areas of Palo Alto which also means that costs can be spread across all areas.



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Base: Zipcode 94301 = 89; 94303 = 116. 94306 = 108.

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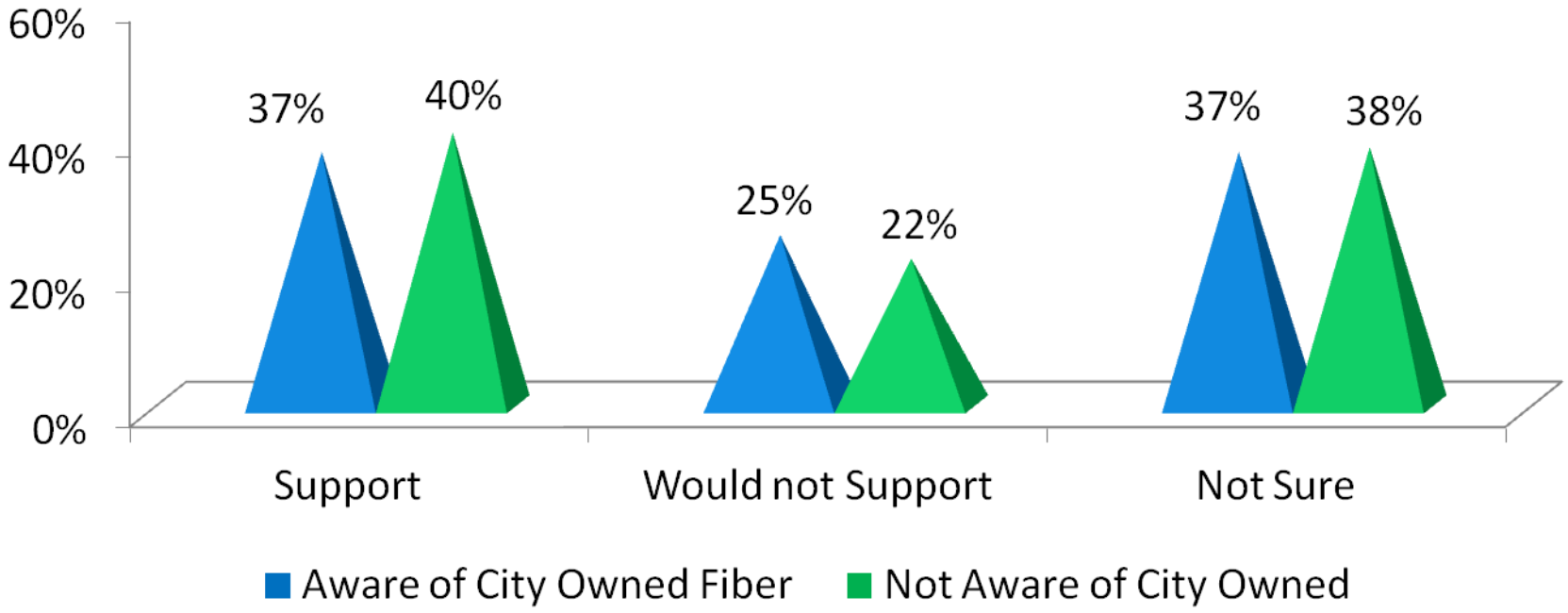
Prior Awareness of City Owned Fiber Optic Network Adds No Additional Support

Whether or not homeowners are aware that the city currently owns a fiber optic network does not influence support or opposition to a citywide build-out. In fact, statistically there is no difference in support if the resident is aware or not aware about the network that already exists.



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Base: Homeowners aware of City owned fiber network (n=171), not aware (n=134).

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FTTP Costs & Homeowner Interest

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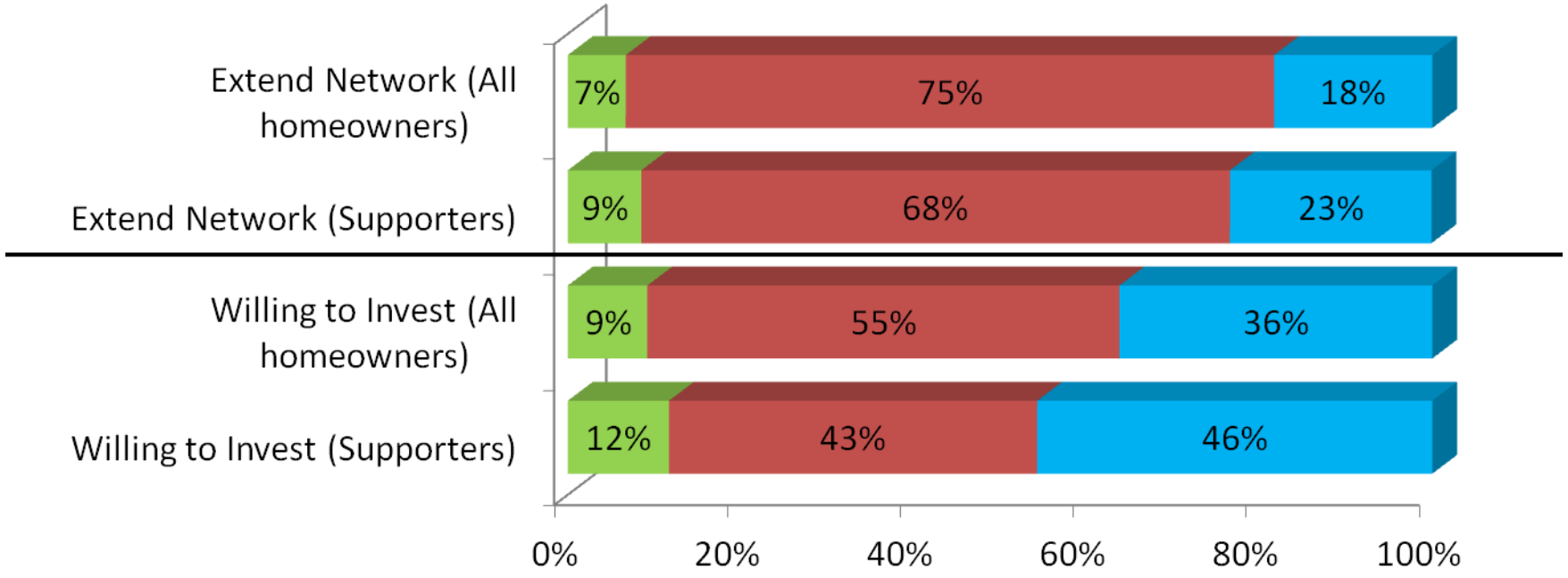
One in Six Homeowners Will Support The Expansion; Just Over One in Three Willing to Invest

One in six homeowners reports they are willing to support CPAU extending the existing fiber network into residential neighborhoods, aware that the costs could be as much as $3,000 up-front and $50 - $250 per month for the service.

- Just over one in three are willing to invest in the fiber extension into their neighborhood.



Base : 317 homeowners. Questions QI-4a, QI-4b.

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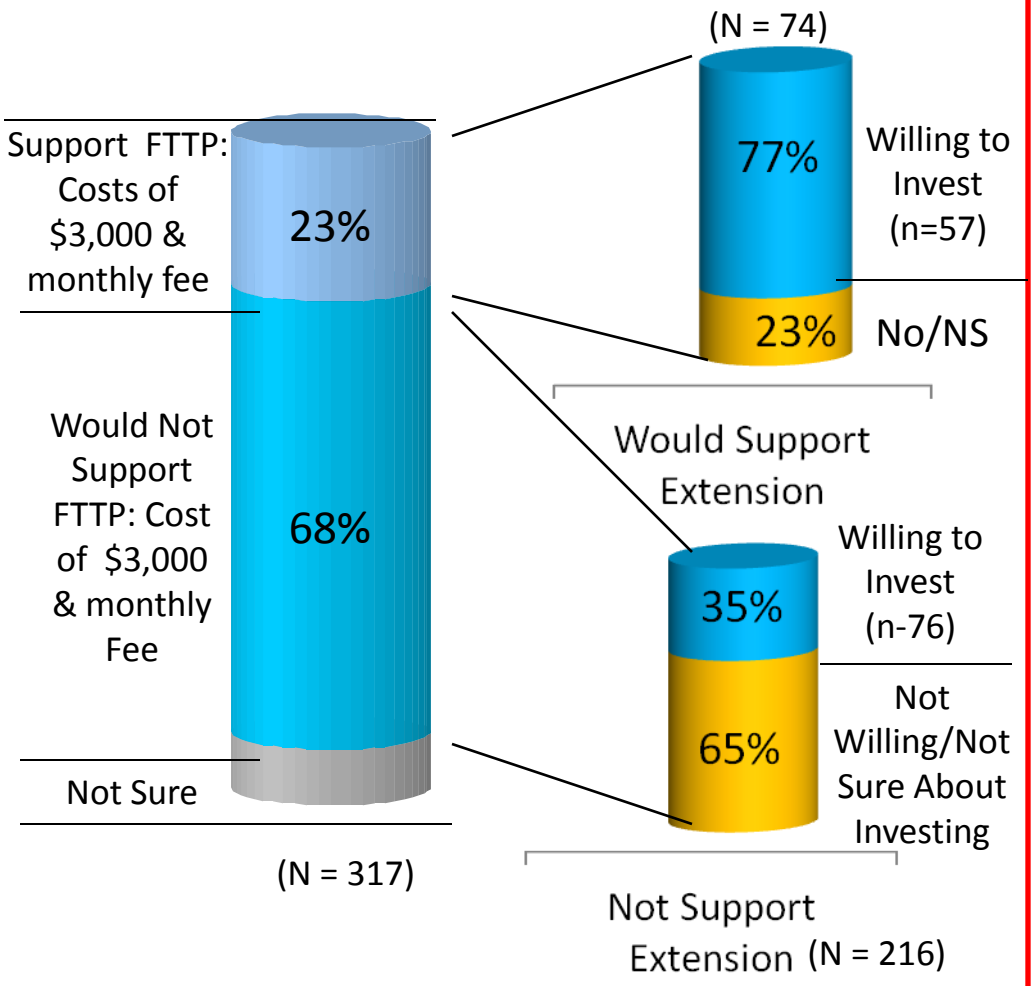
Most Supporters Want the Service in Their Neighborhood

- Most homeowners who support the expansion appear willing to back up their preference, and invest in the fiber network into their neighborhood - this segment of 57 homeowners represents 14% of ALL survey respondents.
- An additional segment of 76 respondents who do not support the expansion, but are willing to invest in an expansion into their neighborhood represents an additional 19% of all respondents.

Both groups combine for a total of 33% of Palo Alto homeowners.



Note: Total Responding = 317 respondents: 74 willing to support $3,000 initial costs plus monthly fee; 216 not supporting initial cost and fees, 27 not sure.

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Investment Segment

- Consistent with FTTP support, homeowners who are willing to invest in the Fiber Optic build-out are younger and more affluent Palo Alto residents.
  - Homeowners willing to invest in the build-out are drawn slightly more from among AT&T customers (52%) than Comcast customers (37%).

Demographics	Willing To Invest	Not Willing to Invest
Age	26%: Over 64 yrs old **57%: Under 54 yrs old**	**42%: Over 64 yrs** 34%: Under 54 yrs old
Income	**62%: Over $100,000**	42%: Over $100,000
Lifestyle	**70%:Employed** 26%:Retired	54%:Employed **44%:Retired**
Current Provider	52%%:AT&T 37%:Comcast	51%:AT&T 36%:Comcast
Aware of CPAU Network	57%	55%

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Note: Base = 145 respondents willing to invest, 135 who are not willing to invest.

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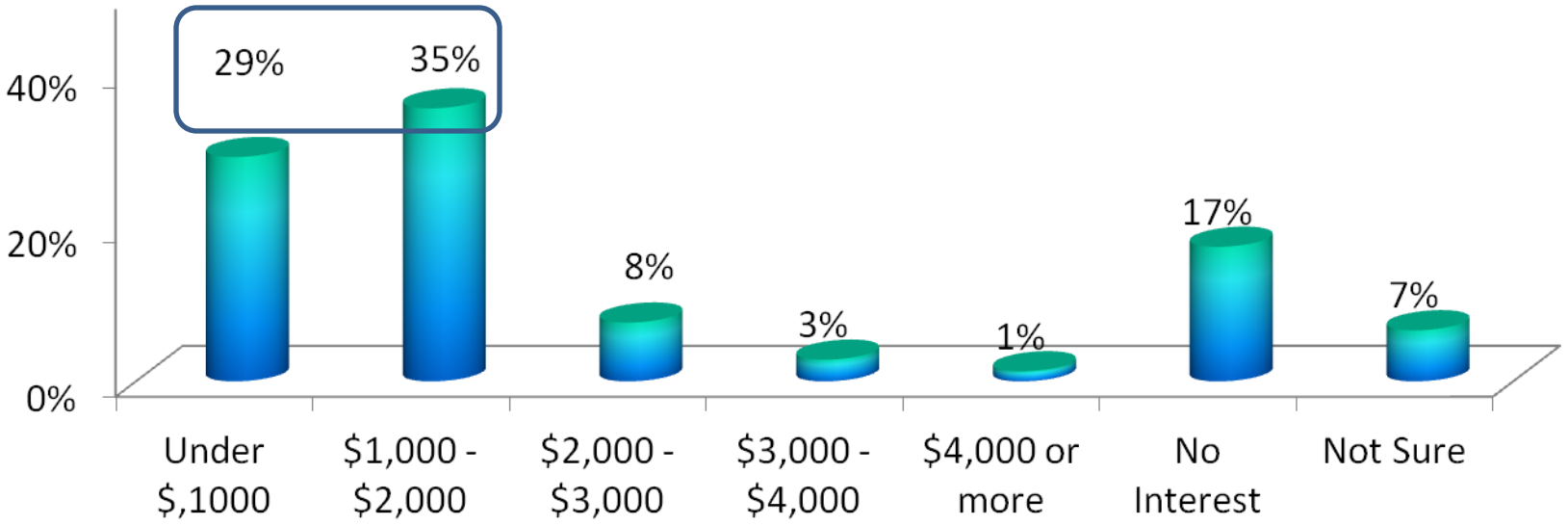
"Acceptable Costs" Fall Well Below Anticipated Build-Out Threshold

While support is strong for the network expansion, most homeowners fall well below the $3,000 threshold of an initial, one-time investment.

- Three in ten homeowners are not willing to pay more than $1,000 for the initial investment, and 35% would pay no more than $2,000 for build-out opportunity. Just 4% of homeowners fall in the $3,000 or more investment range.



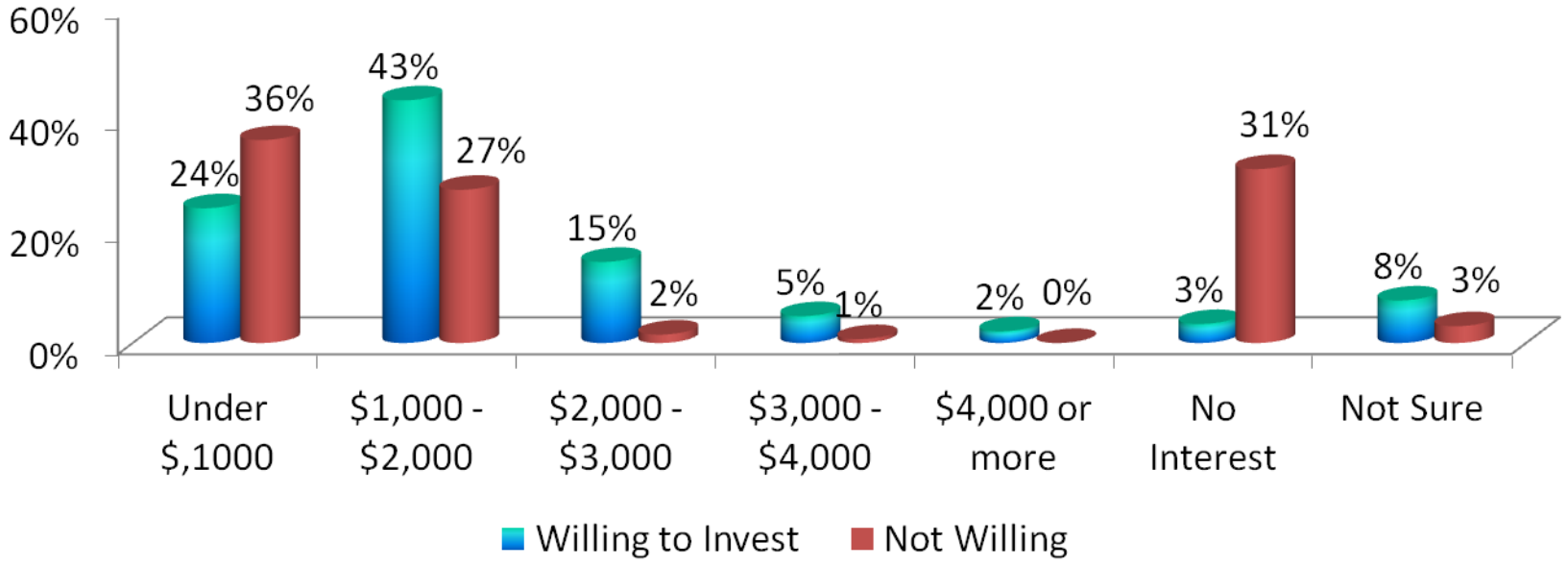
Base is all respondents. Question I-5

CITY of PALO ALTO

Homeowners Willing To Invest Report The Same Price Point As Homeowners Not Willing

Few homeowners willing to invest in the city FTTP are willing to invest more than $2,000, with two-thirds (67%) describing their maximum of $2,000 or less.

- This suggests that while support is strong, hitting the $3,000, or even the $2,000 threshold among homeowners will be a major challenge.



RKS RESEARCH & CONSULTING

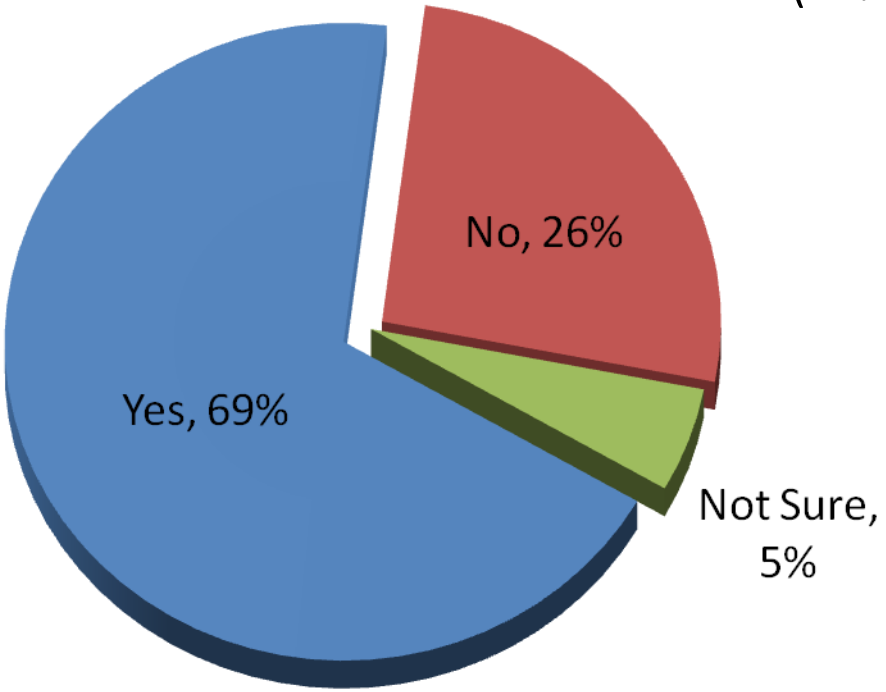
Base: Willing to invest -= 145, Not willing = 135. Question I-5, I4b.

CITY of PALO ALTO

Support for 10-Year Installment Plan is Strong

Homeowners supporting the FTTP plan, overwhelmingly support a 10-year installment plan as a way for the city to offer the build-out into residential neighborhoods.

Among all respondents, (both supporters and non-supporters), support for the build-out represents just under half of Palo Alto homeowners (45%).



Support Among ALL Respondents:

Yes = 45%
No = 52%
NS = 3%

RKS RESEARCH & CONSULTING

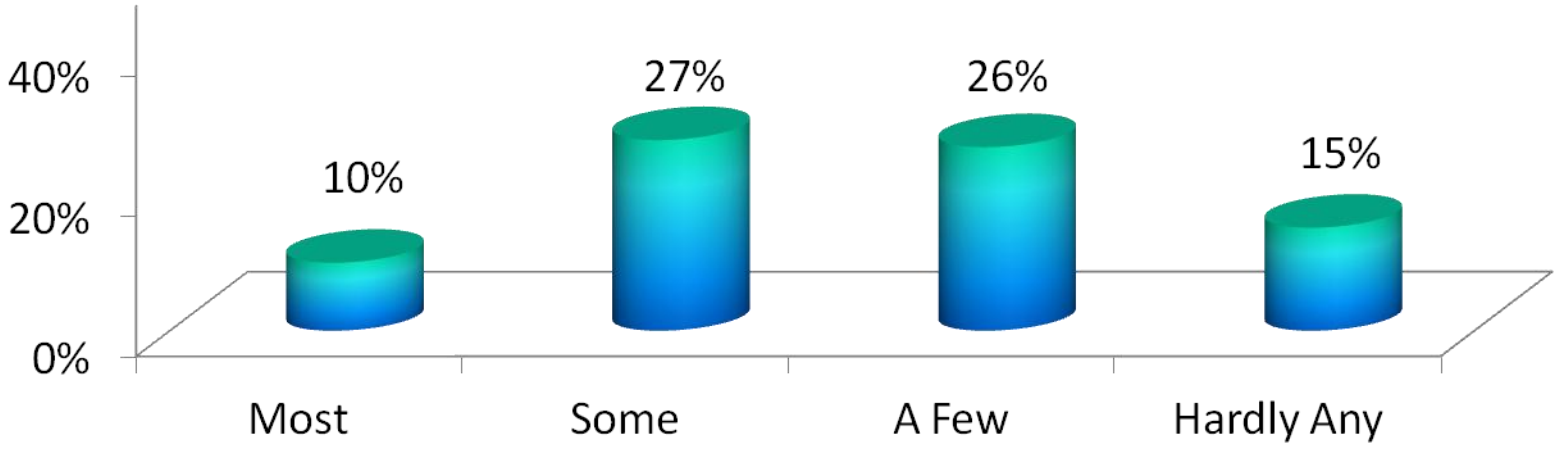
Base is all respondents (262) for Q I-6.

CITY of PALO ALTO

Homeowners' Project How Many of Their Neighbors Would be Willing To Pay The One-Time Fee

Just over a third (37%) of Palo Alto homeowners believe that either all or most of their neighbors would be willing to pay the one-time fee to extend the existing fiber network.

By contrast 41% project that few or hardly any of their neighbors would be willing to pay the one-time fee to extend the network.

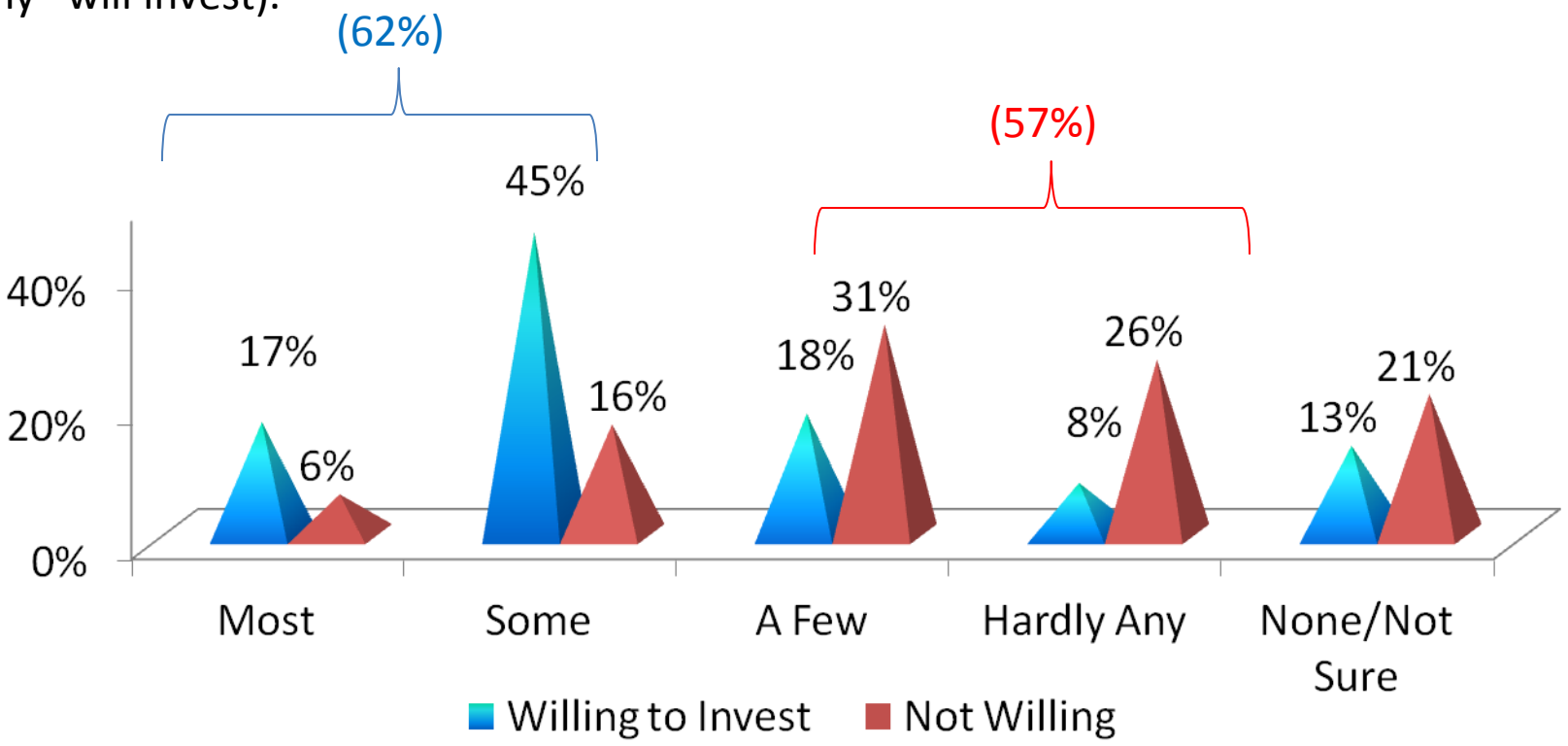


Base is all respondents (401). Question I-7.

