Draft

Financial Feasibility of Building and Operating a Fiber Network in the City of Seattle

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Executive Summary

CCG Consulting, LLC was hired to undertake a financial feasibility study of the various options of building and operating a fiber network throughout the City of Seattle. In order to create the needed financial studies, CCG undertook several tasks:

- Investigation of market rates
- A survey to understand residential demand
- An engineering study to understand the cost of building a fiber network
- An analysis of other costs or providing service.

CCG looked at two different operational models: a retail network where one party would build the network and provide retail services, and a wholesale network, where the City would build the network and multiple other service providers would sell retail services to customers.

The report below explains the process used to create the studies and lists the key assumptions we made for prices, costs and customer penetration rates.

Some key findings of our study:

- A single retail provider can be successful in Seattle. Such a provider could finance, build and operate a fiber network profitably. If the City or a non-profit company was the retail provider they could give a 20% discount over today's market prices and still break even with a 24% market penetration. A commercial firm probably needs a 30% penetration to be successful. Higher penetration rates would generate significantly higher profits and more cash.
- The City could be successful with a wholesale model. In this model the City would build the network and sell access to the network to large service providers. A wholesale model would achieve breakeven at around a 30% market penetration of retail customers. However, it is essential that the retailers sell significant numbers of customers in the first few years or the wholesale business would run out of cash. Thus, the wholesale model carries a large amount of risk.
- There is much promise in a hybrid model. Under this concept, the City or a non-profit business would build the network with bond financing and would be the only retail provider for 5 to 7 years until the network had enough customers to insure the ability to repay the bonds. At that point, the network would be opened to multiple competitive service providers who would bring innovation and additional competition.
- The cost of creating a wholesale or retail business will require financing of over $400M. It costs nearly as much to create a wholesale business as it does a retail business.
- Over 60% of households said they would buy telephone, cable TV and data services from a City-sponsored fiber network if it offered lower prices.

CCG makes the following recommendations.

First, the best outcome for the City would be if a commercial retail provider showed up, made the investment to build the fiber network and offered a full array of services over the network. No such player emerged during the RFI process. However, now that we have financial results that we can share with providers it might be worth a second attempt. The City should consider issuing an RFP that would include the results of the financial analysis. This analysis shows that a commercial provider could make an acceptable profit in the City.

Second, a retail model where the City is the retail provider looks to be the best way to guarantee that there will be sufficient revenues generated to make bond payments. However, an open access wholesale network looks to be the best long-run network for the City since multiple service providers will maximize innovation and competition. Thus, CCG recommends the hybrid approach. The City should build the fiber network. The City, or a non-profit corporation created by the City, ought to be the sole retail provider for a period of 5 to 7 years until such time that the network has sufficient revenues to guarantee bond payments. At this point the network should be opened up to multiple providers as an open access network. The City business would continue and would compete for customers, but with a host of new retail providers.

Today there are no strong retail players ready to step in and serve customers on the fiber network. If the City were to start a wholesale model with the wrong retail partners it could be a financial disaster. There is very little cost for a retail provider to walk away from the network, but the City must make bond payments, even under a standalone financing, or face a lot of political pressure. In a hybrid model, if the City stays in the business as a retail provider it can still pursue the various social goals such as economic development and solving the digital divide. Any commercial network is unlikely to seriously pursue these sorts of goals.

Purpose of Feasibility Study

The financial feasibility was undertaken for several reasons. First, it was important to more closely define the cost of the physical fiber network. During the RFI process the City heard widely differing estimates of the cost of building the network. Second, the study was undertaken in order to understand the financial feasibility of various operating models. The focus was primarily upon a retail and wholesale network. A retail model is one where one primary provider would build and operate the network as the sole provider. An example of a retail network would be the Verizon FiOS network. A wholesale network is one where the City would build the network and then lease capacity multiple retail providers on the network. Understanding profitability of these two options is essential to understanding the potential for getting a network built in Seattle. If a commercial provider is to build and operate a network in Seattle they will have specific profitability goals that must be met. If the City is to operate the fiber network you also would want profitability, but the City defines profitability differently than commercial

entities. A City generally defines profitability as the ability to make bond payments, support future capital requirements and to retain enough cash to be self-supporting. The feasibility report helps us look at these two different definitions of profitability.