CITY of PALO ALTO

Homeowners Willing to Invest More Optimistic About Neighbors' Interest

Homeowners who expressed a willingness to invest in the expansion are more optimistic about their neighbors' interest (62% believe "Most" or "Some" will invest) than respondents not willing to invest in the expansion (57% report "Few" or "Hardly Any" will invest).



Base: Willing to invest -= 145, Not willing = 135. Question I-7, I4b.

CITY of PALO ALTO

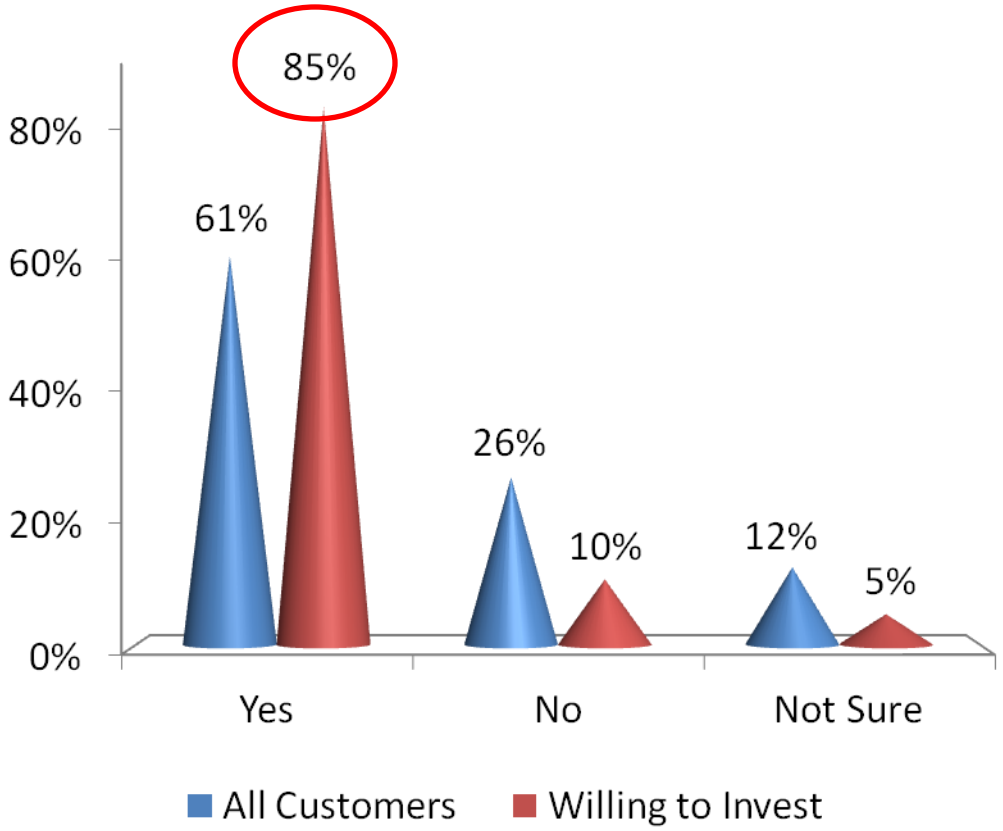
Broadband Competition in Palo Alto

Fiber to Premise Study

RKS RESEARCH & CONSULTING

CITY of PALO ALTO

Most Believe The City Should Extend Network To Stimulate Competition



- Regardless of whether homeowners support or oppose the build-out of the fiber network into residential areas, a majority of respondents (61%) do believe the city should provide broadband services to compete against existing providers.
- Predictably, among those willing to invest in the expansion, an overwhelming number (85%) supports broadband competition.

RKS RESEARCH & CONSULTING

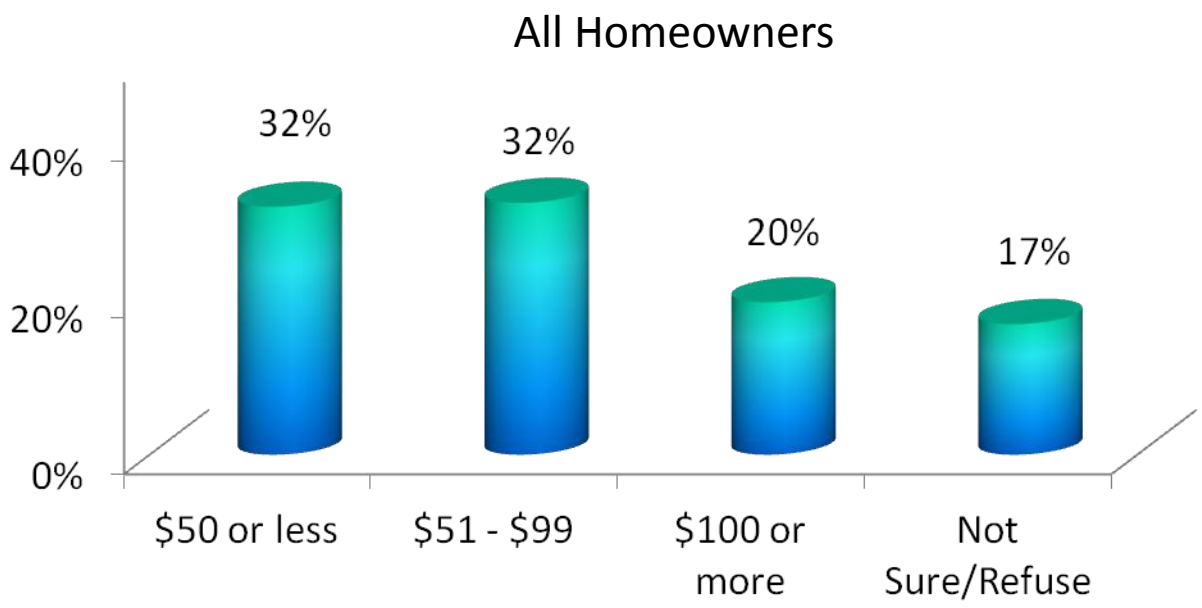
Base: 401 homeowners, 145 willing to invest. Question C-1, I-4b.

CITY of PALO ALTO

Most Homeowners Are Willing to Pay Under $100 Per Month For A Fiber Connection

About two-thirds (64%) of homeowners are willing to pay under $100 per month for a fiber connection; another 20% are willing to pay $100 or more.

Homeowners willing to invest in the CPAU fiber network expansion are willing to pay more per month for a connection, than customers not willing to invest in the fiber expansion.



Customers Willing to Invest

$50 or less = 16%
$51 - $99 = 43%
$100 or More = 31%

Customers Not Willing to Invest

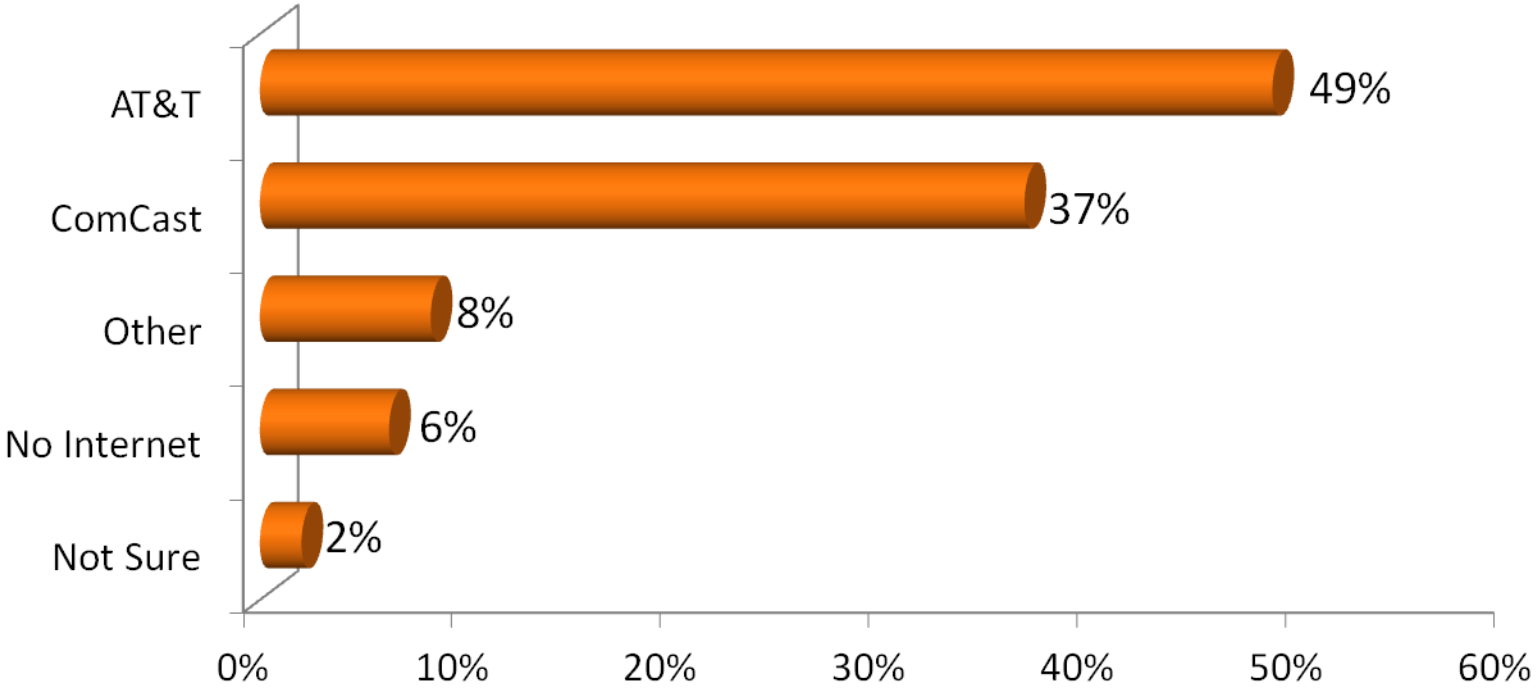
$50 or less = 35%
$51 - $99 = 31%
$100 or More = 17%

Base: = 401; Willing to invest = 145, Not = 135. QC-2, I-4b

CITY of PALO ALTO

AT&T Market Leader Followed By Comcast

Half of Palo Alto homeowners (49%) access the internet through an AT&T service, followed by 37% who use Comcast, and 8% reporting some other service provider.



RKS RESEARCH & CONSULTING

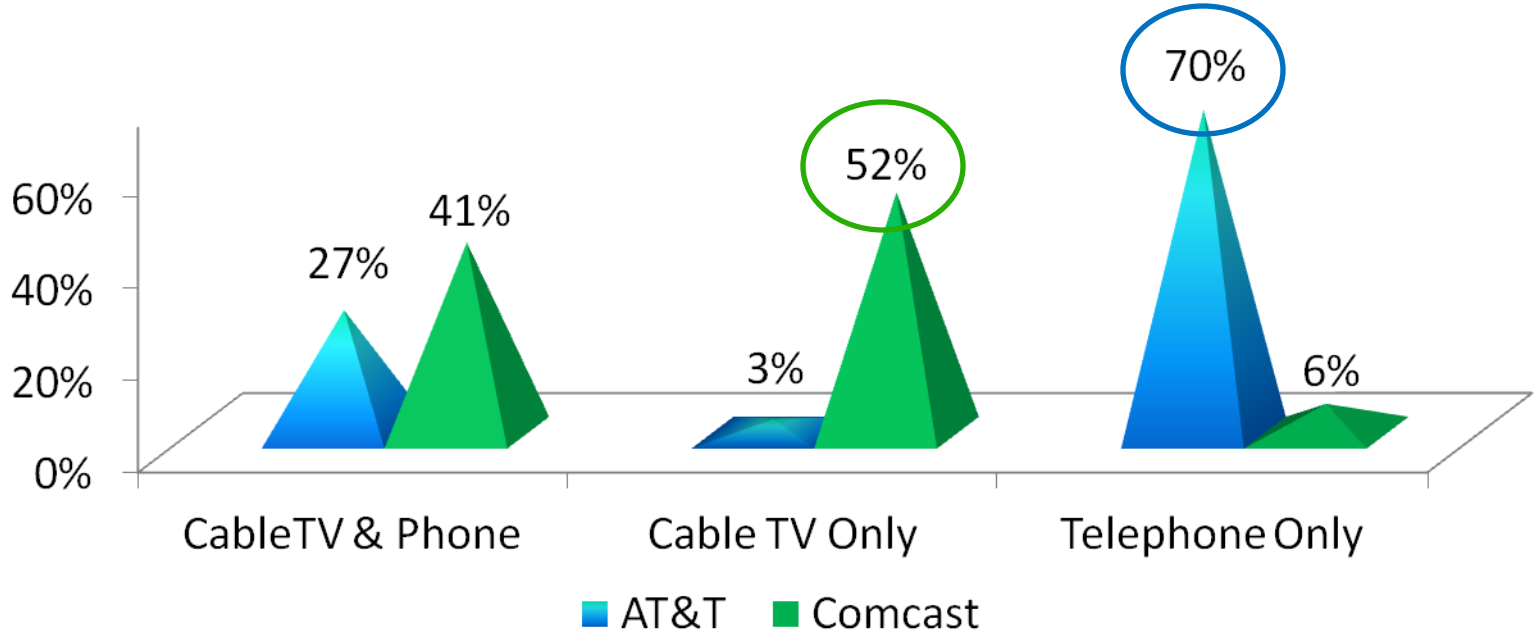
Base is all homeowners (401). Question BG-1a.

CITY of PALO ALTO

Market Leaders AT&T and Comcast Provide Mostly Cable TV and Phone Services

In addition to Internet access, AT&T customers report purchasing mostly telephone service (70%) from the company – one in four has a bundle service (Cable, Telephone and Internet) from the company.

Comcast customers are split between a bundle option (Cable, Telephone, and Internet – 41%) and just an added Cable TV option (52%) through Comcast.



RKS RESEARCH & CONSULTING

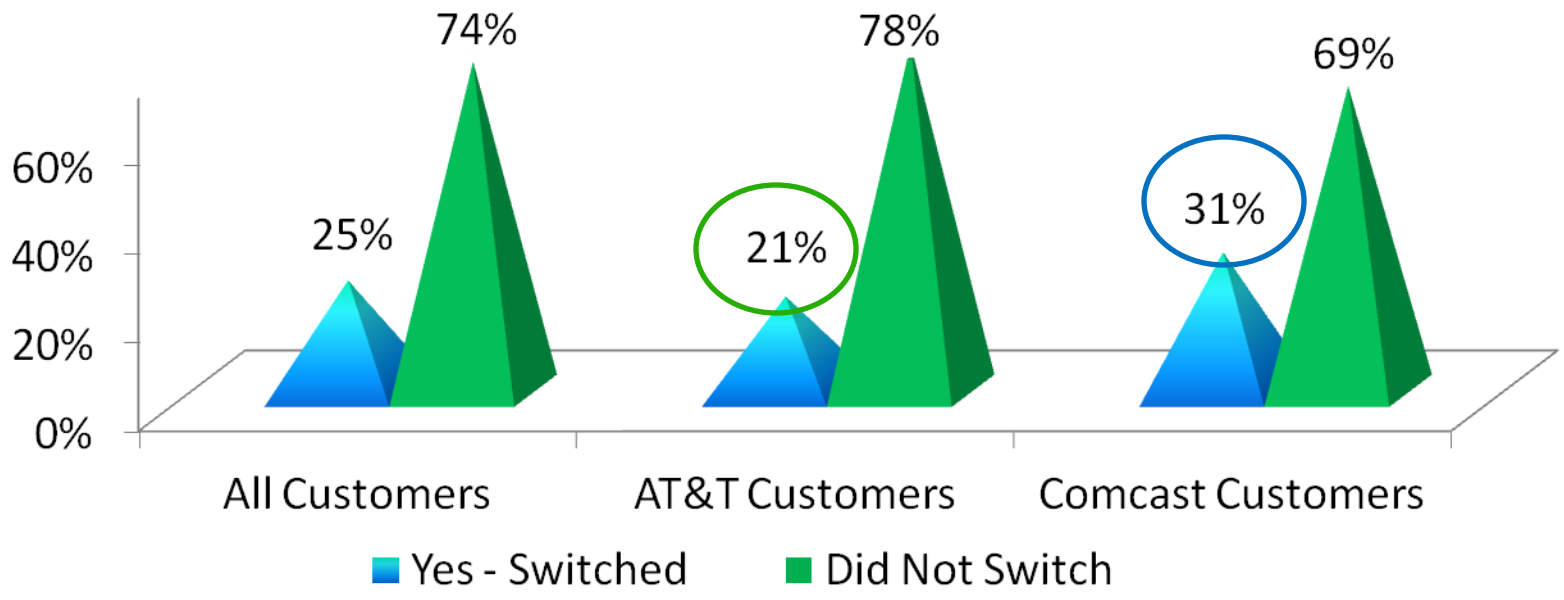
Base is 282. 165 AT&T Customers, 111 Comcast Customers. Question BG-1a, b.

CITY of PALO ALTO

Few Customers Have Switched In the Past 2-Years

Most subscribers report NOT switching in the past 2-years.

Just one in five AT&T customers, and three in ten Comcast customers report switching service in the past 2-years.



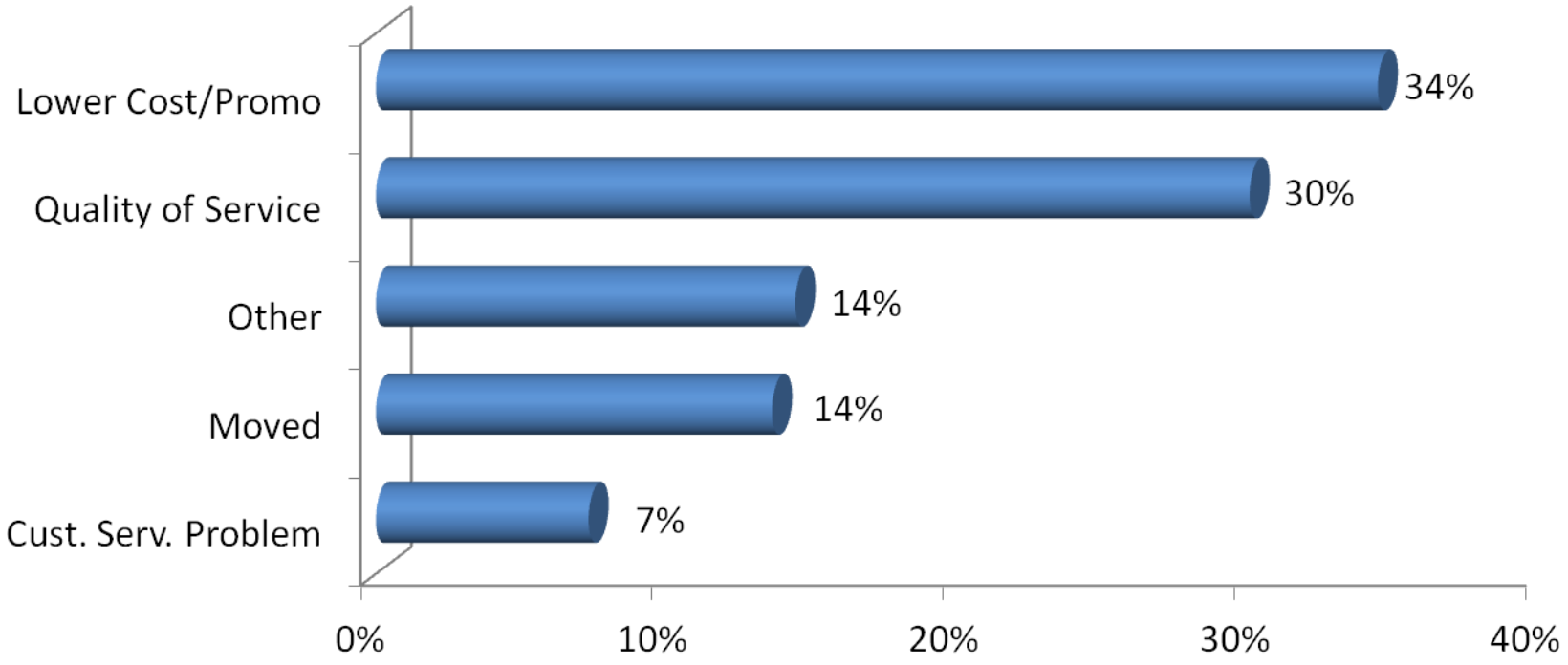
RKS RESEARCH & CONSULTING

Base is 282. 165 AT&T Customers, 111 Comcast Customers. Question BG-1a, b.

CITY of PALO ALTO

Lower Cost Is The Prime Reason For Switching

Among the limited number who report switching in the past 2-years, lowering costs was the primary reason for the move, followed closely by the quality of service from the previous provider. Few said they switched due to a customer service problem (7%).



RKS RESEARCH & CONSULTING

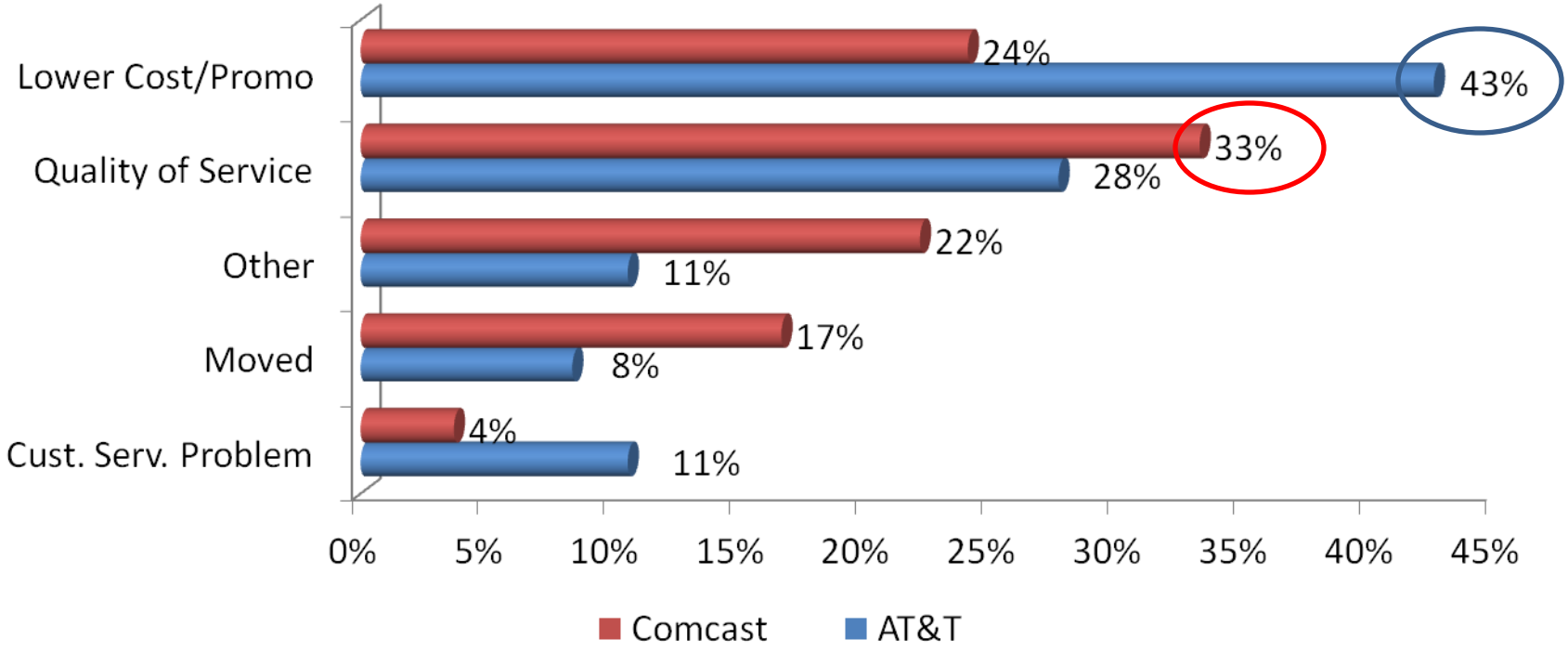
Base is 110 respondents. Questions BG-3.

CITY of PALO ALTO

Promo Pulls Most AT&T Switchers, Service Quality Pulls Comcast Switchers

Customers switching to AT&T cite a promotion (43%) as the primary motivator for the move, followed distantly by Quality of Service (28%).

For Comcast customers who switched, Quality of service (33%) pulled most, followed by a Move (17%).



RKS RESEARCH & CONSULTING

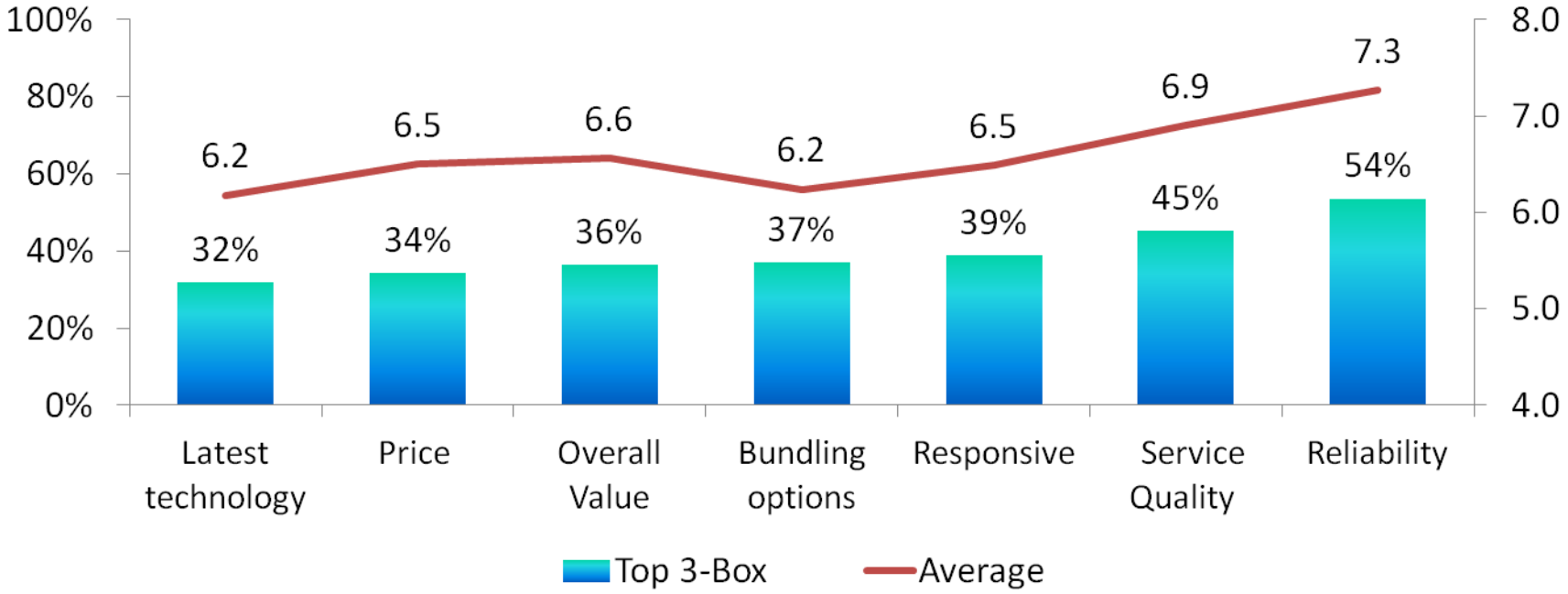
Base is 110 respondents. Questions BG-3.

CITY of PALO ALTO

Responsive, Quality Service Top Satisfaction List

Internet customers are most satisfied with the reliability of the service received, followed by the quality of the service, and responsiveness of billing and customer services.

- Areas of lesser satisfaction include offering customers the latest technology, price, and overall value.



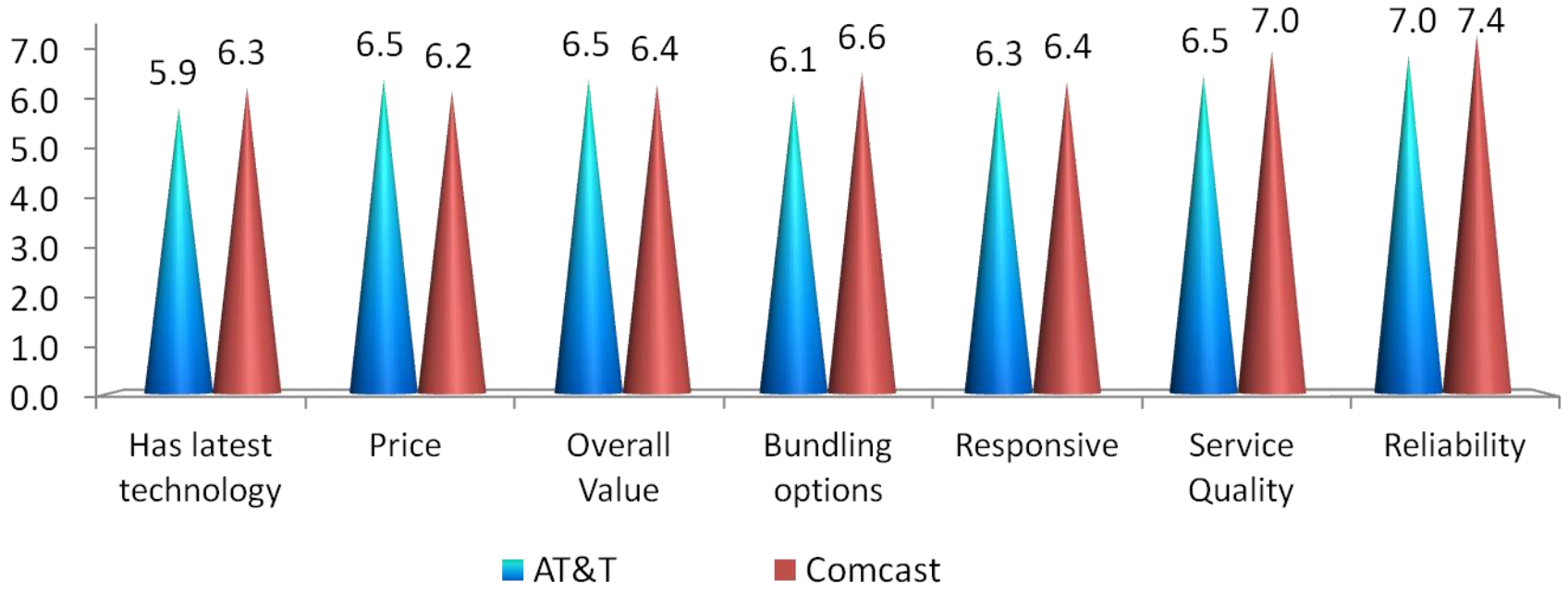
Base is customers of internet service providers with not sure's removed (366)
Ratings on a 0 = Very Dissatisfied to 10 = Very Satisfied scale. QBG-4a-g.

CITY of PALO ALTO

Comcast Leads Most Satisfaction Ratings, But Differences Are Not Significant

In terms of satisfaction, Comcast leads AT&T on most ratings, but only slightly. Customers of both services cite Reliability, and Quality of Service as top areas.

- AT&T does better on Price, but lower on Bundled Options.
- Comcast leads on Having the Latest Technology, but falls short on Price opinion.



RKS RESEARCH & CONSULTING

Base: customers of AT&T and Comcast . Ratings 0 = Very Dissatisfied to 10 = Very Satisfied scale. QBG 4a-g

CITY of PALO ALTO

Demographics

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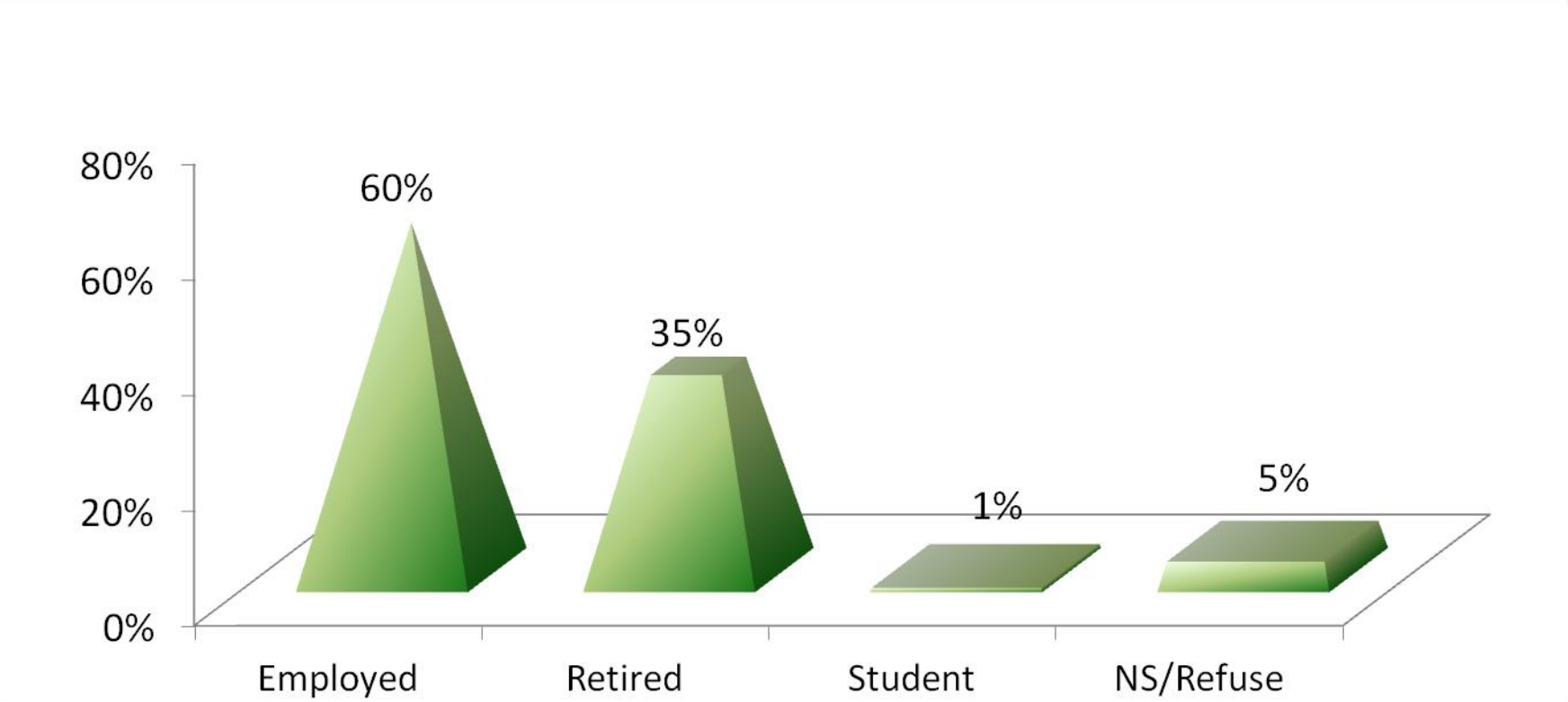
CITY of PALO ALTO

Lifestyle

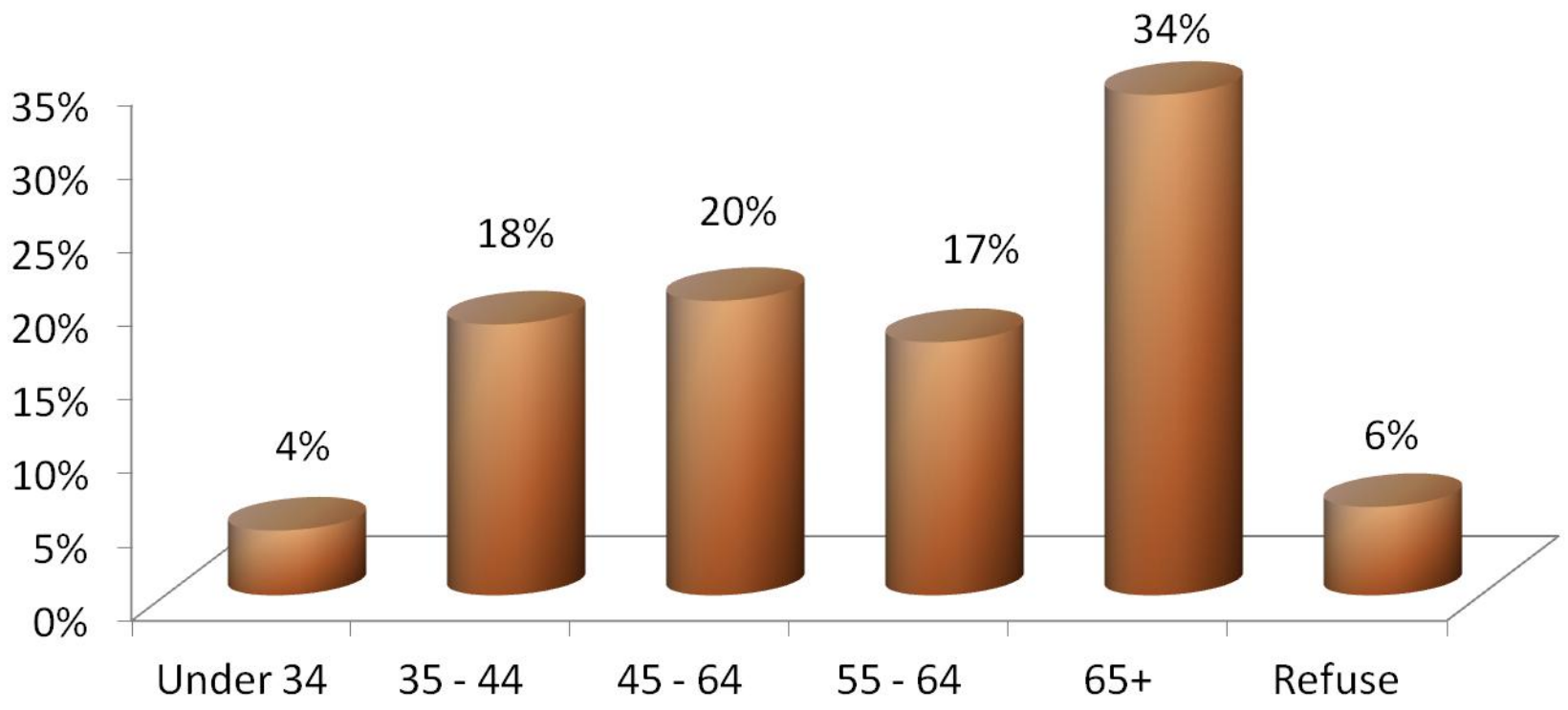


RKS RESEARCH & CONSULTING

Base is all customers. Questions D1.

CITY of PALO ALTO

Age

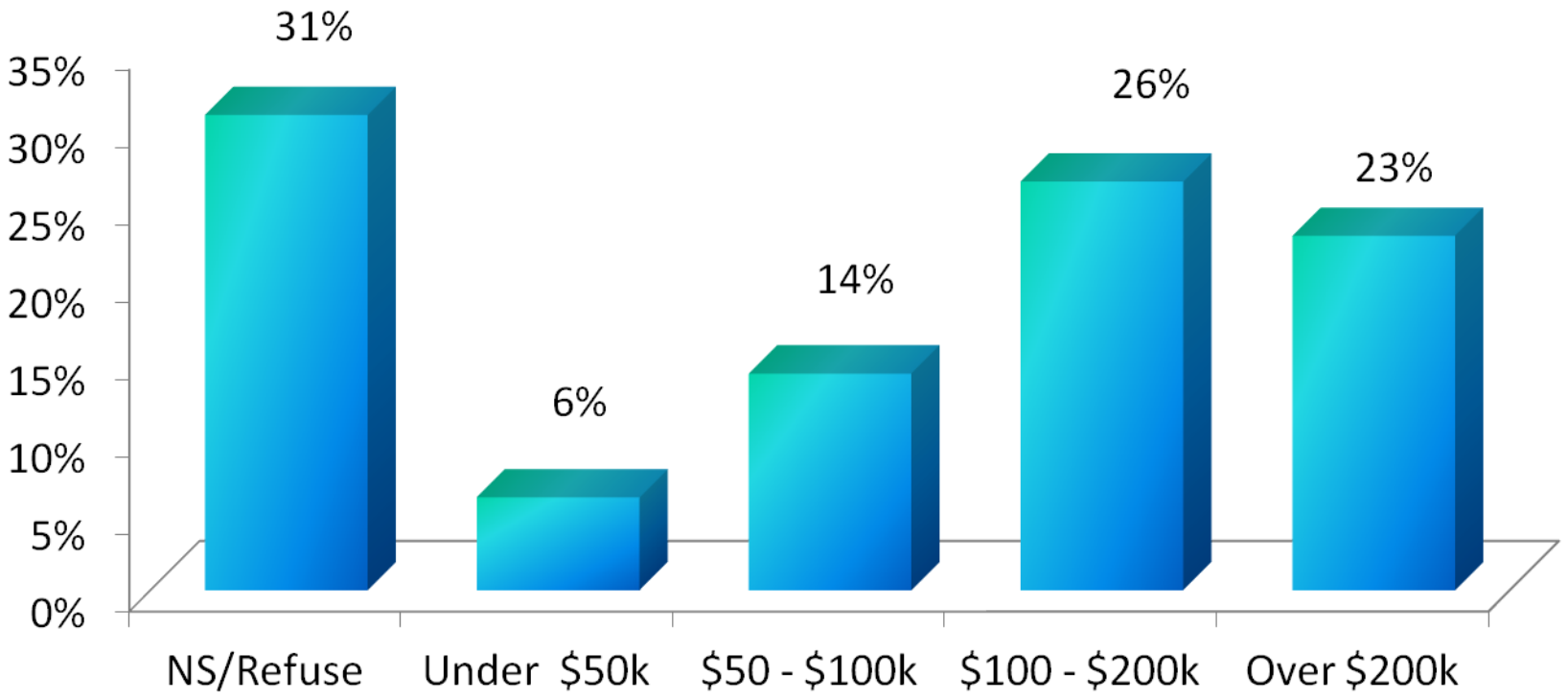


RKS RESEARCH & CONSULTING

Base is all customers. Questions D2.

CITY of PALO ALTO

Income



Base is all customers. Questions D3.

CITY of PALO ALTO

Summary

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CITY of PALO ALTO

Summary – The Market Opportunity

- The results suggest that there is support for CPAU expanding the fiber optic network into residential neighborhoods.
  - One in six homeowners are not only willing to support the build-out at a cost of $40 - $60 million, but also say they would be willing to fund the investment at $3,000 initial cost plus a monthly fee.
  - An additional one in five homeowners are willing to fund the investment even though they do not support the build-out option.
    - Homeowners in both the categories represent just over one in three Palo Alto homeowners (36%).
    - **A pessimistic "correction factor" of 50% leaves roughly 18% of homeowners willing to invest.**

CITY of PALO ALTO

Summary – Tempering Opportunity with Reality

- While there is clearly support for the FTTP option, homeowners are pushing back on their price expectations with most expressed commitments falling well below the $3,000 threshold of an initial, one-time investment.
  - Three in ten homeowners are not willing to pay more than $1,000 for the initial investment, and 35% would pay no more than $2,000 for build out opportunity.
    - Just 4% of all homeowners fall in the $3,000 or more investment range.
    - Homeowners – particularly those willing to invest -- appear willing to meet the monthly commitment of $100 for a service provider, but the hurdle will be in gathering a sufficient number of homeowners who are willing to invest within their comfort range.
- To successfully pull customers from existing providers, the City must move beyond marketing the infrastructure as a selling point, and build a strategic vision that adds value and return on customers' investment.

CITY of PALO ALTO

Summary – Competitors

- AT&T and Comcast share the market, with both providers offering cable and telephone service and most customers appear satisfied.
  - AT&T has about half of the market, with Comcast capturing roughly four in ten customers.
  - The critical issue with both current providers is that *few of their customers have recently – in the past 2-years – switched.*
  - And among those switching, the primary motivator was a promotion that likely lowered costs. Switching based on better quality of service was the second most cited reason, but price appears to be the motivator.
  - Given homeowners' stance on price, if the City of Palo Alto decides to pursue the FTTP service, it must anticipate that homeowners will assess the service not just based on the value added to the home, but also on what is currently available at a similar price.

The City cannot expect a drove of homeowners will switch to its offering just because it offers a competitive service. The City must view and approach the FTTP option as a retail product with several well-established and credible competitors all vying for the same limited customer base.

CITY of PALO ALTO

Summary – Bottom Line

- The City of Palo Alto is in a unique position: continuing research affirms that residents view CPAU as a respected and competent provider of core utility services. As a result, the City can anticipate that measureable numbers will initially want to add telecom to the list of services they purchase from CPAU. This research shows:
  - There is interest in the service,
  - There are options for customers (many would approve a 10-year $25 plan), but also that
  - There are major hurdles to overcome including structuring a realistic competitive price, that effectively pulls a sufficient number of already satisfied customers from other providers.
- All of this suggests strongly that if the City moves ahead it must view the FTTP option as a retail offering that is part of a strategic plan with a marketing agenda that is built on value and price competitiveness, not a "build it and they will come" strategy.

CITY of PALO ALTO

City Of Palo Alto

Fiber To The Premise study

(Residential Customers)

January 2012

RKS
RESEARCH & CONSULTING

(www.RKSresearch.com)

Market Analysis Report

User-Financed FTTP Model

6 June 2012

CITY of PALO ALTO

Tellus Venture Associates

Stephen A. Blum
Tellus Venture Associates

www.tellusventure.com

Table of Contents

1. Executive Summary

One approach to building a municipal fiber-to-the-premise (FTTP) system is to finance it through voluntary user connection fees. In other words, if a resident wants FTTP service, then he or she pays an upfront fee that partially or fully covers the cost of connecting his or her home to the system. Residents that don't want to be connected pay nothing.

The user-financed FTTP concept being considered for Palo Alto would give the City responsibility for building the system and connecting residents who opt in. Those residents would then choose a private sector Internet service provider, presumably a company that utilizes the City's FTTP system on an open access basis. These providers would charge subscribers a monthly fee and split the revenue with the City.

Service levels are assumed to be sufficient to justify the expense of connecting to the system. Residents could purchase other kinds of service, such as television, from any provider that wanted to offer it, but the City would not receive any revenue or be exposed to any risks involved.

The ultimate goal of this analysis is to determine whether it is feasible to embark on a citywide, user-financed fiber-to-the-premise project.

This report goes through four steps to evaluate the feasibility of doing so:

1. Develop a method for estimating the neighborhood by neighborhood cost of a user-financed system, starting with the simplest feasible scenario possible: the "perfect" case.
2. Turn the perfect case into a plausible scenario – an "average" case – that could form the basis for an estimate of typical and likely costs based on real world assumptions.
3. Build a model that assesses the financial viability of a system based on the average case, if it were to be offered citywide.
4. Test the model and evaluate alternatives by making a variety of different assumptions about pricing and user demand.

Under perfect conditions where subscribing homes are in a tight cluster with nearby access to the existing dark fiber network, upfront user fees could pay the full cost of construction. But those conditions are unlikely to be found in the real world. Instead, a more likely – the average – situation would find subscribing homes scattered at random in any given neighborhood.

In that case, a much higher proportion of residents in a neighborhood would have to opt in to completely cover construction costs. A much higher proportion, in fact, than market research would indicate is possible. Nevertheless, an operational FTTP system might be able to pay for itself over time through a combination of upfront fees and operating surpluses.

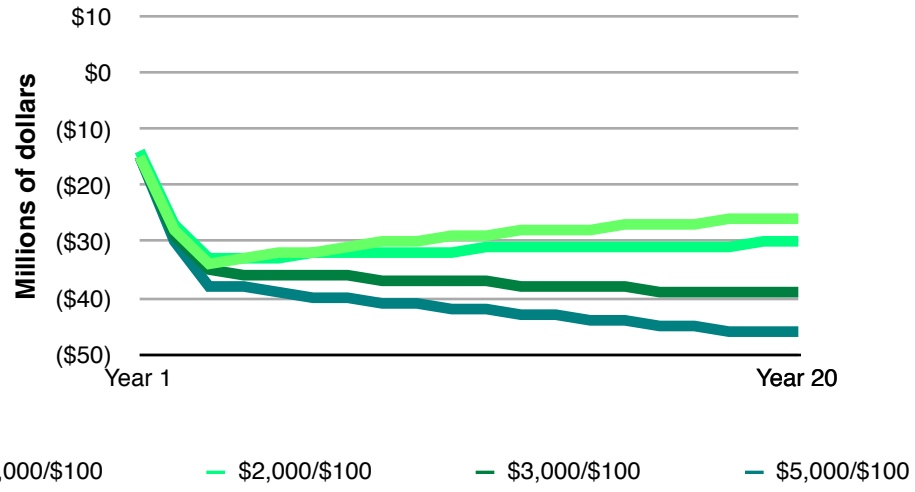
A citywide, user-financed FTTP system was modeled using market research data compiled by RKS Research and Consulting and cost estimates based on previous studies and proposals developed specifically for the City of Palo Alto. As a starting point, optimistic assumptions were made concerning construction and operating costs.

The model was then used to test five different scenarios:

1. Base model using four different price point combinations: $1,000 upfront and $75 monthly, $2,000/$100, $3,000/$100 and $5,000/$100. These points bracket the high and low demand figures, other price points (e.g. $3,000/$75) would fall within the boundaries of this range.
2. Pessimistic demand projections at the four price point combinations.
3. Optimistic demand projections at the four price point combinations.
4. Increasing subscription rate scenarios using 2% and 5% annual growth rates.
5. Effect of using the surplus generated by the existing CPAU dark fiber system

Taking into account the cost of borrowing money to cover deficits, the base model results showed long term losses over many years, with the net present value of the system being negative – between -$46 million and -$26 million – after twenty years.

Chart 1.1 Base Model – Net Present Value



Various other scenarios showed better results, but most showed net system value to be significantly negative over a twenty period and many showed substantial annual operating losses as well. Even at the hypothetical extremes, the system would require substantial, ongoing financial subsidies from the City to show a positive net value within 20 years.

A fully user-financed citywide fiber-to-the-premise system is not possible to achieve in Palo Alto. An opt-in FTTP system can be built using a combination of upfront user fees and City financing, but there is very little probability of the debt incurred being repaid through operations. Ongoing subsidies would be required, very likely in excess of the surpluses generated by the CPAU dark fiber system.

2. Introduction

This report evaluates the financial prospects of an opt-in, user-financed fiber-to-the-premise (FTTP) system built and offered by the City of Palo Alto.

A user-financed system is one where willing subscribers pay an upfront fee to cover the cost of building FTTP infrastructure into their neighborhood, and then pay an ongoing monthly fee for service. Several different pricing alternatives are considered in this report, with a nominal starting point of $3,000 in construction costs upfront and $100 per month for Internet service.

Under a user-financed system, for a given upfront cost, how many households in a typical block have to sign up in order to cover the cost of extending an FTTP system to that block?

Conceptually, a user-financed model is based on the idea that some neighborhoods will receive FTTP service and some won't, and some residents in a served neighborhood will have access to an FTTP system and some won't, in accordance with the economic choices made by those individual residents. This idea is different from a utility or improvement district model, where a neighborhood might vote on installing a fiber system, making everyone subject to the decision of a sufficient majority.

Instead, the City would make the option available citywide and collect binding commitments from prospective subscribers, either directly or through retail service providers. When enough subscribers make a commitment to pay a certain upfront fee, the FTTP system will be extended to their neighborhood and only their homes would be connected to the system. Retail Internet companies would use the system to deliver service on an open access basis, charge subscribers a monthly fee and pay the City a share.

The purpose of this report is not to determine whether a user-financed model would be feasible in rare or special cases: it would certainly work under perfect circumstances, as discussed in Section 4.1 below. Nor does it look at the possibility of a service provider or group of homeowners building a small, private FTTP system. It is already possible to do so using the City of Palo Alto Utilities (CPAU) dark fiber network, and the economics of this business model have been explored in a previous study.[1]

[1] Market Research Report: Citywide Ultra High-Speed Broadband System Project for the City of Palo Alto, Tellus Venture Associates, May 2011, see page 31 "Commercial Property Pricing" and page 44 "Fiber to the Basement Business Model Scenarios". Although the specific example discussed involves office buildings, the general business model can be applied to any small, private system.

Instead, this report looks at the economic case for a City-led and user-financed FTTP program that would be offered throughout the City, but implemented on a neighborhood by neighborhood basis as sufficient numbers of households opt in. Only households that opt in would receive FTTP service. Those who choose not to participate would not be exposed financially, and would not have service drops built to their properties.

This approach raises questions regarding fair treatment of subscribers and non-subscribers alike, as well as parity and equity between neighborhoods. For example, once a neighborhood has been built out and the initial subscribers have been served, how much should latecomers be charged to join and how would the money be spent?

There are many possible answers to these questions and this report does not attempt to pick one over another. Instead, it focuses on establishing an economic basis for deciding whether or not to implement a citywide user-financed FTTP program in Palo Alto.