Methodology

CCG Consulting undertook the feasibility study in the following manner.

CCG performed a high-level engineering study to determine the cost of building a fiber network in Seattle. CCG's engineer visited Seattle and met with both City, and Power Light employees. Since the City has already built a significant amount of fiber the goal was to rely on the cost actual experience of the City in building fiber. From the City we were able to determine current market construction costs for various types of fiber, both aerial and underground. Additionally, the CCG engineer undertook a network design that will be described in more detail below.

CCG's engineer worked with the City to understand the physical needs of the network. The City helped to quantify the number of miles of fiber that needed to be constructed. Further, the City already had a very good estimate of how much existing utilities lines in the City use underground versus aerial cable on poles.

CCG also worked with the City to help quantify the number of households and businesses in the City today, along with the expected growth rate for the future.

CCG undertook an analysis of current market prices for telecommunications services. CCG studied the prices charged today by the incumbents, Qwest and Comcast. We also looked at prices for several CLECs (Competitive Local Exchange Carriers) who offer competitive voice products in the market. A small portion of Seattle is served by a second cable company, Millenium, but prices in the study are based upon Comcast prices, since they are the dominant CATV provider.

CCG then made estimates of costs based upon their experience. CCG consults to over 350 communications entities that operate voice, broadband or cable TV businesses. CCG has created hundreds of financial business plans. We used this experience to estimate the operating costs for the study. These assumptions are described in more detail below.

Network Costs

Derrel Duplechin, the CCG Director of Engineering undertook a high-level engineering study to estimate the cost of building a fiber network in the City. The study is considered high-level since it relies on market estimations and metrics in order to estimate the cost of the network. For example, an estimate was made of total number of route miles to be constructed and total construction cost was then determined by multiplying the estimated miles times current construction costs. If Seattle wants to construct such a network, one

of the first steps will be to perform detailed engineering where engineers would walk every street in town to determine exact construction parameters and exact quantities of required fiber. However, such detailed engineering is time-consuming and very expensive and generally is not done until there is a financial commitment to build the network. In CCG's experience, high-level engineering allows for a reasonable estimate of construction costs, and if assumptions are kept conservative, a high-level estimate should be on the high side.

Working with the City

CCG met with employees of the City and of Power Light to discuss the characteristics of building fiber in the City. Both entities have constructed significant fiber and have experience with local contractors and experience with local Seattle construction conditions. The primary focus of the CCG meetings was to determine the number of street miles needing various types of construction (aerial versus underground), and current constructions costs in the City. Construction costs vary widely by geography and local conditions and the cost to build a fiber in Seattle might be very different than the cost of building in other similar cities. Thus, it was essential to understand actual recent fiber construction projects undertaken by the City.

Basic Network Design

After investigating construction costs, the next step was to develop a basic network design. CCG decided to design the network as a Passive Optical Network (PON). There is one other technological option referred to as an Active Optical Network (AON). CCG chose a PON network because it is the primary type of municipal network being designed today. However, from a cost perspective, both types of networks have similar costs, so our estimate could be used interchangeably for both technologies. It is not necessary to select the specific type of electronics at this early in the process.

CCG determined that the most logical way to design the network is to subdivide the City into sectors. Currently Power Light has divided their electric network into eleven sectors called substations, and we decided to use the existing electric substations as the basis for designing the fiber network. This design concept has proved popular in other cities, because the existing pole and conduit systems generally originate and propagate from the substations, thus making them a natural place to start building a fiber network. However, if detailed engineering is ever performed, it might be even more cost effective with a fewer sectors.