This report takes four steps to develop and test a financial model that can be used to evaluate the economic case for and against a user-financed system, and ultimately decide whether to proceed with it:

1. Develop a method for estimating the neighborhood by neighborhood cost of a user-financed system, starting with the simplest feasible scenario possible: the "perfect" case.

2. Turn the perfect case into a plausible scenario – an "average" case – that could form the basis for an estimate of typical and likely costs based on real world assumptions.

3. Build a model that assesses the financial viability of a system based on the average case, if it were to be offered citywide.

4. Test the model and evaluate alternatives by making a variety of different assumptions about pricing and user demand.

The underlying data used in creating and testing the model is based on market research conducted by RKS Research and Consulting, cost estimates previously developed for fiber optic projects in Palo Alto and other industry information.

The FTTP system envisioned for this analysis would only provide Internet connectivity and bandwidth, at speeds and quality levels presumably chosen on an individual basis by subscribers. To justify the cost, this service would need to be superior to existing offerings.

Although a particular level of service isn't specifically estimated or identified, it can be assumed to be sufficient to support telephone and television service at some level. These additional services are not included in the financial analysis and are assumed to be purchased separately, if at all, by individual subscribers from their provider of choice. The City would not share in revenue from additional services, or be exposed to the costs and risks.

3. Business and Technology Assumptions

1. Business model

The City of Palo Alto can theoretically play two different roles in providing user-financed FTTP service: 1. be the retail Internet service provider to end users, take responsibility for all operations and risks, and keep all the monthly subscriber revenue, or 2. provide a wholesale transport-only service to one or more retail Internet service providers, be responsible for maintaining the core network while leaving customer service, support and provisioning to retail partners, and split the revenue.

We chose the second option for the purpose of this analysis, and assumed a fifty-fifty monthly subscriber revenue split. The wholesale option is much simpler to implement and operate, and minimizes the fixed costs relating to customer service, support and billing that the City will have to bear. If a wholesale model won't work for the City, then a retail one won't either. The analysis assumes that the prospective retail partners are currently serving customers and have already incurred those fixed costs.

The assumption of a fifty-fifty revenue split was based on the City's need to fully fund the entire fixed and variable costs of its side of the operation, while assuming that the retail partners will be able to spread their fixed costs over a larger customer base. If anything, this assumption is optimistic on the City's behalf. There are valid arguments for assigning a smaller share of the revenue to the City, but a fifty-fifty assumption is a good starting point and, as discussed below, it sufficed for the purposes of this analysis.

The resulting business model used to evaluate a user-financed FTTP system minimizes the City's costs, operational complexity and risks. The City...

- Pays the capital cost of building fiber lines to and through served neighborhoods, including the cost of active network electronics.
- Installs the fiber drops and subscriber terminals for served homes.
- Maintains an Ethernet (Layer 2) network connecting served homes to the end user's service provider of choice.
- Provides service through retail partners and not directly to end-users. Retail partners would be the City's only customers.

The retail partners...

- Establish a business relationship with subscribers to provide Internet access. Other services (e.g., telephone and television) could be offered, but are outside of the scope of this analysis.

- Collect the upfront connection fee and the monthly service fee from the subscriber and, in turn, pay the City.
- Provide and maintain Internet (Layer 3) service to subscribers.
- Are responsible for all subscriber support, service, billing and other customer relationship functions.

This model makes optimistic assumptions for the City's construction, operating costs and revenue. It would be possible to justify a more pessimistic approach, but difficult to make better assumptions on the City's behalf. Any business case developed using this model would have to be stress tested before moving forward. However, given the conclusions reached below, that necessity is unlikely.

2. Technology

The cost of building fiber to the home infrastructure in the City of Palo Alto has been examined three times in the past eight years. The initial study was completed in March 2004 by Uptown Services, LLC.

In 2006, the City solicited interest in building an FTTP system via a Request for Proposal. Two companies responded, and 180 Connect Network Services, Inc. (180 Connect) was selected to build the system. In the course of preparing the RFP and subsequently negotiating with the City, 180 Connect produced a second cost estimate for a citywide FTTP system.

Ultimately, 180 Connect did not build the system. In 2011, Columbia Telecommunications Corporation (CTC) prepared a conceptual plan for a phased buildout of an FTTP system, based on the City's existing dark fiber network. The 180 Connect and CTC plans share a common set of assumptions about network architecture and costs, although there are significant differences.

The 180 Connect proposal relies on an active, Ethernet architecture, while CTC recommends a passive optical network (PON) system. These approaches have various advantages and disadvantages, and either could be used for modeling purposes. Costs are in the same ballpark, although arguably an active network is the more inexpensive and operationally simpler option given an open access business model.

In this analysis, we assumed an active, Ethernet architecture because it is better suited to supporting multiple retail service providers and to a scalable, noncontiguous deployment pattern. An active network can be more easily built out to specific neighborhoods where demand exists while bypassing neighborhoods where it doesn't, without making it too costly or inefficient to meet future demand by backfilling.

3. Capital costs

The estimates developed by 180 Connect and CTC were used as the starting point to model the per-subscriber cost of building a user-financed network. Other cost information developed for the purpose of this and other studies was used for comparison purposes, and to fill in gaps. The following key assumptions were made:

Table 3.1 – Capital cost metrics and estimates

Item	Amount	Basis
Total passable parcels	20,879	180 Connect
Average parcels per block	33	180 Connect and map data
Average new system fiber feet required per parcel	53	180 Connect
Fiber installation cost per foot	$28.48	180 Connect and CPAU
Fiber drop and equipment per home	$622	180 Connect
Cost of building a node	$90,000	CTC and TVA research
Maximum nodes needed to cover City	87	CTC
Blocks served by one node	7	Calculation
City inside plant	$140,000	TVA research
Project design and management, as a percentage of direct construction costs	10%	TVA research

For the most part, the cost assumptions used by CTC and 180 Connect were consistent. The one major difference was in the estimated cost per foot of installing new fiber optic lines. CTC used an estimate of $9.96 per foot, while 180 Connect used $28.48. 180 Connect's estimate is consistent with CPAU's experience installing fiber optic lines in Palo Alto and with actual costs incurred on projects elsewhere. CTC's figure might be achievable for a long haul, aerial fiber installation in a rural setting, but it is implausibly low for a piecemeal urban retrofit project in California.

The 2004 Uptown does not detailed estimates capital costs, but to the extent it considers capital costs, it is consistent with CTC and 180 Connect. All three estimates assume that the existing CPAU dark fiber system will be used to the extent possible to support FTTP service. The value of the existing fiber network is not included as a cost in this analysis.

4. Operating costs

The CTC and 180 Connect estimates did not go into great detail regarding operating cost assumptions. The Uptown study did and the figures it uses are largely consistent with the

experience of other system operators. However, the Uptown study assumed a retail business model and a triple play service offering (television, telephone and Internet service).

An operating cost estimate for a wholesale, Layer 2 user-financed network was developed using base City of Palo Alto costs and cost information from other systems developed for the purpose of this study and others. To extent it is comparable, the Uptown estimates are consistent with this approach.

Table 3.2 – Operating cost estimates

Item	Amount	Basis
Fiber plant maintenance, per route mile per year	$1,000	Small, urban system costs
Node and site operations, per location per year	$1,200	Electrical and physical maintenance costs
Network operations per year	$60,000	Outsourcing estimate
Active plant maintenance per year	3%	Percentage of capital cost
Interconnect per year	$30,000	Shared facilities estimate
Subscriber equipment maintenance per year	$4,500	Peer systems
Personnel per year	$238,000	CPAU costs, based on total 2 FTEs spread over 5 positions.
Sales, general and administrative	$55,000	Peer systems

Generally speaking, the above figures fall in the lower range of estimates developed for this analysis, and assume smooth implementation with little additional overhead cost. It would be plausible to use more pessimistic assumptions, but not necessary given the conclusions below.

5. Subscriber adoption

In December 2011, RKS Research and Consulting conducted 401 interviews of randomly selected Palo Alto households on behalf of CPAU[2]. The goal of the study was to "measure consumer receptiveness to an 'open-access' user-financed approach to residential Fiber-to-the-Premise (FTTP)."

Questions about willingness to purchase service at various price points were included. The small sample size and the type of questions asked lead to a high degree of statistical

[2] City of Palo Alto Fiber to the Premise Study, RKS Research and Consulting, January 2012.

uncertainty for any projections that result. Nonetheless, the research does establish a range of possibilities that is sufficient to evaluate the likely number of subscribers and the expected revenue.

To explore this range, we took the raw subscriber interest and price point numbers provided by RKS and calculated three demand cases:

- A base case, which discounts the raw numbers by 20% to factor in a typical gap between expressed interest in surveys and actual service purchases later.
- A pessimistic scenario, which uses a 50% discount to account for the effect of an aggressive competitive response from incumbent providers.
- An optimistic scenario, which adds 50% to the raw numbers in order to consider the possibility that a successful system will attract subscribers who aren't currently interested.

Complete tables of demand at various combinations of price points for all three cases are in Appendix A. The ranges used in the modeling discussed below are:

Table 3.3 Demand for user-financed FTTP in Palo Alto

Upfront fee	$1,000	$2,000	$3,000	$5,000
Monthly fee	$75	$100	$100	$100
Base case	21.2%	10.6%	4.3%	0.5%
Pessimistic scenario	13.2%	6.6%	2.7%	0.3%
Optimistic scenario	39.7%	19.9%	8.0%	0.9%

It's assumed that the City would receive the entire upfront fee and half the monthly fee. Monthly fees above $100 per month weren't considered because demand dropped sharply at that point, making the question moot. Similarly, monthly fees below $75 weren't considered because the revenue generated wouldn't support operations.

Comparisons with other Bay Area cities suggest that the pessimistic case is likelier to reflect actual results if a user-financed FTTP system is implemented. A study[3] conducted in San Francisco concluded that a user-financed system would gain a 4.7% market share with a $1,000 upfront fee, a 1.3% share with a $2,000 fee and no subscribers at all at $2,500 or

[3] *Enhanced Communications in San Francisco: Phase II Fiber Optics Feasibility Report*, prepared for the City and County of San Francisco by Columbia Telecommunications Corporation, October 2009.

more. Business case projections for a city-operated cable television and Internet system in Alameda predicted a 39% market share[4], but the best it could achieve was 30%. At that point, intense competition from the incumbent service providers, particularly Comcast, caused market share to drop to the point that the City of Alameda could not meet its bond obligations.

Another factor to consider is how subscribers would be distributed across the City. In a user-financed model, a low overall subscription rate might not be a problem if the users were concentrated in a few neighborhoods. However, in its Palo Alto research, RKS did not find any geographic clumping:

> No one zip code in Palo Alto reports significantly higher interest in the Fiber Optic build-out than another area. (There is slightly higher support in 94303 and 94306, but the difference is not significant.) The data also show that support (and opposition and "Don't Knows") are equally distributed; this suggests that "buyers" are likely to be drawn from all areas of Palo Alto[5].

Based on RKS's conclusion it would reasonable to assume that there would be random differences in subscription rates between various neighborhoods, but there is no basis for believing that subscribers would be concentrated to a meaningful degree or in a predictable way.

Even so, it's fair to consider the possible effect of concentrated demand. In zip code 94301, conceptual subscriber willingness to invest in network extensions was 109% of the average, and 94% in zip code 94303. This difference of 15% is the maximum subscriber concentration factor that can be plausibly supported by the research.

In keeping with the optimistic assumptions explained above, we assumed that subscribers would be concentrated into 85% of the City's neighborhoods, and that facilities and service would not be extended into the remaining 15%.

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[4] *Market Research Report: Citywide Ultra High-Speed Broadband System Project for the City of Palo Alto*, Tellus Venture Associates, May 2011

[5] City of Palo Alto Fiber to the Premise Study, RKS Research and Consulting, January 2012.

4. User-Financed Model

The key question that has to be addressed in evaluating the user-financed model is: for a given upfront cost, how many households in a block need to participate in order to break even?

1. The "Perfect" case

The answer to that question depends on the cost of building the facilities to serve that neighborhood, which in turn depends on how a neighborhood is defined. One way to picture it is as a string of properties, all of which participate and one end of which is directly on a node. In this "perfect" case, only the minimum amount of fiber needs to be installed.

Figure 4.1 An example of what a "perfect" case might look like. Eight subscribing homes (green dots) are in a cluster next to a node (blue triangle), requiring a minimum amount of fiber optic cable (blue arrow) to reach the existing CPAU network (red line).

A per subscriber cost was developed using the construction cost estimates detailed above, with the additional assumption that the amount of fiber necessary per household is 50% less due to the ideal nature of this case. The total cost of the system and drop fiber and subscriber equipment is approximately $1,400 per home served. Using the base figure of $3,000 per subscriber in user financing, that leaves about $1,600 to contribute toward the cost of building the node.

An active system requires switching and routing nodes to be installed along the fiber route. Bigger nodes can handle more subscribers, at a higher cost per node. A mid-range estimate was used, based on the shared system architecture parameters used by CTC and 180 Connect in Palo, by CTC in a similar study in San Francisco and by other fiber-to-the-premises project. As detailed in Table 3.1, it was estimated that one mid-sized node could serve seven residential neighborhood blocks, with an average of 33 homes per block.

In this perfect case, the $1,600 contributions of 8 subscribing homes would pay for the cost of a block's share of building a node. Eight homes in a 33-home block would be a 23% take-rate.

In a perfect user-financed case, eight subscribing households contributing $3,000 each would cover the cost of building the fiber and electronics necessary to serve them.

Unfortunately, perfection is difficult to achieve in the real world. Even if a tight, contiguous cluster of homes signed up for a user-financed proposition, it would be inefficient and costlier in the long run to install only the minimum amount of fiber necessary. Per foot estimates of fiber costs are based on assumptions about efficient planning and execution, in order to maximize the utility of fixed costs such as closing a street, dispatching a crew and doing engineering and design work, to name just three examples.

It also be inefficient and ultimately costlier to install nodes based on initial, ad hoc concentrations of subscribers. A network that could scale to eventually serve the entire City would necessarily be based on careful selection of node locations, so as to minimize both capital and operating costs, and to efficiently and rationally operate the system.

2. The "Average" case

To answer the key question of how many subscribers are required to make a realistic user-financed model work, perfect assumptions have to be replaced by average ones. The market research conducted by CPAU holds out little hope of a significant number of tight, contiguous subscriber clusters. A better assumption would be that on any given block, subscribers would be more or less scattered at random.

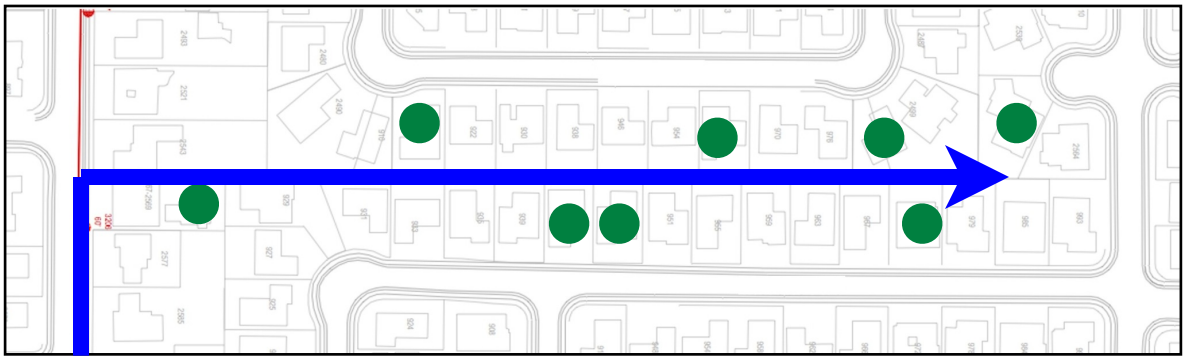


Figure 4.2 If only eight homes in a typical neighborhood block opt in to a user financed model, a more or less random distribution is likely. A $3,000 upfront payment would cover less than half the cost.

It would also be more realistic to assume that the node would be some distance away, requiring yet more fiber to be installed. Using the straight assumptions in Table 3.1, wiring an average 33 home block would require just over 1,700 feet of fiber to be installed, at a cost of just under $50,000.

Eight homes paying $3,000 each wouldn't pay for even half the cost of the fiber alone. Adding in a one-seventh share of a node, the per-user price would be closer to $8,000. At $3,000 each in user-financing, it would take 26 subscribers out of a possible 33 – a 79% take rate – to pay the cost of the necessary node, system fiber, drop and subscriber equipment.

Figure 4.3 In an "average" case, 79% of homes would have to opt in to cover the cost of the fiber run from the node to end of the block, as well as a share of the node and home connection costs.

It would be difficult to try to aggregate user-financing subscribers on any other basis than by linear neighborhood block. Although it could be argued that subscribers could be clustered in a variety of different configurations, the only efficient way to reach them is to use existing utility pole and conduit routes, and those routes are generally linear. Any other assumption about subscriber patterns would lead to higher costs, making recovering construction costs even more unlikely.

To cover the cost of extending an FTTP system to an average Palo Alto neighborhood block, 79% of households would have to agree to pay a $3,000 upfront fee. Even under the most optimistic interpretation and assumptions, the maximum projected demand at that price point would be less than 18%.

3. Citywide base model

The next step is to apply the “average” case assumptions on a citywide basis, using the pricing and subscriber levels predicted by the primary, quantitative market research conducted for the City by RKS.

The business parameters picked (more or less arbitrarily) as a starting point for the Base Model were:

1. Base demand case (raw subscription rate projections discounted by 20%).
2. $3,000 upfront fee.
3. $100 monthly fee.
4. 15% subscriber concentration factor (i.e. only 85% of the City would be built out).
5. The cost estimates described in Section 3 above.

Other assumptions made included an initial three year construction time line, a 5% cost of capital (based on typical California municipal bond rates) and moderate assumptions regarding increases in fixed operating costs if subscriber levels grew significantly.

With two exceptions, all dollar values are figured at a constant rate, with no allowance for inflation. Doing so provides a fixed point of reference, allowing "apples to apples" comparisons between scenarios and over time. Inflation is an important factor in business planning, particularly the tendency for inflation-driven revenue growth to lag behind cost increases. However, for analytical and comparison purposes, inflation adjustments can mask critical differences: “flat” results show up as an increasing line on a graph, while a flat line on a graph actually means deteriorating results.

From an analytical standpoint, keeping dollar values constant allows for a cleaner first cut analysis. A flat line on a graph means flat results.

The two exceptions are equipment maintenance and personnel costs. Those line items are assumed to increase at a rate 2% faster than inflation; maintenance costs because of aging equipment and personnel costs because of historical experience. The subscription rate for a given upfront and monthly fee combination does not change over time. Increasing subscription rate scenarios are discussed below, but a decreasing rate is also possible.

Year to year operating results, cumulative cash flow (including capital contributions and expense) and the net present value[6] of the system were calculated over twenty years. Summary spreadsheets for the base model and scenarios are in Appendix B.

Chart 4.1 Base Model Operating Results

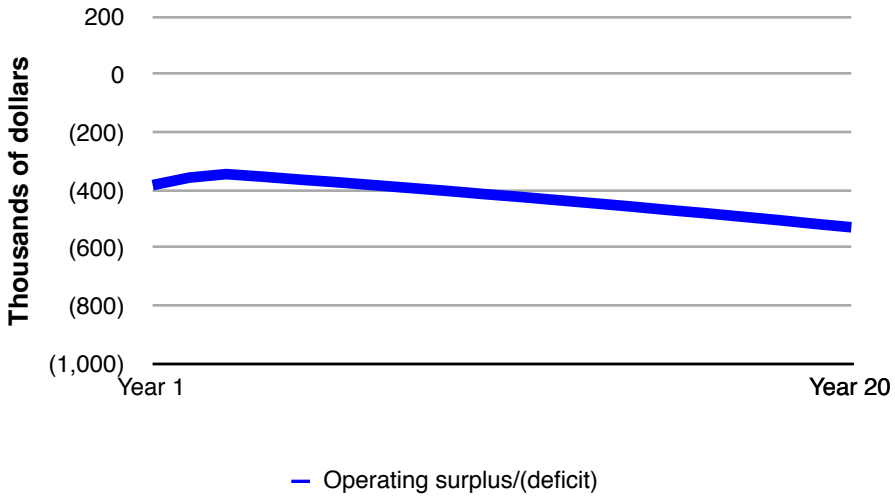
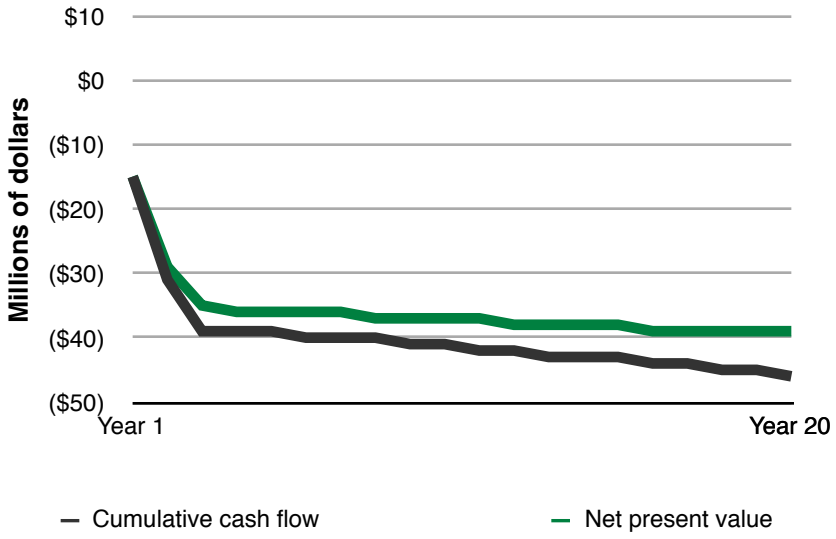


Chart 4.2 Base Model Cash Flow & Net Present Value



[6] Net present value (NPV) is one of the building block calculations for finance. It provides a methodology for evaluating and pricing securities and projects. It is a form of calculating discounted cash flow, in other words the value of money expected in the future discounted by either the cost of borrowing that money or the amount of interest that would have been earned if it had been kept in a bank account. In this model, NPV provides a way to take into account the cost of borrowing money to cover losses.

At a $3,000 upfront cost and $100 a month, the projected base case subscription rate is 4.3%. The result is increasing operating losses over twenty years, and a steadily decreasing negative system value. Under these assumptions, a user-financed FTTP system would be a financial failure.

5. Scenarios

The parameters used in the first run of the base model, as described above, are:

- Upfront cost of $3,000, monthly fee of $100.
- Raw subscription rate numbers discounted by 20%.
- System will only have to be built out to 85% of the City.
- Operating and capital cost estimates from the low end of possible ranges.
- No year-to-year subscriber gain or loss.
- No subsidies from the CPAU dark fiber system except use of fibers.

The result is a system that generates increasing operating losses over twenty years, with a negative net value of almost $40 million at the end of that period. The next step is to run the model with different parameters, to see the potential effect.

Two parameters were not tested: cost estimates and the percentage of the City to be built out. Both are estimated using the most plausibly optimistic figures possible. Using more pessimistic assumptions would make a bad case even worse.

The five scenarios that were tested are:

1. Base model using four different price point combinations: $1,000 upfront and $75 monthly, $2,000/$100, $3,000/$100 and $5,000/$100. These points bracket the high and low demand figures, other price points (e.g. $3,000/$75) would fall within the boundaries of this range.
2. Pessimistic demand projections at the four price point combinations.
3. Optimistic demand projections at the four price point combinations.
4. Increasing subscription rate scenarios using 2% and 5% annual growth rates.
5. Effect of using the surplus generated by the existing CPAU dark fiber system

A full set of spreadsheets showing operating results and capital budgets is in Appendix B.

1. Base model alternatives

Testing the base model using different upfront/monthly price point combinations resulted in positive operating costs, but did not come close to producing a positive net system value.

Chart 5.1 Base Model Alternatives – Operating Results

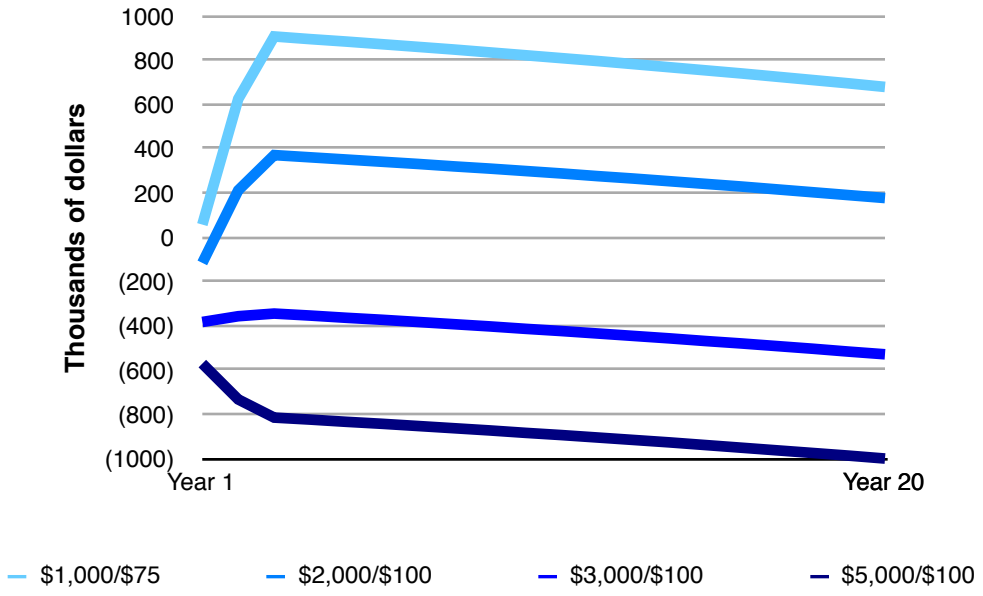
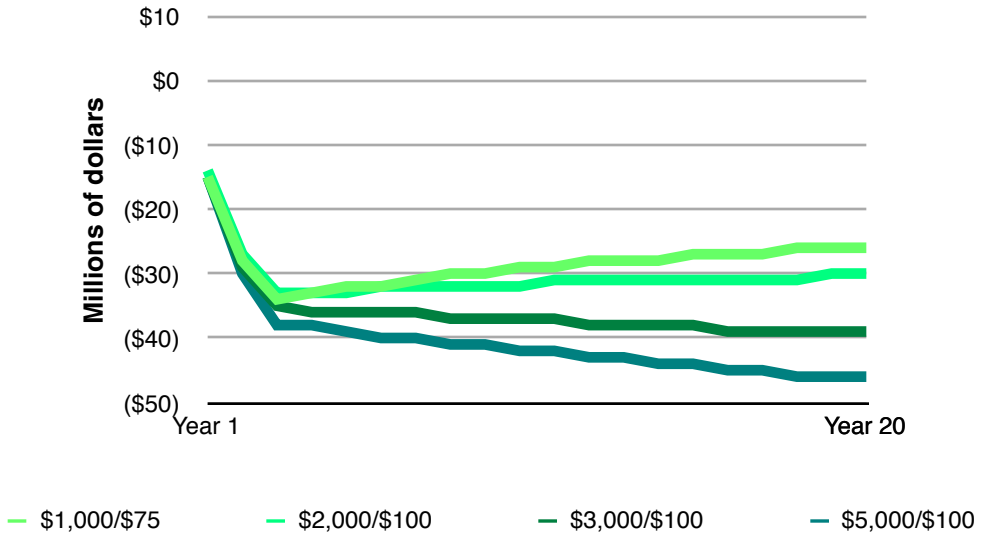


Chart 5.2 Base Model Alternatives – Net Present Value



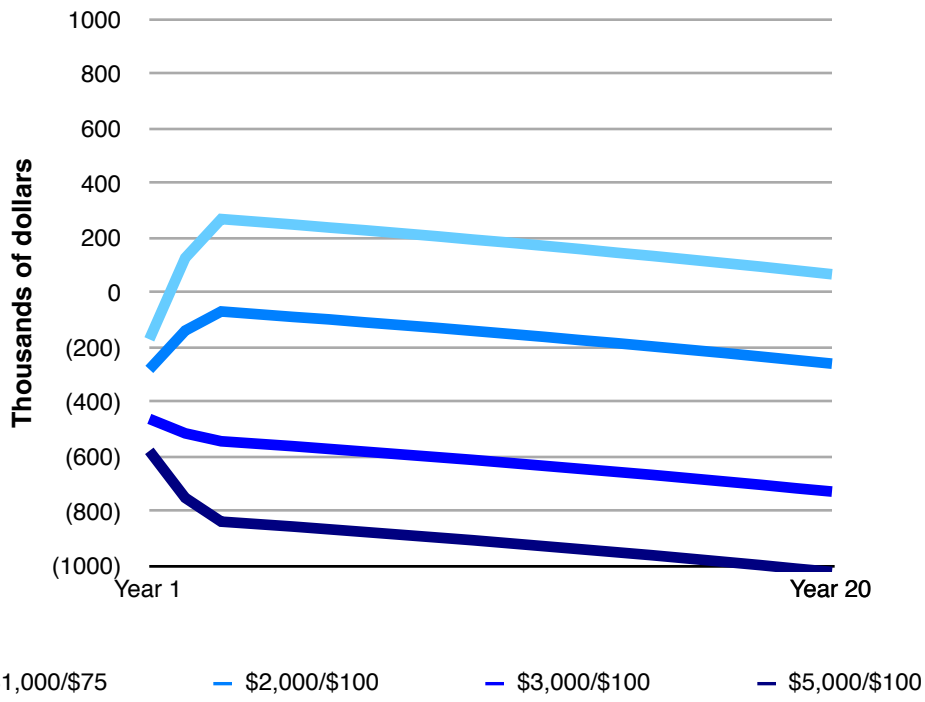
The annual operating surplus peaks at $905 thousand in Year 3 and then declines primarily because personnel and maintenance costs are assumed to grow at 2% per year, with no offsetting increases in revenue. This surplus is not sufficient to pay back the cost of construction within 20 years.

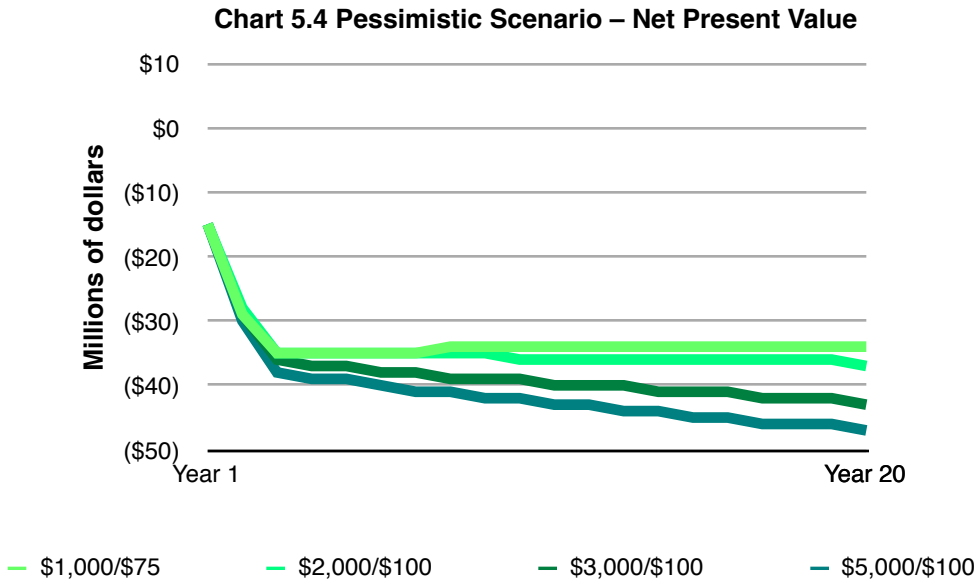
2. Pessimistic scenarios

The pessimistic scenario uses the assumptions in the base model, with the exception of the subscription rate projections. The pessimistic demand figures discount the raw RKS numbers by 50%.

Not surprisingly, the results are worse than the base case for both operating results and system value. As discussed above, it can be argued that the pessimistic demand scenario is a likelier outcome than the base case and should be factored into risk evaluations.

Chart 5.3 Pessimistic Scenario – Operating Results





3. Optimistic scenarios

The optimistic scenarios assume that demand will be 50% greater than RKS's raw numbers, and consequently nearly twice that (88% greater) of the base case.

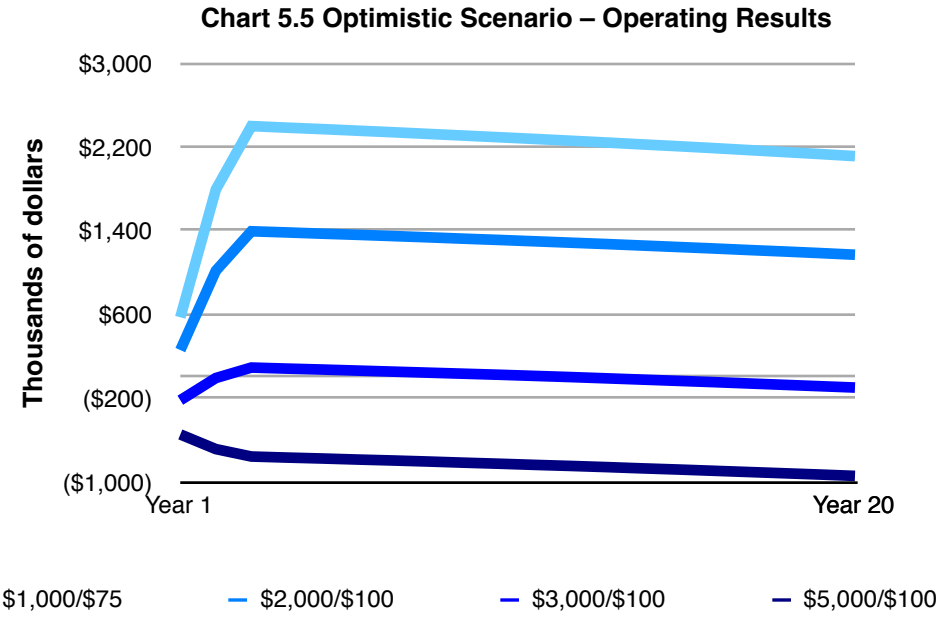
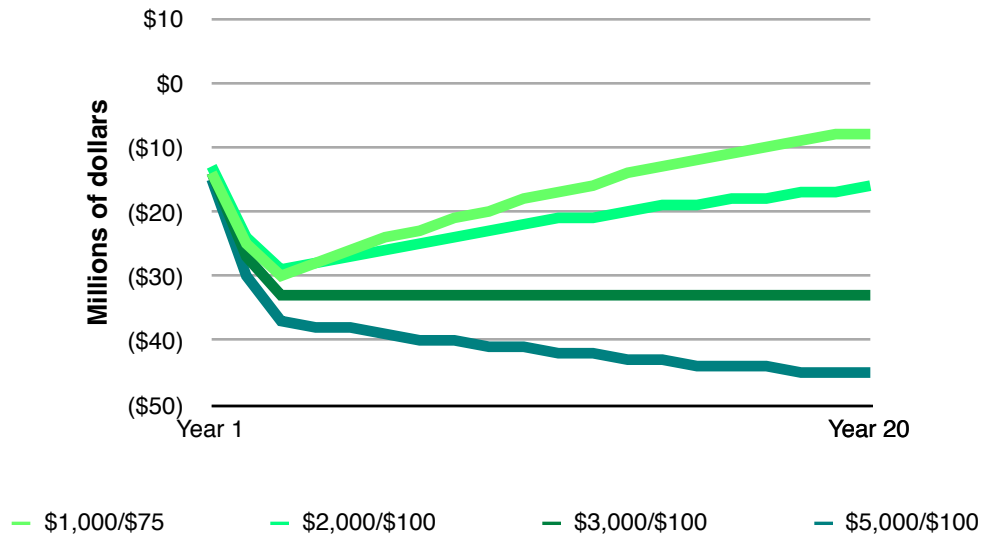


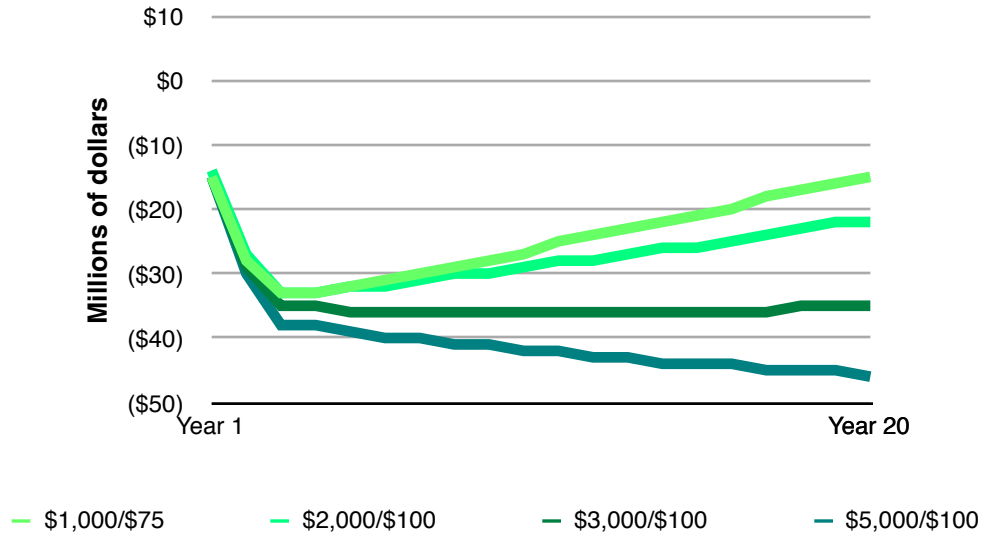
Chart 5.6 Optimistic Scenario – Net Present Value



Although the operating results are significantly improved, even this surplus is not sufficient to pay back the cost of construction over 20 years.

4. Increasing subscription rate scenarios

Chart 5.7 Base Case with 5% Annual Subscriber Growth – Net Present Value

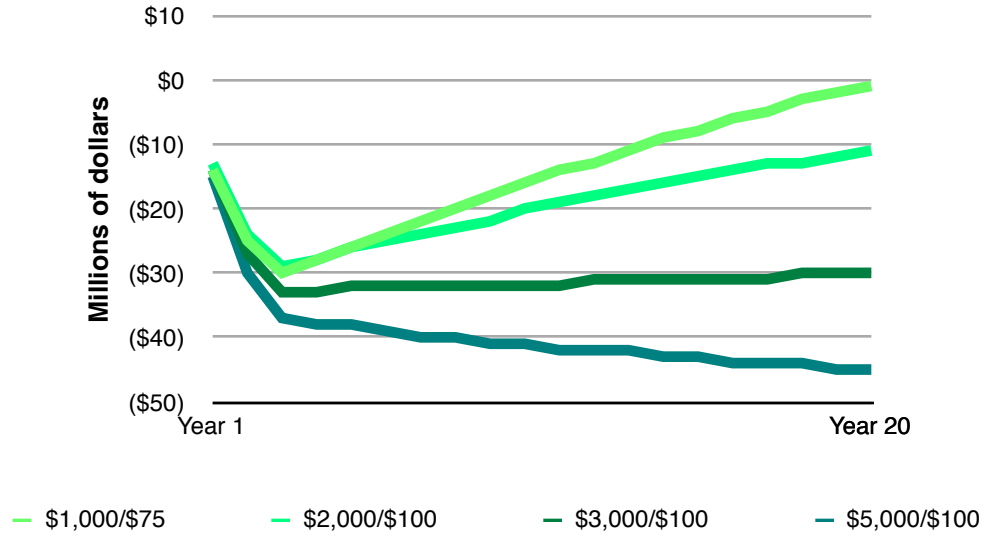


Taking the base model and adding the assumption that the subscription rate will grow by 5% per year produces a result similar to the optimistic demand scenario. Operating revenue increases and turns positive in some cases, but isn't enough to pay back the initial cost of

the system. The net value of the system after 20 years is still significantly negative under any demand assumptions.

A 5% growth rate brings the system's market share to nearly 50% over 20 years, which is a very aggressive target given the level of existing competition and results obtained by municipal systems elsewhere.

Chart 5.8 Optimistic Scenario with 2% Annual Subscriber Growth – Net Present Value



It would be difficult to justify a higher ultimate market share. However, taking the optimistic demand scenario and adding a 2% annual subscription rate increase produces a similar market share but generates greater operating surpluses more quickly, with the result that the net value of the system after 20 years rises close to zero in the best scenario.

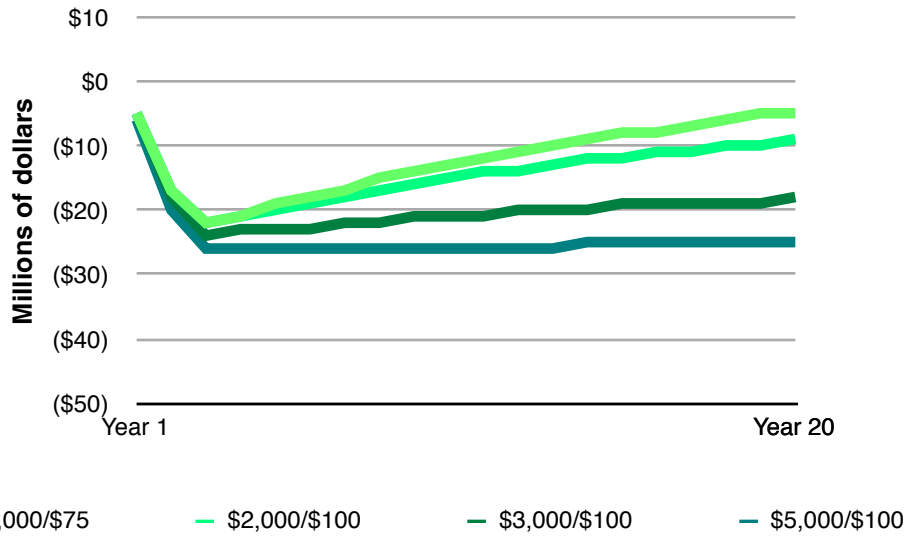
5. Effect of subsidies

Another potential option is to use the surpluses generated by the existing CPAU dark fiber system to subsidize the cost of building and operating a user-financed FTTP system. Currently, the dark fiber system generates a surplus of approximately $2 million per year and has an accumulated surplus of about $12 million.

If $10 million of the accumulated surplus is used to help pay for the initial construction costs (leaving a $2 million reserve) and $1 million per year in future surpluses are used to pay down the system's debt, the net value of the system would significantly less negative. Adding this subsidy to the base model brings the net value of the system after 20 years to

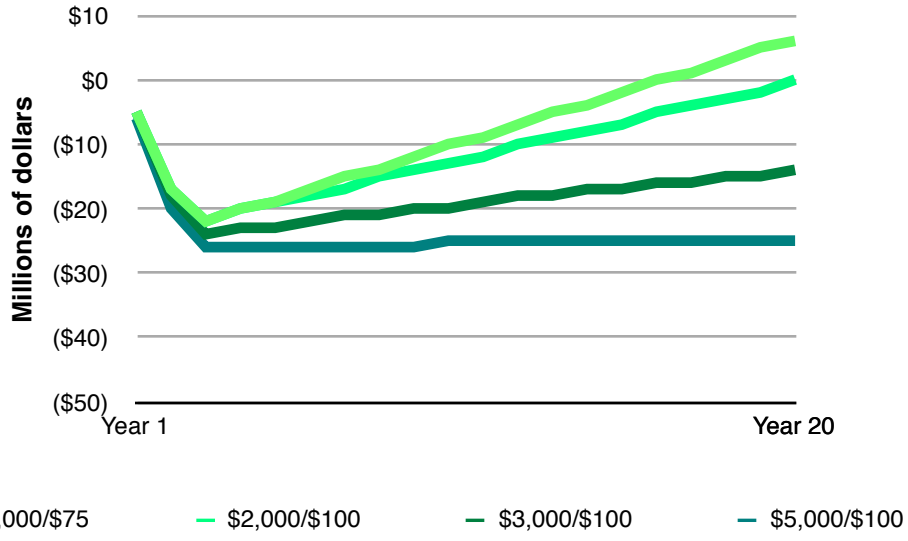
somewhere between -$25 million and -$5 million, depending on the demand assumptions used.

Chart 5.9 Base Model with $10M/$1M Subsidies – Net Present Value



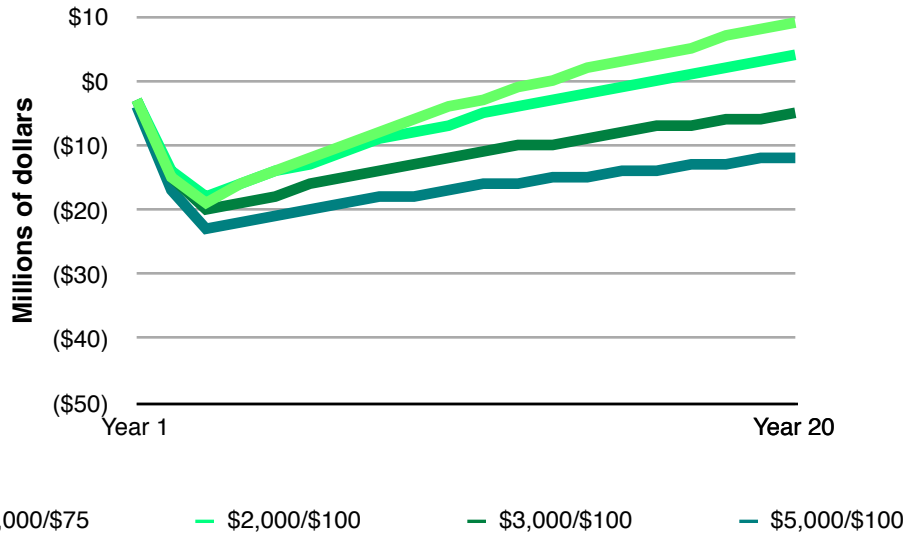
The picture further improves if the base model is modified by assuming that the subscription rate will increase by 5% annually.

Chart 5.10 Base Model with $10M/$1M Subsidies & 5% Annual Growth – Net Present Value



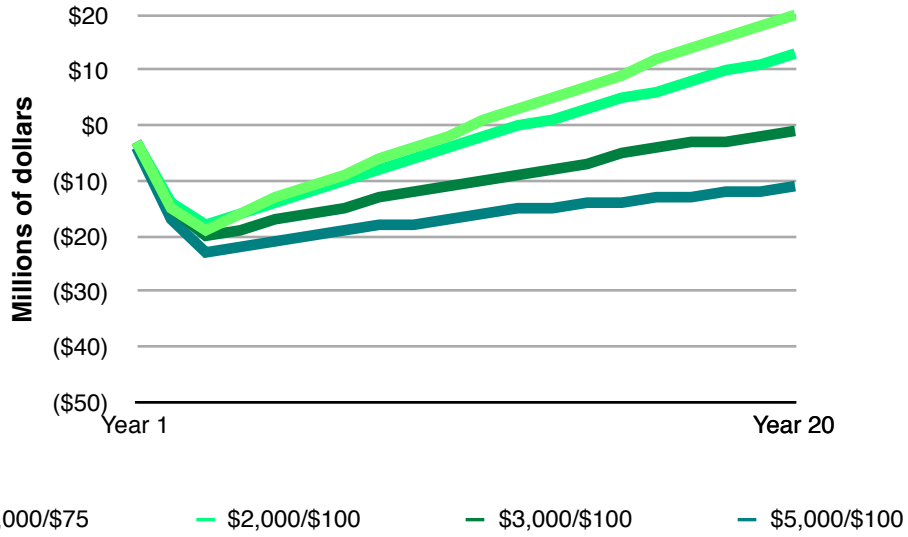
In this scenario, using the most optimistic demand assumptions, the net system value is a positive $6 million after 20 years. Under other demand assumptions, though, the net system value after 20 years ranges from -$25 million to zero.

Chart 5.11 Base Model with $12M/$2M Subsidies – Net Present Value



Higher subsidies produce higher net values. If the entire $12 million accumulated surplus is contributed toward construction costs and the assumption is made that the dark fiber system can contribute at least $2 million in subsidies for the following 20 years, then the more optimistic demand assumptions show a positive net value of up to $9 million after 20 years. At the lower end of the demand assumption range, though, net 20-year values are still negative, ranging from -$12 million to -$5 million.

Chart 5.12 Base Model with $12M/$2M Subsidies & 5% Annual Growth – Net Present Value



Adding in an assumption that subscriber growth will continue at a 5% annual rate for 20 years improves the actual numbers but doesn't change the pattern: optimistic subscriber assumptions show a positive value after 20 years, less optimistic assumptions do not. The most optimistic case assessed – $12 million in upfront subsidies, $2 million in ongoing annual subsidies, high initial demand and continual subscriber 5% growth – takes 11 years to cross the line into positive net value territory.

6. Conclusions

The primary reason to implement a user-financed model is just that: the people who use it bear the cost of building it. A lower upfront fee will likely attract more users, but it also means each user initially contributes less towards construction costs. Under every scenario considered, even with the most aggressively optimistic assumptions, the initial upfront user fees would never come close to paying for those costs.

It is possible to imagine scenarios where, in the course of 20 years, a user-financed FTTP system could pay for itself, or at least come close. However, those optimistic scenarios are at the hypothetical extremes and are unlikely to be achieved under real world, competitive market conditions.

Using mid-range assumptions, the base model predicts that the system will require tens of millions of dollars in bond financing or other outside sources of capital, with no realistic prospect of repaying those obligations out of operating revenue. Using surplus dark fiber revenue to subsidize the FTTP system helps, but does not solve the problem.

A user-financed FTTP system might even require annual operating subsidies. Under our initial pricing assumptions – a $3,000 upfront cost and a $100 per month fee – the system will lose several hundred thousand dollars a year. The market research conducted by RKS shows that the demand for a user-financed FTTP system is sensitive to price and it is possible to model conditions where lower prices would produce better results.

However, as discussed above, other research suggests that the "true" demand figures for Palo Alto are at the lower end of RKS's range, significantly raising the risk of annual operating losses, even with lower prices. Operating losses will lead to additional borrowing requirements, possibly in the tens of millions of dollars range, with no immediate source of repayment.

A fully user-financed citywide fiber-to-the-premise system is not possible to achieve in Palo Alto. An opt-in FTTP system can be built using a combination of upfront user fees and City financing, but there is very little probability of the debt incurred being repaid through operations. Ongoing subsidies would be required, very likely in excess of the surpluses currently generated by the CPAU dark fiber system.

7. Appendix A - Market Demand Research

Base case

Decrement (-) 20%

Monthly subscription cost	**Maximum one-time investment**					
	$0	**$1,000**	**$2,000**	**$3,000**	**$4,000**	**$5,000**
$0	65.6%	60.3%	37.4%	9.3%	3.3%	1.0%
$10	56.8%	53.2%	32.8%	8.8%	2.8%	1.0%
$15	56.5%	53.0%	32.8%	8.8%	2.8%	1.0%
$18	56.3%	52.7%	32.8%	8.8%	2.8%	1.0%
$20	56.3%	52.7%	32.8%	8.8%	2.8%	1.0%
$25	54.8%	51.2%	32.1%	8.8%	2.8%	1.0%
$30	51.0%	48.2%	30.8%	8.6%	2.5%	0.8%
$35	48.5%	45.7%	29.5%	8.6%	2.5%	0.8%
$40	46.7%	43.9%	28.8%	8.6%	2.5%	0.8%
$45	43.2%	40.6%	27.0%	8.6%	2.5%	0.8%
$49	42.6%	40.1%	26.8%	8.6%	2.5%	0.8%
$50	42.4%	39.9%	26.5%	8.6%	2.5%	0.8%
$55	28.0%	26.8%	17.9%	7.1%	2.0%	0.8%
$60	27.5%	26.2%	17.4%	6.8%	2.0%	0.8%
$65	24.2%	23.0%	16.2%	6.6%	1.8%	0.5%
$70	23.7%	22.5%	15.9%	6.6%	1.8%	0.5%
$75	22.5%	21.2%	15.4%	6.3%	1.8%	0.5%
$80	18.9%	17.9%	12.9%	5.8%	1.8%	0.5%
$99	16.7%	15.6%	10.9%	4.3%	1.5%	0.5%
$100	16.4%	15.4%	10.6%	4.3%	1.5%	0.5%
$125	5.8%	5.3%	3.8%	2.0%	1.3%	0.5%
$150	5.3%	4.8%	3.8%	2.0%	1.3%	0.5%
$175	2.8%	2.8%	2.3%	1.5%	0.8%	0.0%
$200	2.8%	2.8%	2.3%	1.5%	0.8%	0.0%
$250	0.8%	0.8%	0.8%	0.8%	0.5%	0.0%
$300	0.5%	0.5%	0.5%	0.5%	0.3%	0.0%
$1,000	0.3%	0.3%	0.3%	0.3%	0.0%	0.0%
$3,000	0.3%	0.3%	0.3%	0.3%	0.0%	0.0%

Pessimistic demand case

Decrement (-) 50%

Monthly subscription cost	**Maximum one-time investment**					
	$0	**$1,000**	**$2,000**	**$3,000**	**$4,000**	**$5,000**
$0	41.0%	37.7%	23.3%	5.8%	2.1%	0.6%
$10	35.5%	33.3%	20.5%	5.5%	1.7%	0.6%
$15	35.3%	33.1%	20.5%	5.5%	1.7%	0.6%
$18	35.2%	33.0%	20.5%	5.5%	1.7%	0.6%
$20	35.2%	33.0%	20.5%	5.5%	1.7%	0.6%
$25	34.2%	32.0%	20.0%	5.5%	1.7%	0.6%
$30	31.9%	30.1%	19.2%	5.4%	1.6%	0.5%
$35	30.3%	28.5%	18.5%	5.4%	1.6%	0.5%
$40	29.2%	27.4%	18.0%	5.4%	1.6%	0.5%
$45	27.0%	25.4%	16.9%	5.4%	1.6%	0.5%
$49	26.7%	25.1%	16.7%	5.4%	1.6%	0.5%
$50	26.5%	24.9%	16.6%	5.4%	1.6%	0.5%
$55	17.5%	16.7%	11.2%	4.4%	1.3%	0.5%
$60	17.2%	16.4%	10.9%	4.3%	1.3%	0.5%
$65	15.1%	14.4%	10.1%	4.1%	1.1%	0.3%
$70	14.8%	14.0%	9.9%	4.1%	1.1%	0.3%
$75	14.0%	13.2%	9.6%	3.9%	1.1%	0.3%
$80	11.8%	11.2%	8.0%	3.6%	1.1%	0.3%
$99	10.4%	9.8%	6.8%	2.7%	0.9%	0.3%
$100	10.3%	9.6%	6.6%	2.7%	0.9%	0.3%
$125	3.6%	3.3%	2.4%	1.3%	0.8%	0.3%
$150	3.3%	3.0%	2.4%	1.3%	0.8%	0.3%
$175	1.7%	1.7%	1.4%	0.9%	0.5%	0.0%
$200	1.7%	1.7%	1.4%	0.9%	0.5%	0.0%
$250	0.5%	0.5%	0.5%	0.5%	0.3%	0.0%
$300	0.3%	0.3%	0.3%	0.3%	0.2%	0.0%
$1,000	0.2%	0.2%	0.2%	0.2%	0.0%	0.0%
$3,000	0.2%	0.2%	0.2%	0.2%	0.0%	0.0%

Optimistic demand case

Increment (+) 50%

Monthly subscription cost	**Maximum one-time investment**					
	$0	**$1,000**	**$2,000**	**$3,000**	**$4,000**	**$5,000**
$0	100.0%	100.0%	70.0%	17.5%	6.2%	1.9%
$10	100.0%	99.8%	61.5%	16.6%	5.2%	1.9%
$15	100.0%	99.4%	61.5%	16.6%	5.2%	1.9%
$18	100.0%	98.9%	61.5%	16.6%	5.2%	1.9%
$20	100.0%	98.9%	61.5%	16.6%	5.2%	1.9%
$25	100.0%	96.1%	60.1%	16.6%	5.2%	1.9%
$30	95.6%	90.4%	57.7%	16.1%	4.7%	1.4%
$35	90.9%	85.6%	55.4%	16.1%	4.7%	1.4%
$40	87.5%	82.3%	53.9%	16.1%	4.7%	1.4%
$45	80.9%	76.2%	50.6%	16.1%	4.7%	1.4%
$49	80.0%	75.2%	50.2%	16.1%	4.7%	1.4%
$50	79.5%	74.8%	49.7%	16.1%	4.7%	1.4%
$55	52.5%	50.2%	33.6%	13.2%	3.8%	1.4%
$60	51.6%	49.2%	32.6%	12.8%	3.8%	1.4%
$65	45.4%	43.1%	30.3%	12.3%	3.3%	0.9%
$70	44.5%	42.1%	29.8%	12.3%	3.3%	0.9%
$75	42.1%	39.7%	28.9%	11.8%	3.3%	0.9%
$80	35.5%	33.6%	24.1%	10.9%	3.3%	0.9%
$99	31.2%	29.3%	20.3%	8.0%	2.8%	0.9%
$100	30.8%	28.9%	19.9%	8.0%	2.8%	0.9%
$125	10.9%	9.9%	7.1%	3.8%	2.4%	0.9%
$150	9.9%	9.0%	7.1%	3.8%	2.4%	0.9%
$175	5.2%	5.2%	4.3%	2.8%	1.4%	0.0%
$200	5.2%	5.2%	4.3%	2.8%	1.4%	0.0%
$250	1.4%	1.4%	1.4%	1.4%	0.9%	0.0%
$300	0.9%	0.9%	0.9%	0.9%	0.5%	0.0%
$1,000	0.5%	0.5%	0.5%	0.5%	0.0%	0.0%
$3,000	0.5%	0.5%	0.5%	0.5%	0.0%	0.0%

Unadjusted (raw) RKS data

Monthly subscription cost	Maximum one-time investment					
	$0	$1,000	$2,000	$3,000	$4,000	$5,000
$0	82.0%	75.4%	46.7%	11.7%	4.1%	1.3%
$10	71.0%	66.6%	41.0%	11.0%	3.5%	1.3%
$15	70.7%	66.2%	41.0%	11.0%	3.5%	1.3%
$18	70.3%	65.9%	41.0%	11.0%	3.5%	1.3%
$20	70.3%	65.9%	41.0%	11.0%	3.5%	1.3%
$25	68.5%	64.0%	40.1%	11.0%	3.5%	1.3%
$30	63.7%	60.3%	38.5%	10.7%	3.2%	0.9%
$35	60.6%	57.1%	36.9%	10.7%	3.2%	0.9%
$40	58.4%	54.9%	36.0%	10.7%	3.2%	0.9%
$45	53.9%	50.8%	33.8%	10.7%	3.2%	0.9%
$49	53.3%	50.2%	33.4%	10.7%	3.2%	0.9%
$50	53.0%	49.8%	33.1%	10.7%	3.2%	0.9%
$55	35.0%	33.4%	22.4%	8.8%	2.5%	0.9%
$60	34.4%	32.8%	21.8%	8.5%	2.5%	0.9%
$65	30.3%	28.7%	20.2%	8.2%	2.2%	0.6%
$70	29.7%	28.1%	19.9%	8.2%	2.2%	0.6%
$75	28.1%	26.5%	19.2%	7.9%	2.2%	0.6%
$80	23.7%	22.4%	16.1%	7.3%	2.2%	0.6%
$99	20.8%	19.6%	13.6%	5.4%	1.9%	0.6%
$100	20.5%	19.2%	13.2%	5.4%	1.9%	0.6%
$125	7.3%	6.6%	4.7%	2.5%	1.6%	0.6%
$150	6.6%	6.0%	4.7%	2.5%	1.6%	0.6%
$175	3.5%	3.5%	2.8%	1.9%	0.9%	0.0%
$200	3.5%	3.5%	2.8%	1.9%	0.9%	0.0%
$250	0.9%	0.9%	0.9%	0.9%	0.6%	0.0%
$300	0.6%	0.6%	0.6%	0.6%	0.3%	0.0%
$1,000	0.3%	0.3%	0.3%	0.3%	0.0%	0.0%
$3,000	0.3%	0.3%	0.3%	0.3%	0.0%	0.0%

8. Appendix B - Spreadsheets

1. Base model - Charts 4.1 & 4.2

Base Case	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Revenue (000)																				
Monthly CPAU connect charge	$25	$53	$66	$70	$73	$77	$81	$85	$89	$93	$98	$103	$108	$114	$119	$125	$131	$138	$145	$152
Total revenue	$25	$53	$66	$70	$73	$77	$81	$85	$89	$93	$98	$103	$108	$114	$119	$125	$131	$138	$145	$152
Operating Expense (000)																				
Fiber plant																				
Fiber plant maintenance	$73	$146	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182
Subtotal	$73	$146	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182
Network																				
Network actives maintenance	$82	$167	$209	$213	$217	$222	$226	$231	$235	$240	$245	$250	$255	$260	$265	$270	$276	$281	$287	$293
Inside plant maintenance	$4	$4	$4	$4	$4	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$6	$6	$6	$6	$6
Site operations	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92	$92
PAIX	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30
Subtotal	$208	$294	$335	$340	$344	$348	$353	$358	$362	$367	$372	$377	$382	$387	$393	$398	$403	$409	$415	$421
Operations																				
NOC	$24	$48	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60
Internet bandwidth	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Leased backhaul	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CPE maintenance	$0	$0	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1
Subtotal	$24	$48	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61	$61
Administration																				
Personnel	$238	$243	$248	$253	$258	$263	$268	$273	$279	$284	$290	$296	$302	$308	$314	$320	$327	$333	$340	$347
SG&A	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55	$55
Growth driven opex increase	$0	$0	$0	$4	$4	$4	$4	$4	$4	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5	$5
Subtotal	$293	$298	$303	$312	$317	$322	$327	$333	$338	$344	$350	$356	$362	$368	$374	$380	$387	$393	$400	$407
Total operating cost	$598	$785	$880	$894	$903	$913	$923	$933	$943	$954	$964	$975	$986	$997	$1,009	$1,021	$1,033	$1,045	$1,057	$1,070
Operating Results (000)																				
Operating surplus/(deficit)	($573)	($732)	($814)	($824)	($830)	($836)	($842)	($848)	($854)	($860)	($866)	($872)	($878)	($884)	($890)	($895)	($901)	($907)	($912)	($918)
Cumulative operating cash flow	($573)	($1,305)	($2,119)	($2,943)	($3,774)	($4,610)	($5,452)	($6,300)	($7,154)	($8,014)	($8,880)	($9,753)	($10,630)	($11,514)	($12,404)	($13,299)	($14,201)	($15,108)	($16,020)	($16,938)
Operating cash flow NPV	($546)	($1,729)	($3,560)	($5,982)	($8,938)	($12,378)	($16,253)	($20,517)	($25,129)	($30,049)	($35,241)	($40,672)	($46,309)	($52,125)	($58,091)	($64,184)	($70,380)	($76,657)	($82,997)	($89,380)
Capital Expense (000)	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**
Fiber optic cable installation	$10,948	$10,948	$5,474	$1	$1	$1	$1	$1	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$3
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Drops and CPE	$26	$26	$13	$3	$3	$4	$4	$4	$4	$4	$5	$5	$5	$5	$6	$6	$6	$6	$7	$7
Construction services	$1,376	$1,376	$688	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$15,827	$15,827	$7,913	$5	$5	$5	$6	$6	$6	$6	$7	$7	$7	$8	$8	$9	$9	$10	$10	$11
Cumulative capex	$15,827	$31,654	$39,567	$39,572	$39,577	$39,583	$39,588	$39,594	$39,600	$39,607	$39,614	$39,621	$39,628	$39,636	$39,644	$39,653	$39,662	$39,672	$39,682	$39,692
Cash Flow (000)	$211	$211	$105	$26	$28	$29	$30	$32	$34	$35	$37	$39	$41	$43	$45	$47	$50	$52	$55	$58
User construction contribution	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Subsidy	($15,827)	($15,827)	($7,913)	($5)	($5)	($5)	($6)	($6)	($6)	($6)	($7)	($7)	($7)	($8)	($8)	($9)	($9)	($10)	($10)	($11)
Capital expense	($4,189)	($14,348)	($6,822)	$1,197	$1,192	$1,188	$1,183	$1,178	$1,173	$1,169	$1,164	$1,160	$1,155	$1,151	$1,147	$1,143	$1,139	$1,136	$1,132	$1,129
Cash flow																				
Cumulative cash flow	($4,189)	($18,538)	($25,160)	($23,963)	($22,770)	($21,583)	($20,400)	($19,222)	($18,049)	($16,880)	($15,716)	($14,556)	($13,401)	($12,249)	($11,102)	($9,959)	($8,820)	($7,684)	($6,552)	($5,423)
Net present value	($3,990)	($17,004)	($22,725)	($21,740)	($20,805)	($19,919)	($19,079)	($18,281)	($17,525)	($16,808)	($16,127)	($15,481)	($14,868)	($14,287)	($13,735)	($13,211)	($12,714)	($12,242)	($11,794)	($11,369)
Cost of capital	5%																			

2. Base model alternatives – Charts 5.1 & 5.2

Scenario Parameters

Demand case	Base
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$797	$1,593	$1,992	$1,992	$1,992	$1,992	$1,992	$1,992
Total revenue	$797	$1,593	$1,992	$1,992	$1,992	$1,992	$1,992	$1,992
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$33	$66	$82	$82	$82	$82	$82	$82
Administration	$425	$432	$440	$448	$455	$497	$543	$594
Total operating cost	$739	$937	$1,039	$1,051	$1,063	$1,128	$1,200	$1,279
Operating Results (000)								
Operating surplus/(deficit)	$55	$623	$905	$893	$882	$820	$752	$677
Cumulative operating cash flow	$55	$678	$1,583	$2,477	$3,359	$7,586	$11,486	$15,026
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,101	$1,101	$551	$0	$0	$0	$0	$0
Construction services	$1,484	$1,484	$742	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$742	$742	$371	$0	$0	$0	$0	$0
Total	$17,063	$17,063	$8,532	$0	$0	$0	$0	$0
Cumulative capex	$17,063	$34,126	$42,658	$42,658	$42,658	$42,658	$42,658	$42,658
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$0	$0	$0	$0	$0
Operating surplus/(deficit)	$55	$623	$905	$893	$882	$820	$752	$677
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($17,063)	($17,063)	($8,532)	$0	$0	$0	$0	$0
Cash flow	($15,238)	($14,669)	($6,742)	$893	$882	$820	$752	$677
Cumulative cash flow	($15,238)	($29,907)	($36,649)	($35,755)	($34,873)	($30,646)	($26,746)	($23,206)
Net present value	($14,512)	($27,818)	($33,641)	($32,906)	($32,215)	($29,343)	($27,267)	($25,789)

Scenario Parameters

Demand case	Base
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$531	$1,062	$1,328	$1,328	$1,328	$1,328	$1,328	$1,328
Total revenue	$531	$1,062	$1,328	$1,328	$1,328	$1,328	$1,328	$1,328
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$28	$57	$71	$71	$71	$71	$71	$71
Administration	$340	$345	$351	$357	$363	$395	$431	$470
Total operating cost	$649	$841	$940	$950	$960	$1,015	$1,076	$1,144
Operating Results (000)								
Operating surplus/(deficit)	($118)	$210	$369	$359	$349	$297	$239	$175
Cumulative operating cash flow	($118)	$92	$461	$820	$1,169	$2,760	$4,073	$5,078
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$551	$551	$275	$0	$0	$0	$0	$0
Construction services	$1,429	$1,429	$714	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$714	$714	$357	$0	$0	$0	$0	$0
Total	$16,430	$16,430	$8,215	$0	$0	$0	$0	$0
Cumulative capex	$16,430	$32,860	$41,075	$41,075	$41,075	$41,075	$41,075	$41,075
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($118)	$210	$369	$359	$349	$297	$239	$175
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,430)	($16,430)	($8,215)	$0	$0	$0	$0	$0
Cash flow	($14,778)	($14,450)	($6,961)	$359	$349	$297	$239	$175
Cumulative cash flow	($14,778)	($29,227)	($36,188)	($35,829)	($35,480)	($33,889)	($32,576)	($31,571)
Net present value	($14,074)	($27,180)	($33,193)	($32,898)	($32,624)	($31,541)	($30,841)	($30,419)

Scenario Parameters

Demand case	Base
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$215	$430	$537	$537	$537	$537	$537	$537
Total revenue	$215	$430	$537	$537	$537	$537	$537	$537
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$26	$52	$64	$64	$64	$64	$64	$64
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$600	$788	$884	$894	$903	$953	$1,008	$1,069
Operating Results (000)								
Operating surplus/(deficit)	($385)	($359)	($347)	($356)	($366)	($416)	($471)	($531)
Cumulative operating cash flow	($385)	($743)	($1,090)	($1,447)	($1,812)	($3,788)	($6,029)	($8,562)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$223	$223	$111	$0	$0	$0	$0	$0
Construction services	$1,396	$1,396	$698	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$698	$698	$349	$0	$0	$0	$0	$0
Total	$16,053	$16,053	$8,027	$0	$0	$0	$0	$0
Cumulative capex	$16,053	$32,106	$40,133	$40,133	$40,133	$40,133	$40,133	$40,133
Cash Flow (000)								
User construction contribution	$1,075	$1,075	$537	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($385)	($359)	($347)	($356)	($366)	($416)	($471)	($531)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,053)	($16,053)	($8,027)	$0	$0	$0	$0	$0
Cash flow	($15,363)	($15,337)	($7,836)	($356)	($366)	($416)	($471)	($531)
Cumulative cash flow	($15,363)	($30,700)	($38,536)	($38,892)	($39,258)	($41,234)	($43,474)	($46,008)
Net present value	($14,631)	($28,542)	($35,311)	($35,605)	($35,891)	($37,228)	($38,416)	($39,469)

Scenario Parameters

Demand case	Base
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$25	$51	$63	$63	$63	$63	$63	$63
Total revenue	$25	$51	$63	$63	$63	$63	$63	$63
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$48	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$598	$785	$880	$890	$899	$949	$1,004	$1,065
Operating Results (000)								
Operating surplus/(deficit)	($573)	($735)	($817)	($826)	($836)	($886)	($941)	($1,002)
Cumulative operating cash flow	($573)	($1,308)	($2,125)	($2,951)	($3,787)	($8,114)	($12,707)	($17,591)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$26	$26	$13	$0	$0	$0	$0	$0
Construction services	$1,376	$1,376	$688	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0
Total	$15,827	$15,827	$7,913	$0	$0	$0	$0	$0
Cumulative capex	$15,827	$31,654	$39,567	$39,567	$39,567	$39,567	$39,567	$39,567
Cash Flow (000)								
User construction contribution	$211	$211	$105	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($573)	($735)	($817)	($826)	($836)	($886)	($941)	($1,002)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($15,827)	($15,827)	($7,913)	$0	$0	$0	$0	$0
Cash flow	($16,189)	($16,351)	($8,625)	($826)	($836)	($886)	($941)	($1,002)
Cumulative cash flow	($16,189)	($32,540)	($41,165)	($41,992)	($42,828)	($47,155)	($51,747)	($56,632)
Net present value	($15,418)	($30,249)	($37,700)	($38,380)	($39,035)	($41,967)	($44,406)	($46,438)

3. Pessimistic scenarios – Charts 5.3 & 5.4

Scenario Parameters

Demand case	Pessimistic
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$498	$996	$1,245	$1,245	$1,245	$1,245	$1,245	$1,245
Total revenue	$498	$996	$1,245	$1,245	$1,245	$1,245	$1,245	$1,245
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$30	$59	$74	$74	$74	$74	$74	$74
Administration	$361	$367	$373	$380	$386	$421	$459	$501
Total operating cost	$672	$865	$965	$975	$986	$1,044	$1,107	$1,177
Operating Results (000)								
Operating surplus/(deficit)	($174)	$124	$266	$256	$246	$191	$131	$64
Cumulative operating cash flow	($174)	($50)	$217	$473	$719	$1,786	$2,563	$3,020
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$688	$688	$344	$0	$0	$0	$0	$0
Construction services	$1,442	$1,442	$721	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$721	$721	$361	$0	$0	$0	$0	$0
Total	$16,588	$16,588	$8,294	$0	$0	$0	$0	$0
Cumulative capex	$16,588	$33,177	$41,471	$41,471	$41,471	$41,471	$41,471	$41,471
Cash Flow (000)								
User construction contribution	$1,107	$1,107	$553	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($174)	$124	$266	$256	$246	$191	$131	$64
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,588)	($16,588)	($8,294)	$0	$0	$0	$0	$0
Cash flow	($15,655)	($15,358)	($7,475)	$256	$246	$191	$131	$64
Cumulative cash flow	($15,655)	($31,013)	($38,488)	($38,232)	($37,986)	($36,918)	($36,141)	($35,685)
Net present value	($14,910)	($28,840)	($35,297)	($35,086)	($34,893)	($34,166)	($33,749)	($33,556)

Scenario Parameters

Demand case	Pessimistic
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$332	$664	$830	$830	$830	$830	$830	$830
Total revenue	$332	$664	$830	$830	$830	$830	$830	$830
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$27	$54	$67	$67	$67	$67	$67	$67
Administration	$308	$313	$318	$323	$329	$357	$389	$423
Total operating cost	$615	$805	$902	$912	$921	$973	$1,030	$1,093
Operating Results (000)								
Operating surplus/(deficit)	($284)	($142)	($72)	($82)	($92)	($143)	($200)	($263)
Cumulative operating cash flow	($284)	($425)	($497)	($579)	($671)	($1,281)	($2,166)	($3,352)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$344	$344	$172	$0	$0	$0	$0	$0
Construction services	$1,408	$1,408	$704	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$704	$704	$352	$0	$0	$0	$0	$0
Total	$16,193	$16,193	$8,096	$0	$0	$0	$0	$0
Cumulative capex	$16,193	$32,385	$40,481	$40,481	$40,481	$40,481	$40,481	$40,481
Cash Flow (000)								
User construction contribution	$1,107	$1,107	$553	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($284)	($142)	($72)	($82)	($92)	($143)	($200)	($263)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,193)	($16,193)	($8,096)	$0	$0	$0	$0	$0
Cash flow	($15,370)	($15,228)	($7,615)	($82)	($92)	($143)	($200)	($263)
Cumulative cash flow	($15,370)	($30,597)	($38,213)	($38,294)	($38,386)	($38,997)	($39,881)	($41,068)
Net present value	($14,638)	($28,450)	($35,028)	($35,095)	($35,167)	($35,578)	($36,045)	($36,537)

Scenario Parameters

Demand case	Pessimistic
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$134	$269	$336	$336	$336	$336	$336	$336
Total revenue	$134	$269	$336	$336	$336	$336	$336	$336
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$25	$50	$63	$63	$63	$63	$63	$63
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$599	$787	$883	$892	$901	$951	$1,006	$1,067
Operating Results (000)								
Operating surplus/(deficit)	($465)	($518)	($547)	($556)	($565)	($615)	($670)	($731)
Cumulative operating cash flow	($465)	($983)	($1,530)	($2,086)	($2,652)	($5,627)	($8,867)	($12,399)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$139	$139	$70	$0	$0	$0	$0	$0
Construction services	$1,388	$1,388	$694	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$694	$694	$347	$0	$0	$0	$0	$0
Total	$15,957	$15,957	$7,979	$0	$0	$0	$0	$0
Cumulative capex	$15,957	$31,914	$39,893	$39,893	$39,893	$39,893	$39,893	$39,893
Cash Flow (000)								
User construction contribution	$672	$672	$336	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($465)	($518)	($547)	($556)	($565)	($615)	($670)	($731)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($15,957)	($15,957)	($7,979)	$0	$0	$0	$0	$0
Cash flow	($15,750)	($15,804)	($8,189)	($556)	($565)	($615)	($670)	($731)
Cumulative cash flow	($15,750)	($31,554)	($39,743)	($40,299)	($40,865)	($43,840)	($47,080)	($50,612)
Net present value	($15,000)	($29,334)	($36,409)	($36,866)	($37,309)	($39,324)	($41,044)	($42,513)

Scenario Parameters

Demand case	Pessimistic
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$16	$32	$40	$40	$40	$40	$40	$40
Total revenue	$16	$32	$40	$40	$40	$40	$40	$40
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$48	$60	$60	$60	$60	$60	$60
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$598	$785	$880	$890	$899	$949	$1,004	$1,065
Operating Results (000)								
Operating surplus/(deficit)	($582)	($754)	($841)	($850)	($859)	($909)	($964)	($1,025)
Cumulative operating cash flow	($582)	($1,336)	($2,177)	($3,027)	($3,886)	($8,331)	($13,040)	($18,043)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$16	$16	$8	$0	$0	$0	$0	$0
Construction services	$1,375	$1,375	$688	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0
Total	$15,816	$15,816	$7,908	$0	$0	$0	$0	$0
Cumulative capex	$15,816	$31,631	$39,539	$39,539	$39,539	$39,539	$39,539	$39,539
Cash Flow (000)								
User construction contribution	$132	$132	$66	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($582)	($754)	($841)	($850)	($859)	($909)	($964)	($1,025)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($15,816)	($15,816)	($7,908)	$0	$0	$0	$0	$0
Cash flow	($16,266)	($16,438)	($8,683)	($850)	($859)	($909)	($964)	($1,025)
Cumulative cash flow	($16,266)	($32,704)	($41,387)	($42,237)	($43,096)	($47,541)	($52,250)	($57,253)
Net present value	($15,492)	($30,401)	($37,901)	($38,601)	($39,274)	($42,286)	($44,787)	($46,868)

4. Optimistic scenarios – Charts 5.5 and 5.6

Scenario Parameters

Demand case	Optimistic
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$1,494	$2,988	$3,735	$3,735	$3,735	$3,735	$3,735	$3,735
Total revenue	$1,494	$2,988	$3,735	$3,735	$3,735	$3,735	$3,735	$3,735
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$41	$81	$101	$101	$101	$101	$101	$101
Administration	$574	$584	$595	$606	$617	$675	$740	$811
Total operating cost	$896	$1,105	$1,214	$1,229	$1,244	$1,326	$1,416	$1,515
Operating Results (000)								
Operating surplus/(deficit)	$568	$1,789	$2,395	$2,380	$2,366	$2,288	$2,203	$2,108
Cumulative operating cash flow	$568	$2,357	$4,752	$7,132	$9,498	$21,097	$32,285	$43,019
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$2,065	$2,065	$1,032	$0	$0	$0	$0	$0
Construction services	$1,580	$1,580	$790	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$790	$790	$395	$0	$0	$0	$0	$0
Total	$18,171	$18,171	$9,086	$0	$0	$0	$0	$0
Cumulative capex	$18,171	$36,343	$45,428	$45,428	$45,428	$45,428	$45,428	$45,428
Cash Flow (000)								
User construction contribution	$3,320	$3,320	$1,660	$0	$0	$0	$0	$0
Operating surplus/(deficit)	$568	$1,789	$2,395	$2,380	$2,366	$2,288	$2,203	$2,108
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($18,171)	($18,171)	($9,086)	$0	$0	$0	$0	$0
Cash flow	($14,283)	($13,063)	($5,031)	$2,380	$2,366	$2,288	$2,203	$2,108
Cumulative cash flow	($14,283)	($27,346)	($32,378)	($29,997)	($27,632)	($16,032)	($4,844)	$5,889
Net present value	($13,603)	($25,452)	($29,798)	($27,840)	($25,986)	($18,111)	($12,159)	($7,685)

Scenario Parameters

Demand case	Optimistic
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$996	$1,992	$2,490	$2,490	$2,490	$2,490	$2,490	$2,490
Total revenue	$996	$1,992	$2,490	$2,490	$2,490	$2,490	$2,490	$2,490
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$32	$65	$81	$81	$81	$81	$81	$81
Administration	$414	$421	$429	$436	$444	$484	$529	$578
Total operating cost	$728	$925	$1,027	$1,039	$1,051	$1,114	$1,184	$1,262
Operating Results (000)								
Operating surplus/(deficit)	$255	$1,013	$1,390	$1,379	$1,367	$1,307	$1,240	$1,166
Cumulative operating cash flow	$255	$1,268	$2,658	$4,036	$5,403	$12,060	$18,397	$24,379
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,032	$1,032	$516	$0	$0	$0	$0	$0
Construction services	$1,477	$1,477	$738	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$738	$738	$369	$0	$0	$0	$0	$0
Total	$16,984	$16,984	$8,492	$0	$0	$0	$0	$0
Cumulative capex	$16,984	$33,968	$42,460	$42,460	$42,460	$42,460	$42,460	$42,460
Cash Flow (000)								
User construction contribution	$3,320	$3,320	$1,660	$0	$0	$0	$0	$0
Operating surplus/(deficit)	$255	$1,013	$1,390	$1,379	$1,367	$1,307	$1,240	$1,166
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,984)	($16,984)	($8,492)	$0	$0	$0	$0	$0
Cash flow	($13,410)	($12,651)	($5,443)	$1,379	$1,367	$1,307	$1,240	$1,166
Cumulative cash flow	($13,410)	($26,061)	($31,503)	($30,125)	($28,758)	($22,101)	($15,765)	($9,782)
Net present value	($12,771)	($24,246)	($28,948)	($27,814)	($26,742)	($22,222)	($18,850)	($16,355)

Scenario Parameters

Demand case	Optimistic
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$403	$806	$1,008	$1,008	$1,008	$1,008	$1,008	$1,008
Total revenue	$403	$806	$1,008	$1,008	$1,008	$1,008	$1,008	$1,008
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$27	$55	$68	$68	$68	$68	$68	$68
Administration	$319	$324	$330	$335	$341	$371	$404	$440
Total operating cost	$628	$818	$916	$925	$935	$988	$1,047	$1,111
Operating Results (000)								
Operating surplus/(deficit)	($224)	($12)	$88	$78	$69	$19	($39)	($103)
Cumulative operating cash flow	($224)	($237)	($149)	($71)	($2)	$193	$118	($267)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$418	$418	$209	$0	$0	$0	$0	$0
Construction services	$1,415	$1,415	$708	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$708	$708	$354	$0	$0	$0	$0	$0
Total	$16,277	$16,277	$8,139	$0	$0	$0	$0	$0
Cumulative capex	$16,277	$32,555	$40,693	$40,693	$40,693	$40,693	$40,693	$40,693
Cash Flow (000)								
User construction contribution	$2,015	$2,015	$1,008	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($224)	($12)	$88	$78	$69	$19	($39)	($103)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,277)	($16,277)	($8,139)	$0	$0	$0	$0	$0
Cash flow	($14,486)	($14,274)	($7,043)	$78	$69	$19	($39)	($103)
Cumulative cash flow	($14,486)	($28,760)	($35,804)	($35,726)	($35,657)	($35,461)	($35,537)	($35,922)
Net present value	($13,797)	($26,744)	($32,828)	($32,764)	($32,710)	($32,574)	($32,611)	($32,768)

Scenario Parameters

Demand case	Optimistic
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$47	$95	$119	$119	$119	$119	$119	$119
Total revenue	$47	$95	$119	$119	$119	$119	$119	$119
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$49	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$598	$786	$881	$890	$900	$949	$1,005	$1,065
Operating Results (000)								
Operating surplus/(deficit)	($551)	($691)	($762)	($772)	($781)	($831)	($886)	($947)
Cumulative operating cash flow	($551)	($1,242)	($2,004)	($2,776)	($3,557)	($7,610)	($11,927)	($16,538)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$49	$49	$25	$0	$0	$0	$0	$0
Construction services	$1,379	$1,379	$689	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$689	$689	$345	$0	$0	$0	$0	$0
Total	$15,853	$15,853	$7,927	$0	$0	$0	$0	$0
Cumulative capex	$15,853	$31,707	$39,633	$39,633	$39,633	$39,633	$39,633	$39,633
Cash Flow (000)								
User construction contribution	$395	$395	$198	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($551)	($691)	($762)	($772)	($781)	($831)	($886)	($947)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($15,853)	($15,853)	($7,927)	$0	$0	$0	$0	$0
Cash flow	($16,009)	($16,149)	($8,491)	($772)	($781)	($831)	($886)	($947)
Cumulative cash flow	($16,009)	($32,158)	($40,650)	($41,421)	($42,202)	($46,255)	($50,573)	($55,183)
Net present value	($15,247)	($29,894)	($37,230)	($37,865)	($38,476)	($41,223)	($43,515)	($45,433)

5. Increasing subscription rate scenarios - Charts 5.7 & 5.8

Scenario Parameters

Demand case	Base
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$797	$1,673	$2,091	$2,196	$2,306	$2,943	$3,756	$4,793
Total revenue	$797	$1,673	$2,091	$2,196	$2,306	$2,943	$3,756	$4,793
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$33	$66	$82	$82	$82	$82	$82	$82
Administration	$425	$432	$440	$453	$460	$502	$549	$600
Total operating cost	$739	$937	$1,039	$1,056	$1,069	$1,134	$1,205	$1,285
Operating Results (000)								
Operating surplus/(deficit)	$55	$699	$999	$1,083	$1,175	$1,719	$2,423	$3,333
Cumulative operating cash flow	$55	$754	$1,754	$2,836	$4,011	$11,461	$22,094	$36,846
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$50	$53	$67	$86	$109
Nodes	$2,732	$2,732	$1,366	$8	$8	$11	$14	$17
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,101	$1,101	$551	$138	$145	$184	$235	$300
Construction services	$1,484	$1,484	$742	$4	$5	$6	$7	$9
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$742	$742	$371	$2	$2	$3	$4	$5
Total	$17,063	$17,063	$8,532	$202	$213	$271	$346	$442
Cumulative capex	$17,063	$34,126	$42,658	$42,860	$43,073	$44,306	$45,880	$47,888
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$221	$232	$297	$379	$483
Operating surplus/(deficit)	$55	$699	$999	$1,083	$1,175	$1,719	$2,423	$3,333
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($17,063)	($17,063)	($8,532)	($202)	($213)	($271)	($346)	($442)
Cash flow	($15,238)	($14,594)	($6,647)	$1,102	$1,195	$1,744	$2,455	$3,374
Cumulative cash flow	($15,238)	($29,831)	($36,478)	($35,377)	($34,182)	($26,617)	($15,837)	($898)
Net present value	($14,512)	($27,749)	($33,491)	($32,585)	($31,648)	($26,553)	($20,860)	($14,676)

Scenario Parameters

Demand case	Base
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$531	$1,115	$1,394	$1,464	$1,537	$1,962	$2,504	$3,196
Total revenue	$531	$1,115	$1,394	$1,464	$1,537	$1,962	$2,504	$3,196
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$28	$57	$71	$71	$71	$71	$71	$71
Administration	$340	$345	$351	$362	$368	$400	$436	$475
Total operating cost	$649	$841	$940	$954	$965	$1,020	$1,081	$1,149
Operating Results (000)								
Operating surplus/(deficit)	($118)	$260	$432	$484	$544	$895	$1,351	$1,944
Cumulative operating cash flow	($118)	$142	$574	$1,058	$1,602	$5,336	$11,131	$19,604
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$25	$26	$34	$43	$55
Nodes	$2,732	$2,732	$1,366	$4	$4	$6	$7	$9
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$551	$551	$275	$69	$72	$92	$118	$150
Construction services	$1,429	$1,429	$714	$2	$2	$3	$4	$5
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$714	$714	$357	$1	$1	$1	$2	$2
Total	$16,430	$16,430	$8,215	$101	$106	$136	$173	$221
Cumulative capex	$16,430	$32,860	$41,075	$41,176	$41,283	$41,900	$42,688	$43,694
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$221	$232	$297	$379	$483
Operating surplus/(deficit)	($118)	$260	$432	$484	$544	$895	$1,351	$1,944
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,430)	($16,430)	($8,215)	($101)	($106)	($136)	($173)	($221)
Cash flow	($14,778)	($14,399)	($6,898)	$604	$670	$1,055	$1,556	$2,206
Cumulative cash flow	($14,778)	($29,177)	($36,075)	($35,471)	($34,801)	($30,337)	($23,609)	($13,945)
Net present value	($14,074)	($27,134)	($33,093)	($32,596)	($32,072)	($29,069)	($25,519)	($21,521)

Scenario Parameters

Demand case	Base
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$215	$451	$564	$593	$622	$794	$1,013	$1,293
Total revenue	$215	$451	$564	$593	$622	$794	$1,013	$1,293
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$26	$52	$64	$64	$64	$64	$64	$64
Administration	$293	$298	$303	$312	$317	$344	$374	$407
Total operating cost	$600	$788	$884	$898	$907	$958	$1,013	$1,074
Operating Results (000)								
Operating surplus/(deficit)	($385)	($337)	($320)	($305)	($285)	($163)	$1	$208
Cumulative operating cash flow	($385)	($722)	($1,042)	($1,347)	($1,632)	($2,708)	($3,052)	($2,450)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$10	$11	$14	$17	$22
Nodes	$2,732	$2,732	$1,366	$2	$2	$2	$3	$4
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$223	$223	$111	$28	$29	$37	$48	$61
Construction services	$1,396	$1,396	$698	$1	$1	$1	$2	$2
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$698	$698	$349	$0	$0	$1	$1	$1
Total	$16,053	$16,053	$8,027	$41	$43	$55	$70	$90
Cumulative capex	$16,053	$32,106	$40,133	$40,174	$40,217	$40,467	$40,787	$41,194
Cash Flow (000)								
User construction contribution	$1,075	$1,075	$537	$134	$141	$180	$230	$293
Operating surplus/(deficit)	($385)	($337)	($320)	($305)	($285)	($163)	$1	$208
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,053)	($16,053)	($8,027)	($41)	($43)	($55)	($70)	($90)
Cash flow	($15,363)	($15,315)	($7,809)	($212)	($187)	($38)	$160	$412
Cumulative cash flow	($15,363)	($30,678)	($38,488)	($38,700)	($38,887)	($39,394)	($39,013)	($37,484)
Net present value	($14,631)	($28,523)	($35,269)	($35,443)	($35,590)	($35,944)	($35,752)	($35,126)

Scenario Parameters

Demand case	Base
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$25	$53	$66	$70	$73	$93	$119	$152
Total revenue	$25	$53	$66	$70	$73	$93	$119	$152
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$48	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$312	$317	$344	$374	$407
Total operating cost	$598	$785	$880	$894	$903	$954	$1,009	$1,070
Operating Results (000)								
Operating surplus/(deficit)	($573)	($732)	($814)	($824)	($830)	($860)	($890)	($918)
Cumulative operating cash flow	($573)	($1,305)	($2,119)	($2,943)	($3,774)	($8,014)	($12,404)	($16,938)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$1	$1	$2	$2	$3
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$26	$26	$13	$3	$3	$4	$6	$7
Construction services	$1,376	$1,376	$688	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0
Total	$15,827	$15,827	$7,913	$5	$5	$6	$8	$11
Cumulative capex	$15,827	$31,654	$39,567	$39,572	$39,577	$39,607	$39,644	$39,692
Cash Flow (000)								
User construction contribution	$211	$211	$105	$26	$28	$35	$45	$58
Operating surplus/(deficit)	($573)	($732)	($814)	($824)	($830)	($860)	($890)	($918)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($15,827)	($15,827)	($7,913)	($5)	($5)	($6)	($8)	($11)
Cash flow	($16,189)	($16,348)	($8,622)	($803)	($808)	($831)	($853)	($871)
Cumulative cash flow	($16,189)	($32,538)	($41,160)	($41,963)	($42,770)	($46,880)	($51,102)	($55,423)
Net present value	($15,418)	($30,247)	($37,695)	($38,355)	($38,988)	($41,775)	($44,018)	($45,817)

Scenario Parameters

Demand case	Optimistic
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	2%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$1,494	$3,047	$3,809	$3,885	$3,963	$4,376	$4,831	$5,334
Total revenue	$1,494	$3,047	$3,809	$3,885	$3,963	$4,376	$4,831	$5,334
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$41	$81	$101	$101	$101	$101	$101	$101
Administration	$574	$584	$595	$608	$619	$678	$743	$814
Total operating cost	$896	$1,105	$1,214	$1,231	$1,247	$1,328	$1,419	$1,518
Operating Results (000)								
Operating surplus/(deficit)	$568	$1,846	$2,466	$2,521	$2,581	$2,895	$3,242	$3,625
Cumulative operating cash flow	$568	$2,414	$4,879	$7,401	$9,981	$23,814	$39,315	$56,658
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$38	$38	$42	$47	$52
Nodes	$2,732	$2,732	$1,366	$6	$6	$6	$7	$8
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$2,065	$2,065	$1,032	$103	$105	$116	$128	$142
Construction services	$1,580	$1,580	$790	$3	$3	$4	$4	$4
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$790	$790	$395	$2	$2	$2	$2	$2
Total	$18,171	$18,171	$9,086	$151	$154	$171	$188	$208
Cumulative capex	$18,171	$36,343	$45,428	$45,580	$45,734	$46,554	$47,459	$48,459
Cash Flow (000)								
User construction contribution	$3,320	$3,320	$1,660	$166	$169	$187	$206	$228
Operating surplus/(deficit)	$568	$1,846	$2,466	$2,521	$2,581	$2,895	$3,242	$3,625
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($18,171)	($18,171)	($9,086)	($151)	($154)	($171)	($188)	($208)
Cash flow	($14,283)	($13,006)	($4,960)	$2,536	$2,595	$2,911	$3,260	$3,645
Cumulative cash flow	($14,283)	($27,290)	($32,250)	($29,714)	($27,119)	($13,207)	$2,381	$19,820
Net present value	($13,603)	($25,400)	($29,685)	($27,599)	($25,565)	($16,148)	($7,880)	($632)

Scenario Parameters

Demand case	Optimistic
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	2%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$996	$2,032	$2,539	$2,590	$2,642	$2,917	$3,221	$3,556
Total revenue	$996	$2,032	$2,539	$2,590	$2,642	$2,917	$3,221	$3,556
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$32	$65	$81	$81	$81	$81	$81	$81
Administration	$414	$421	$429	$438	$446	$487	$531	$581
Total operating cost	$728	$925	$1,027	$1,041	$1,053	$1,116	$1,187	$1,264
Operating Results (000)								
Operating surplus/(deficit)	$255	$1,051	$1,437	$1,472	$1,510	$1,711	$1,932	$2,177
Cumulative operating cash flow	$255	$1,306	$2,743	$4,215	$5,725	$13,869	$23,078	$33,464
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$19	$19	$21	$23	$26
Nodes	$2,732	$2,732	$1,366	$3	$3	$3	$4	$4
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,032	$1,032	$516	$52	$53	$58	$64	$71
Construction services	$1,477	$1,477	$738	$2	$2	$2	$2	$2
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$738	$738	$369	$1	$1	$1	$1	$1
Total	$16,984	$16,984	$8,492	$76	$77	$85	$94	$104
Cumulative capex	$16,984	$33,968	$42,460	$42,536	$42,614	$43,025	$43,478	$43,979
Cash Flow (000)								
User construction contribution	$3,320	$3,320	$1,660	$166	$169	$187	$206	$228
Operating surplus/(deficit)	$255	$1,051	$1,437	$1,472	$1,510	$1,711	$1,932	$2,177
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,984)	($16,984)	($8,492)	($76)	($77)	($85)	($94)	($104)
Cash flow	($13,410)	($12,613)	($5,395)	$1,562	$1,602	$1,812	$2,044	$2,301
Cumulative cash flow	($13,410)	($26,023)	($31,418)	($29,856)	($28,254)	($19,623)	($9,875)	$1,105
Net present value	($12,771)	($24,212)	($28,872)	($27,587)	($26,332)	($20,490)	($15,320)	($10,758)

Scenario Parameters

Demand case	Optimistic
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	2%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$403	$822	$1,028	$1,048	$1,069	$1,181	$1,304	$1,439
Total revenue	$403	$822	$1,028	$1,048	$1,069	$1,181	$1,304	$1,439
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$27	$55	$68	$68	$68	$68	$68	$68
Administration	$319	$324	$330	$337	$343	$373	$406	$442
Total operating cost	$628	$818	$916	$927	$937	$990	$1,049	$1,113
Operating Results (000)								
Operating surplus/(deficit)	($224)	$4	$107	$115	$126	$181	$242	$310
Cumulative operating cash flow	($224)	($221)	($114)	$1	$127	$919	$2,006	$3,417
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$8	$8	$9	$9	$10
Nodes	$2,732	$2,732	$1,366	$1	$1	$1	$2	$2
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$418	$418	$209	$21	$21	$24	$26	$29
Construction services	$1,415	$1,415	$708	$1	$1	$1	$1	$1
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$708	$708	$354	$0	$0	$0	$0	$0
Total	$16,277	$16,277	$8,139	$31	$31	$35	$38	$42
Cumulative capex	$16,277	$32,555	$40,693	$40,724	$40,756	$40,922	$41,106	$41,309
Cash Flow (000)								
User construction contribution	$2,015	$2,015	$1,008	$101	$103	$113	$125	$138
Operating surplus/(deficit)	($224)	$4	$107	$115	$126	$181	$242	$310
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($16,277)	($16,277)	($8,139)	($31)	($31)	($35)	($38)	($42)
Cash flow	($14,486)	($14,258)	($7,024)	$185	$197	$260	$329	$406
Cumulative cash flow	($14,486)	($28,745)	($35,769)	($35,584)	($35,387)	($34,215)	($32,710)	($30,837)
Net present value	($13,797)	($26,729)	($32,797)	($32,645)	($32,490)	($31,700)	($30,903)	($30,126)

Scenario Parameters

Demand case	Optimistic
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	2%
Dark fiber subsidy Year 1	$0
Dark fiber subsidy Year 2+	$0
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$47	$97	$121	$123	$126	$139	$153	$169
Total revenue	$47	$97	$121	$123	$126	$139	$153	$169
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$49	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$309	$314	$341	$371	$404
Total operating cost	$598	$786	$881	$892	$901	$951	$1,007	$1,068
Operating Results (000)								
Operating surplus/(deficit)	($551)	($689)	($760)	($769)	($776)	($812)	($853)	($898)
Cumulative operating cash flow	($551)	($1,240)	($2,000)	($2,768)	($3,544)	($7,531)	($11,714)	($16,113)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$1	$1	$1	$1	$1
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$49	$49	$25	$2	$3	$3	$3	$3
Construction services	$1,379	$1,379	$689	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$689	$689	$345	$0	$0	$0	$0	$0
Total	$15,853	$15,853	$7,927	$4	$4	$4	$5	$5
Cumulative capex	$15,853	$31,707	$39,633	$39,637	$39,641	$39,660	$39,682	$39,706
Cash Flow (000)								
User construction contribution	$395	$395	$198	$20	$20	$22	$25	$27
Operating surplus/(deficit)	($551)	($689)	($760)	($769)	($776)	($812)	($853)	($898)
Subsidy	$0	$0	$0	$0	$0	$0	$0	$0
Capital expense	($15,853)	($15,853)	($7,927)	($4)	($4)	($4)	($5)	($5)
Cash flow	($16,009)	($16,147)	($8,489)	($752)	($759)	($794)	($833)	($876)
Cumulative cash flow	($16,009)	($32,156)	($40,645)	($41,398)	($42,157)	($46,056)	($50,143)	($54,436)
Net present value	($15,247)	($29,893)	($37,226)	($37,845)	($38,440)	($41,083)	($43,253)	($45,040)

6. Effect of subsidies – Charts 5.9 through 5.12

Scenario Parameters

Demand case	Base
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$797	$1,593	$1,992	$1,992	$1,992	$1,992	$1,992	$1,992
Total revenue	$797	$1,593	$1,992	$1,992	$1,992	$1,992	$1,992	$1,992
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$33	$66	$82	$82	$82	$82	$82	$82
Administration	$425	$432	$440	$448	$455	$497	$543	$594
Total operating cost	$739	$937	$1,039	$1,051	$1,063	$1,128	$1,200	$1,279
Operating Results (000)								
Operating surplus/(deficit)	$55	$623	$905	$893	$882	$820	$752	$677
Cumulative operating cash flow	$55	$678	$1,583	$2,477	$3,359	$7,586	$11,486	$15,026
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,101	$1,101	$551	$0	$0	$0	$0	$0
Construction services	$1,484	$1,484	$742	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$742	$742	$371	$0	$0	$0	$0	$0
Total	$17,063	$17,063	$8,532	$0	$0	$0	$0	$0
Cumulative capex	$17,063	$34,126	$42,658	$42,658	$42,658	$42,658	$42,658	$42,658
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$0	$0	$0	$0	$0
Operating surplus/(deficit)	$55	$623	$905	$893	$882	$820	$752	$677
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($17,063)	($17,063)	($8,532)	$0	$0	$0	$0	$0
Cash flow	($5,238)	($13,669)	($5,742)	$1,893	$1,882	$1,820	$1,752	$1,677
Cumulative cash flow	($5,238)	($18,907)	($24,649)	($22,755)	($20,873)	($11,646)	($2,746)	$5,794
Net present value	($4,988)	($17,387)	($22,347)	($20,789)	($19,314)	($13,050)	($8,315)	($4,755)

Scenario Parameters

Demand case	Base
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$531	$1,062	$1,328	$1,328	$1,328	$1,328	$1,328	$1,328
Total revenue	$531	$1,062	$1,328	$1,328	$1,328	$1,328	$1,328	$1,328
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$28	$57	$71	$71	$71	$71	$71	$71
Administration	$340	$345	$351	$357	$363	$395	$431	$470
Total operating cost	$649	$841	$940	$950	$960	$1,015	$1,076	$1,144
Operating Results (000)								
Operating surplus/(deficit)	($118)	$210	$369	$359	$349	$297	$239	$175
Cumulative operating cash flow	($118)	$92	$461	$820	$1,169	$2,760	$4,073	$5,078
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$551	$551	$275	$0	$0	$0	$0	$0
Construction services	$1,429	$1,429	$714	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$714	$714	$357	$0	$0	$0	$0	$0
Total	$16,430	$16,430	$8,215	$0	$0	$0	$0	$0
Cumulative capex	$16,430	$32,860	$41,075	$41,075	$41,075	$41,075	$41,075	$41,075
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($118)	$210	$369	$359	$349	$297	$239	$175
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($16,430)	($16,430)	($8,215)	$0	$0	$0	$0	$0
Cash flow	($4,778)	($13,450)	($5,961)	$1,359	$1,349	$1,297	$1,239	$1,175
Cumulative cash flow	($4,778)	($18,227)	($24,188)	($22,829)	($21,480)	($14,889)	($8,576)	($2,571)
Net present value	($4,550)	($16,749)	($21,899)	($20,781)	($19,723)	($15,248)	($11,889)	($9,385)

Scenario Parameters

Demand case	Base
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$215	$430	$537	$537	$537	$537	$537	$537
Total revenue	$215	$430	$537	$537	$537	$537	$537	$537
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$26	$52	$64	$64	$64	$64	$64	$64
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$600	$788	$884	$894	$903	$953	$1,008	$1,069
Operating Results (000)								
Operating surplus/(deficit)	($385)	($359)	($347)	($356)	($366)	($416)	($471)	($531)
Cumulative operating cash flow	($385)	($743)	($1,090)	($1,447)	($1,812)	($3,788)	($6,029)	($8,562)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$223	$223	$111	$0	$0	$0	$0	$0
Construction services	$1,396	$1,396	$698	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$698	$698	$349	$0	$0	$0	$0	$0
Total	$16,053	$16,053	$8,027	$0	$0	$0	$0	$0
Cumulative capex	$16,053	$32,106	$40,133	$40,133	$40,133	$40,133	$40,133	$40,133
Cash Flow (000)								
User construction contribution	$1,075	$1,075	$537	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($385)	($359)	($347)	($356)	($366)	($416)	($471)	($531)
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($16,053)	($16,053)	($8,027)	$0	$0	$0	$0	$0
Cash flow	($5,363)	($14,337)	($6,836)	$644	$634	$584	$529	$469
Cumulative cash flow	($5,363)	($19,700)	($26,536)	($25,892)	($25,258)	($22,234)	($19,474)	($17,008)
Net present value	($5,108)	($18,111)	($24,017)	($23,487)	($22,990)	($20,935)	($19,465)	($18,435)

Scenario Parameters

Demand case	Base
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$25	$51	$63	$63	$63	$63	$63	$63
Total revenue	$25	$51	$63	$63	$63	$63	$63	$63
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$48	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$598	$785	$880	$890	$899	$949	$1,004	$1,065
Operating Results (000)								
Operating surplus/(deficit)	($573)	($735)	($817)	($826)	($836)	($886)	($941)	($1,002)
Cumulative operating cash flow	($573)	($1,308)	($2,125)	($2,951)	($3,787)	($8,114)	($12,707)	($17,591)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$26	$26	$13	$0	$0	$0	$0	$0
Construction services	$1,376	$1,376	$688	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0
Total	$15,827	$15,827	$7,913	$0	$0	$0	$0	$0
Cumulative capex	$15,827	$31,654	$39,567	$39,567	$39,567	$39,567	$39,567	$39,567
Cash Flow (000)								
User construction contribution	$211	$211	$105	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($573)	($735)	($817)	($826)	($836)	($886)	($941)	($1,002)
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($15,827)	($15,827)	($7,913)	$0	$0	$0	$0	$0
Cash flow	($6,189)	($15,351)	($7,625)	$174	$164	$114	$59	($2)
Cumulative cash flow	($6,189)	($21,540)	($29,165)	($28,992)	($28,828)	($28,155)	($27,747)	($27,632)
Net present value	($5,894)	($19,818)	($26,405)	($26,263)	($26,134)	($25,674)	($25,454)	($25,404)

Scenario Parameters

Demand case	Base
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$797	$1,673	$2,091	$2,196	$2,306	$2,943	$3,756	$4,793
Total revenue	$797	$1,673	$2,091	$2,196	$2,306	$2,943	$3,756	$4,793
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$33	$66	$82	$82	$82	$82	$82	$82
Administration	$425	$432	$440	$453	$460	$502	$549	$600
Total operating cost	$739	$937	$1,039	$1,056	$1,069	$1,134	$1,205	$1,285
Operating Results (000)								
Operating surplus/(deficit)	$55	$699	$999	$1,083	$1,175	$1,719	$2,423	$3,333
Cumulative operating cash flow	$55	$754	$1,754	$2,836	$4,011	$11,461	$22,094	$36,846
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$50	$53	$67	$86	$109
Nodes	$2,732	$2,732	$1,366	$8	$8	$11	$14	$17
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,101	$1,101	$551	$138	$145	$184	$235	$300
Construction services	$1,484	$1,484	$742	$4	$5	$6	$7	$9
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$742	$742	$371	$2	$2	$3	$4	$5
Total	$17,063	$17,063	$8,532	$202	$213	$271	$346	$442
Cumulative capex	$17,063	$34,126	$42,658	$42,860	$43,073	$44,306	$45,880	$47,888
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$221	$232	$297	$379	$483
Operating surplus/(deficit)	$55	$699	$999	$1,083	$1,175	$1,719	$2,423	$3,333
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($17,063)	($17,063)	($8,532)	($202)	($213)	($271)	($346)	($442)
Cash flow	($5,238)	($13,594)	($5,647)	$2,102	$2,195	$2,744	$3,455	$4,374
Cumulative cash flow	($5,238)	($18,831)	($24,478)	($22,377)	($20,182)	($7,617)	$8,163	$28,102
Net present value	($4,988)	($17,318)	($22,196)	($20,467)	($18,747)	($10,260)	($1,909)	$6,357

Scenario Parameters

Demand case	Base
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$531	$1,115	$1,394	$1,464	$1,537	$1,962	$2,504	$3,196
Total revenue	$531	$1,115	$1,394	$1,464	$1,537	$1,962	$2,504	$3,196
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$28	$57	$71	$71	$71	$71	$71	$71
Administration	$340	$345	$351	$362	$368	$400	$436	$475
Total operating cost	$649	$841	$940	$954	$965	$1,020	$1,081	$1,149
Operating Results (000)								
Operating surplus/(deficit)	($118)	$260	$432	$484	$544	$895	$1,351	$1,944
Cumulative operating cash flow	($118)	$142	$574	$1,058	$1,602	$5,336	$11,131	$19,604
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$25	$26	$34	$43	$55
Nodes	$2,732	$2,732	$1,366	$4	$4	$6	$7	$9
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$551	$551	$275	$69	$72	$92	$118	$150
Construction services	$1,429	$1,429	$714	$2	$2	$3	$4	$5
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$714	$714	$357	$1	$1	$1	$2	$2
Total	$16,430	$16,430	$8,215	$101	$106	$136	$173	$221
Cumulative capex	$16,430	$32,860	$41,075	$41,176	$41,283	$41,900	$42,688	$43,694
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$221	$232	$297	$379	$483
Operating surplus/(deficit)	($118)	$260	$432	$484	$544	$895	$1,351	$1,944
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($16,430)	($16,430)	($8,215)	($101)	($106)	($136)	($173)	($221)
Cash flow	($4,778)	($13,399)	($5,898)	$1,604	$1,670	$2,055	$2,556	$3,206
Cumulative cash flow	($4,778)	($18,177)	($24,075)	($22,471)	($20,801)	($11,337)	$391	$15,055
Net present value	($4,550)	($16,704)	($21,799)	($20,479)	($19,171)	($12,776)	($6,568)	($487)

Scenario Parameters

Demand case	Base
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$215	$451	$564	$593	$622	$794	$1,013	$1,293
Total revenue	$215	$451	$564	$593	$622	$794	$1,013	$1,293
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$26	$52	$64	$64	$64	$64	$64	$64
Administration	$293	$298	$303	$312	$317	$344	$374	$407
Total operating cost	$600	$788	$884	$898	$907	$958	$1,013	$1,074
Operating Results (000)								
Operating surplus/(deficit)	($385)	($337)	($320)	($305)	($285)	($163)	$1	$208
Cumulative operating cash flow	($385)	($722)	($1,042)	($1,347)	($1,632)	($2,708)	($3,052)	($2,450)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$10	$11	$14	$17	$22
Nodes	$2,732	$2,732	$1,366	$2	$2	$2	$3	$4
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$223	$223	$111	$28	$29	$37	$48	$61
Construction services	$1,396	$1,396	$698	$1	$1	$1	$2	$2
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$698	$698	$349	$0	$0	$1	$1	$1
Total	$16,053	$16,053	$8,027	$41	$43	$55	$70	$90
Cumulative capex	$16,053	$32,106	$40,133	$40,174	$40,217	$40,467	$40,787	$41,194
Cash Flow (000)								
User construction contribution	$1,075	$1,075	$537	$134	$141	$180	$230	$293
Operating surplus/(deficit)	($385)	($337)	($320)	($305)	($285)	($163)	$1	$208
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($16,053)	($16,053)	($8,027)	($41)	($43)	($55)	($70)	($90)
Cash flow	($5,363)	($14,315)	($6,809)	$788	$813	$962	$1,160	$1,412
Cumulative cash flow	($5,363)	($19,678)	($26,488)	($25,700)	($24,887)	($20,394)	($15,013)	($8,484)
Net present value	($5,108)	($18,092)	($23,974)	($23,326)	($22,689)	($19,651)	($16,801)	($14,092)

Scenario Parameters

Demand case	Base
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$10,000,000
Dark fiber subsidy Year 2+	$1,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$25	$53	$66	$70	$73	$93	$119	$152
Total revenue	$25	$53	$66	$70	$73	$93	$119	$152
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$48	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$312	$317	$344	$374	$407
Total operating cost	$598	$785	$880	$894	$903	$954	$1,009	$1,070
Operating Results (000)								
Operating surplus/(deficit)	($573)	($732)	($814)	($824)	($830)	($860)	($890)	($918)
Cumulative operating cash flow	($573)	($1,305)	($2,119)	($2,943)	($3,774)	($8,014)	($12,404)	($16,938)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$1	$1	$2	$2	$3
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$26	$26	$13	$3	$3	$4	$6	$7
Construction services	$1,376	$1,376	$688	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0
Total	$15,827	$15,827	$7,913	$5	$5	$6	$8	$11
Cumulative capex	$15,827	$31,654	$39,567	$39,572	$39,577	$39,607	$39,644	$39,692
Cash Flow (000)								
User construction contribution	$211	$211	$105	$26	$28	$35	$45	$58
Operating surplus/(deficit)	($573)	($732)	($814)	($824)	($830)	($860)	($890)	($918)
Subsidy	$10,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Capital expense	($15,827)	($15,827)	($7,913)	($5)	($5)	($6)	($8)	($11)
Cash flow	($6,189)	($15,348)	($7,622)	$197	$192	$169	$147	$129
Cumulative cash flow	($6,189)	($21,538)	($29,160)	($28,963)	($28,770)	($27,880)	($27,102)	($26,423)
Net present value	($5,894)	($19,816)	($26,400)	($26,238)	($26,087)	($25,482)	($25,067)	($24,783)

Scenario Parameters

Demand case	Base
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$797	$1,593	$1,992	$1,992	$1,992	$1,992	$1,992	$1,992
Total revenue	$797	$1,593	$1,992	$1,992	$1,992	$1,992	$1,992	$1,992
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$33	$66	$82	$82	$82	$82	$82	$82
Administration	$425	$432	$440	$448	$455	$497	$543	$594
Total operating cost	$739	$937	$1,039	$1,051	$1,063	$1,128	$1,200	$1,279
Operating Results (000)								
Operating surplus/(deficit)	$55	$623	$905	$893	$882	$820	$752	$677
Cumulative operating cash flow	$55	$678	$1,583	$2,477	$3,359	$7,586	$11,486	$15,026
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,101	$1,101	$551	$0	$0	$0	$0	$0
Construction services	$1,484	$1,484	$742	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$742	$742	$371	$0	$0	$0	$0	$0
Total	$17,063	$17,063	$8,532	$0	$0	$0	$0	$0
Cumulative capex	$17,063	$34,126	$42,658	$42,658	$42,658	$42,658	$42,658	$42,658
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$0	$0	$0	$0	$0
Operating surplus/(deficit)	$55	$623	$905	$893	$882	$820	$752	$677
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($17,063)	($17,063)	($8,532)	$0	$0	$0	$0	$0
Cash flow	($3,238)	($12,669)	($4,742)	$2,893	$2,882	$2,820	$2,752	$2,677
Cumulative cash flow	($3,238)	($15,907)	($20,649)	($17,755)	($14,873)	($646)	$13,254	$26,794
Net present value	($3,084)	($14,575)	($18,671)	($16,291)	($14,033)	($4,376)	$3,017	$8,659

Scenario Parameters

Demand case	Base
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$531	$1,062	$1,328	$1,328	$1,328	$1,328	$1,328	$1,328
Total revenue	$531	$1,062	$1,328	$1,328	$1,328	$1,328	$1,328	$1,328
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$28	$57	$71	$71	$71	$71	$71	$71
Administration	$340	$345	$351	$357	$363	$395	$431	$470
Total operating cost	$649	$841	$940	$950	$960	$1,015	$1,076	$1,144
Operating Results (000)								
Operating surplus/(deficit)	($118)	$210	$369	$359	$349	$297	$239	$175
Cumulative operating cash flow	($118)	$92	$461	$820	$1,169	$2,760	$4,073	$5,078
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$551	$551	$275	$0	$0	$0	$0	$0
Construction services	$1,429	$1,429	$714	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$714	$714	$357	$0	$0	$0	$0	$0
Total	$16,430	$16,430	$8,215	$0	$0	$0	$0	$0
Cumulative capex	$16,430	$32,860	$41,075	$41,075	$41,075	$41,075	$41,075	$41,075
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($118)	$210	$369	$359	$349	$297	$239	$175
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($16,430)	($16,430)	($8,215)	$0	$0	$0	$0	$0
Cash flow	($2,778)	($12,450)	($4,961)	$2,359	$2,349	$2,297	$2,239	$2,175
Cumulative cash flow	($2,778)	($15,227)	($20,188)	($17,829)	($15,480)	($3,889)	$7,424	$18,429
Net present value	($2,645)	($13,938)	($18,223)	($16,282)	($14,442)	($6,574)	($557)	$4,029

Scenario Parameters

Demand case	Base
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$215	$430	$537	$537	$537	$537	$537	$537
Total revenue	$215	$430	$537	$537	$537	$537	$537	$537
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$26	$52	$64	$64	$64	$64	$64	$64
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$600	$788	$884	$894	$903	$953	$1,008	$1,069
Operating Results (000)								
Operating surplus/(deficit)	($385)	($359)	($347)	($356)	($366)	($416)	($471)	($531)
Cumulative operating cash flow	($385)	($743)	($1,090)	($1,447)	($1,812)	($3,788)	($6,029)	($8,562)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$223	$223	$111	$0	$0	$0	$0	$0
Construction services	$1,396	$1,396	$698	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$698	$698	$349	$0	$0	$0	$0	$0
Total	$16,053	$16,053	$8,027	$0	$0	$0	$0	$0
Cumulative capex	$16,053	$32,106	$40,133	$40,133	$40,133	$40,133	$40,133	$40,133
Cash Flow (000)								
User construction contribution	$1,075	$1,075	$537	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($385)	($359)	($347)	($356)	($366)	($416)	($471)	($531)
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($16,053)	($16,053)	($8,027)	$0	$0	$0	$0	$0
Cash flow	($3,363)	($13,337)	($5,836)	$1,644	$1,634	$1,584	$1,529	$1,469
Cumulative cash flow	($3,363)	($16,700)	($22,536)	($20,892)	($19,258)	($11,234)	($3,474)	$3,992
Net present value	($3,203)	($15,300)	($20,341)	($18,989)	($17,708)	($12,261)	($8,133)	($5,021)

Scenario Parameters

Demand case	Base
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	0%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$25	$51	$63	$63	$63	$63	$63	$63
Total revenue	$25	$51	$63	$63	$63	$63	$63	$63
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$48	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$308	$313	$339	$369	$402
Total operating cost	$598	$785	$880	$890	$899	$949	$1,004	$1,065
Operating Results (000)								
Operating surplus/(deficit)	($573)	($735)	($817)	($826)	($836)	($886)	($941)	($1,002)
Cumulative operating cash flow	($573)	($1,308)	($2,125)	($2,951)	($3,787)	($8,114)	($12,707)	($17,591)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$0	$0	$0	$0	$0
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$26	$26	$13	$0	$0	$0	$0	$0
Construction services	$1,376	$1,376	$688	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0
Total	$15,827	$15,827	$7,913	$0	$0	$0	$0	$0
Cumulative capex	$15,827	$31,654	$39,567	$39,567	$39,567	$39,567	$39,567	$39,567
Cash Flow (000)								
User construction contribution	$211	$211	$105	$0	$0	$0	$0	$0
Operating surplus/(deficit)	($573)	($735)	($817)	($826)	($836)	($886)	($941)	($1,002)
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($15,827)	($15,827)	($7,913)	$0	$0	$0	$0	$0
Cash flow	($4,189)	($14,351)	($6,625)	$1,174	$1,164	$1,114	$1,059	$998
Cumulative cash flow	($4,189)	($18,540)	($25,165)	($23,992)	($22,828)	($17,155)	($11,747)	($6,632)
Net present value	($3,990)	($17,006)	($22,730)	($21,764)	($20,852)	($17,000)	($14,122)	($11,989)

Scenario Parameters

Demand case	Base
User construction contribution	$1,000
Monthly cost	$75
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$797	$1,673	$2,091	$2,196	$2,306	$2,943	$3,756	$4,793
Total revenue	$797	$1,673	$2,091	$2,196	$2,306	$2,943	$3,756	$4,793
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$33	$66	$82	$82	$82	$82	$82	$82
Administration	$425	$432	$440	$453	$460	$502	$549	$600
Total operating cost	$739	$937	$1,039	$1,056	$1,069	$1,134	$1,205	$1,285
Operating Results (000)								
Operating surplus/(deficit)	$55	$699	$999	$1,083	$1,175	$1,719	$2,423	$3,333
Cumulative operating cash flow	$55	$754	$1,754	$2,836	$4,011	$11,461	$22,094	$36,846
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$50	$53	$67	$86	$109
Nodes	$2,732	$2,732	$1,366	$8	$8	$11	$14	$17
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$1,101	$1,101	$551	$138	$145	$184	$235	$300
Construction services	$1,484	$1,484	$742	$4	$5	$6	$7	$9
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$742	$742	$371	$2	$2	$3	$4	$5
Total	$17,063	$17,063	$8,532	$202	$213	$271	$346	$442
Cumulative capex	$17,063	$34,126	$42,658	$42,860	$43,073	$44,306	$45,880	$47,888
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$221	$232	$297	$379	$483
Operating surplus/(deficit)	$55	$699	$999	$1,083	$1,175	$1,719	$2,423	$3,333
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($17,063)	($17,063)	($8,532)	($202)	($213)	($271)	($346)	($442)
Cash flow	($3,238)	($12,594)	($4,647)	$3,102	$3,195	$3,744	$4,455	$5,374
Cumulative cash flow	($3,238)	($15,831)	($20,478)	($17,377)	($14,182)	$3,383	$24,163	$49,102
Net present value	($3,084)	($14,506)	($18,521)	($15,969)	($13,466)	($1,586)	$9,423	$19,772

Scenario Parameters

Demand case	Base
User construction contribution	$2,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$531	$1,115	$1,394	$1,464	$1,537	$1,962	$2,504	$3,196
Total revenue	$531	$1,115	$1,394	$1,464	$1,537	$1,962	$2,504	$3,196
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$28	$57	$71	$71	$71	$71	$71	$71
Administration	$340	$345	$351	$362	$368	$400	$436	$475
Total operating cost	$649	$841	$940	$954	$965	$1,020	$1,081	$1,149
Operating Results (000)								
Operating surplus/(deficit)	($118)	$260	$432	$484	$544	$895	$1,351	$1,944
Cumulative operating cash flow	($118)	$142	$574	$1,058	$1,602	$5,336	$11,131	$19,604
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$25	$26	$34	$43	$55
Nodes	$2,732	$2,732	$1,366	$4	$4	$6	$7	$9
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$551	$551	$275	$69	$72	$92	$118	$150
Construction services	$1,429	$1,429	$714	$2	$2	$3	$4	$5
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$714	$714	$357	$1	$1	$1	$2	$2
Total	$16,430	$16,430	$8,215	$101	$106	$136	$173	$221
Cumulative capex	$16,430	$32,860	$41,075	$41,176	$41,283	$41,900	$42,688	$43,694
Cash Flow (000)								
User construction contribution	$1,770	$1,770	$885	$221	$232	$297	$379	$483
Operating surplus/(deficit)	($118)	$260	$432	$484	$544	$895	$1,351	$1,944
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($16,430)	($16,430)	($8,215)	($101)	($106)	($136)	($173)	($221)
Cash flow	($2,778)	($12,399)	($4,898)	$2,604	$2,670	$3,055	$3,556	$4,206
Cumulative cash flow	($2,778)	($15,177)	($20,075)	($17,471)	($14,801)	($337)	$16,391	$36,055
Net present value	($2,645)	($13,892)	($18,123)	($15,981)	($13,889)	($4,101)	$4,764	$12,927

Scenario Parameters

Demand case	Base
User construction contribution	$3,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$215	$451	$564	$593	$622	$794	$1,013	$1,293
Total revenue	$215	$451	$564	$593	$622	$794	$1,013	$1,293
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$26	$52	$64	$64	$64	$64	$64	$64
Administration	$293	$298	$303	$312	$317	$344	$374	$407
Total operating cost	$600	$788	$884	$898	$907	$958	$1,013	$1,074
Operating Results (000)								
Operating surplus/(deficit)	($385)	($337)	($320)	($305)	($285)	($163)	$1	$208
Cumulative operating cash flow	($385)	($722)	($1,042)	($1,347)	($1,632)	($2,708)	($3,052)	($2,450)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$10	$11	$14	$17	$22
Nodes	$2,732	$2,732	$1,366	$2	$2	$2	$3	$4
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$223	$223	$111	$28	$29	$37	$48	$61
Construction services	$1,396	$1,396	$698	$1	$1	$1	$2	$2
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$698	$698	$349	$0	$0	$1	$1	$1
Total	$16,053	$16,053	$8,027	$41	$43	$55	$70	$90
Cumulative capex	$16,053	$32,106	$40,133	$40,174	$40,217	$40,467	$40,787	$41,194
Cash Flow (000)								
User construction contribution	$1,075	$1,075	$537	$134	$141	$180	$230	$293
Operating surplus/(deficit)	($385)	($337)	($320)	($305)	($285)	($163)	$1	$208
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($16,053)	($16,053)	($8,027)	($41)	($43)	($55)	($70)	($90)
Cash flow	($3,363)	($13,315)	($5,809)	$1,788	$1,813	$1,962	$2,160	$2,412
Cumulative cash flow	($3,363)	($16,678)	($22,488)	($20,700)	($18,887)	($9,394)	$987	$12,516
Net present value	($3,203)	($15,280)	($20,298)	($18,828)	($17,407)	($10,977)	($5,469)	($678)

Scenario Parameters

Demand case	Base
User construction contribution	$5,000
Monthly cost	$100
Annual subscriber growth rate	5%
Dark fiber subsidy Year 1	$12,000,000
Dark fiber subsidy Year 2+	$2,000,000
Subscriber density factor	15%

Scenario Pro Forma

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Revenue (000)								
Monthly CPAU connect charge	$25	$53	$66	$70	$73	$93	$119	$152
Total revenue	$25	$53	$66	$70	$73	$93	$119	$152
Operating Expense (000)								
Fiber plant	$73	$146	$182	$182	$182	$182	$182	$182
Network	$208	$294	$335	$340	$344	$367	$393	$421
Operations	$24	$48	$61	$61	$61	$61	$61	$61
Administration	$293	$298	$303	$312	$317	$344	$374	$407
Total operating cost	$598	$785	$880	$894	$903	$954	$1,009	$1,070
Operating Results (000)								
Operating surplus/(deficit)	($573)	($732)	($814)	($824)	($830)	($860)	($890)	($918)
Cumulative operating cash flow	($573)	($1,305)	($2,119)	($2,943)	($3,774)	($8,014)	($12,404)	($16,938)
Capital Expense (000)								
Fiber optic cable installation	$10,948	$10,948	$5,474	$1	$1	$2	$2	$3
Nodes	$2,732	$2,732	$1,366	$0	$0	$0	$0	$0
Inside plant	$56	$56	$28	$0	$0	$0	$0	$0
Drops and CPE	$26	$26	$13	$3	$3	$4	$6	$7
Construction services	$1,376	$1,376	$688	$0	$0	$0	$0	$0
Environmental & right of way	$0	$0	$0	$0	$0	$0	$0	$0
Indirect costs	$688	$688	$344	$0	$0	$0	$0	$0
Total	$15,827	$15,827	$7,913	$5	$5	$6	$8	$11
Cumulative capex	$15,827	$31,654	$39,567	$39,572	$39,577	$39,607	$39,644	$39,692
Cash Flow (000)								
User construction contribution	$211	$211	$105	$26	$28	$35	$45	$58
Operating surplus/(deficit)	($573)	($732)	($814)	($824)	($830)	($860)	($890)	($918)
Subsidy	$12,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Capital expense	($15,827)	($15,827)	($7,913)	($5)	($5)	($6)	($8)	($11)
Cash flow	($4,189)	($14,348)	($6,622)	$1,197	$1,192	$1,169	$1,147	$1,129
Cumulative cash flow	($4,189)	($18,538)	($25,160)	($23,963)	($22,770)	($16,880)	($11,102)	($5,423)
Net present value	($3,990)	($17,004)	($22,725)	($21,740)	($20,805)	($16,808)	($13,735)	($11,369)

City of Palo Alto
Office of the City Manager

March 19, 2012

Ms. Cathy Mak
Co-Chief Business Officer
Palo Alto Unified School District
25 Churchill Avenue
Palo Alto, CA 94306

Re: Dark Fiber Services

Dear Ms. Mak:

The City of Palo Alto (the "City") and the Palo Alto Unified School District (the "District") wish to enter into an agreement (or modify an existing agreement) to extend the City's dark optical fiber backbone system (the "System"), and provide dark fiber services (the "Services"), to eighteen (18) of the District's building facilities (the "Project").

The Project will cover the District's business office, fifteen Palo Alto-based schools, and two schools located on the Stanford campus, the Escondido and Nixon Schools, which will be interconnected to the System. Services will be rendered directly to 16 of the 18 facilities and to an interconnect point on the System at the City's jurisdictional boundary with Stanford, which will facilitate Services to the Escondido and Nixon Schools. The proposed date of completion of the Project is on or after July 1, 2013.

The District currently licenses the System's dark fibers, which facilitates Services to the Terman School under a Dark Optical Fiber Backbone License Agreement (the "License Agreement"), executed on December 16, 2010. The District is interested in interconnecting the Project and the Terman School, so that a total of 19 of the District's building facilities are interconnected. An amendment to the License Agreement or a new License Agreement will cover the Project and Terman School on mutually acceptable terms and conditions, as follows:

1. Payment of Project and related costs. The District has paid the City an advance engineering fee in the amount of $13,194 to complete a network design and arrive at a final one-time interconnection fee (i.e. installation). The City has provided the District with a preliminary cost estimate of $424,716 for the one-time interconnection fee for dark fiber service at the District business office and connectivity to seventeen (17) schools. The District has requested a design that includes a hub at the District business office and connection to the Palo Alto Internet Exchange. The actual cost for the interconnection fee will be determined after the advance engineering work is completed and a final design is submitted for acceptance by the District. It is anticipated the advance engineering work and design will be completed in four to six months. The City

P.O. Box 10250
Palo Alto, CA 94303
650.329.2563
650.325.5025 fax

has agreed in principle to bear one-half of the interconnection fee at its own cost and expense, and the District shall reimburse the City for the other one-half of such fee in 120 monthly payments over a ten year period.

2. License Fees. The District will pay one hundred percent (100%) of the total base monthly fee at the then Public Agency Rate determined under Utility Rate Schedule EDF-3. The total base monthly licensee fee is estimated to be $8,187. This monthly cost estimate includes the existing dark fiber service connection at Terman. Actual fees will be based on the final network configuration and will be in accordance with the rate schedule in effect at the time of completion. No monthly license fee payments for Services rendered will be due until the System's connections are installed and are made available for the District's use.

3. Term: The original term of a new License Agreement will be five (5) years. An Amendment to the License Agreement will shorten the current ten-year term to five years. The original five-year term may be extended for one additional five-year term. If the District does not wish to extend the applicable agreement for the second five-year term, then the District's obligation to make payment of the unpaid portion of the interconnection fee will be accelerated to coincide with the expiration date of the original five-year term.

4. Improvements at the Stanford campus. All capital improvement work to be performed on the Stanford campus in order to facilitate Services to the Escondido and Nixon Schools shall be performed or caused to be performed by the District.

5. E-rate funding. The District will assume the sole responsibility for applying for and securing E-rate funding for the Project. The City's Service Provider Identification Number ("SPIN") is 143035172.

6. Necessary Approvals. The amended License Agreement or a new License Agreement will be subject to the approval of the City Council and approval as to form by the City Attorney.

This letter is not intended to be a binding contract between the parties with respect to the Project. It is intended to facilitate discussion of the Project and is only an expression of the basis on which the parties would amend the License Agreement or execute a new License Agreement regarding the Project and the rights and obligations of the parties.

The City requests execution of this letter of intent below in order that the City may proceed to draft an amendment to the existing License Agreement or a new License Agreement concerning the Project for the District's consideration.

Sincerely,

CITY OF PALO ALTO

James Keene
City Manager

The Palo Alto Unified School District hereby agrees in concept to the general terms of a License Agreement as set forth above, subject to preparation of such an agreement and concurrence with its specific terms, and further subject to Board of Education approval of such an agreement once completed.

PALO ALTO UNIFIED SCHOOL DISTRICT

By:
Title: chief Business officer

cc: Kevin Skelly
Ann Dunkin
Valerie Fong
Grant Kolling