In each sector the network would begin with a hub site that consists of a small building that houses electronics and terminates the fiber. Fiber would initiate at each of these hub sites and would follow the existing utility practices throughout the City – underground where other utilities are underground, and on poles where existing utilities are on poles. It would be convenient if the hub sites could be located with the existing electric substations. These locations already have security and backup power. However, if that

can’t be worked out, the hub sites could be located somewhere near the electric substations.

In addition to the eleven hub sites, the network would have one core hub where key electronics would be housed. This hub is referred to in a network as the headend. The headend could be anywhere in the City along the primary fiber route. In the retail model the headend would house the equipment needed to provide voice, video and data. In the wholesale model it would be the point of interface between the retail providers and the wholesale network operator.

The eleven hub sites and the headend would be connected by a two-way fiber ring. Such a ring architecture insures that no hub can be isolated if there is a fiber cut. Today City Light maintains a fiber ring that already connects the substations. After meeting with City Light it was determined that the core ring for the fiber network could probably be leased from City Light, eliminating a need for new construction of the core network. The fiber network probably needs no more than 6 or 8 fiber pairs on the existing core fiber ring.

In a PON network, all key active electronics are housed in a location referred to as a headend. The hub sites contain electronics used to light the core ring. The hub sites also would contain splitters. Splitters are physical devices that allow one fiber pair to be subdivided to feed multiple fibers. The use of splitters is the key design mechanism in a PON network that enables having a fiber for every home and business in town.

Feeder fibers would be constructed into neighborhoods starting at the eleven hub sites. These feeder fibers would be used to carry the signal deep into each neighborhood. Each feeder fiber can serve between 16 and 32 homes or businesses, depending upon the vendor selected. The CCG network design created enough feeder fibers to be able to serve every home and business in the City. A more conservative design might have assumed a 50% take rate of customers and only designed a fiber for half of the homes and businesses.

Customers are served from the feeder fibers by the use of fiber drop wires and fiber electronics installed for each customer. Fiber drops would follow existing utility practices and would be aerial where other utilities use aerial drops and underground where other utilities use underground drops. The electronics at each customer is referred to as an ONT (Optical Network Terminal). The ONT is housed in a small box that is usually put on the outside of each customer location. There are different types of ONTs depending upon the type of customer. The smallest ONT is designed to serve residential customers and small businesses. There are larger ONTs designed to serve MDUs (Multi-dwelling units) and large businesses.

The network was further designed to use connectorized drops. This is a construction method whereby devices called multi-ports are installed on poles or in pedestals. With connectorized drops the drop wire is pre-configured with a plug on each so that it can be plugged into the multi-port and plugged into the customer ONT. This construction

methodology saves time and costs since the installers don't need to splice every time they install a new customer.

Seattle has one interesting geographical feature that allows for a very efficient fiber feeder network design. In the majority of the City the blocks are long in the North-South direction and short in the East-West direction. There are exceptions, but this basic characteristic covers most of the City. CCG determined that it was only necessary to design feeder fiber for the North-South streets. The East-West blocks are short enough that customers on those streets could be reached with a drop wire. Using this technique saved significant construction costs since a feeder network is not constructed on the short ends of the blocks.

Major Design Assumptions

Following are some specific network design assumptions made by CCG:

Network

- Used 11 hub sites based upon the layout of the existing electric substations. We added a twelfth hub site for the headend. This design equates to roughly 30,000 homes and businesses per hub site.
- Used the existing City fiber ring for the core network that would connect the hubs.
- Used all new construction for the feeder fibers to neighborhoods.
- Followed existing electric cable miles for determining required fiber construction. Today's electric network consists of 1,282 miles of aerial cable on poles, 370 miles of buried cable, and 69 miles of cable underground in conduits.
- Designed feeder fibers to run North/South for most of the City and will use fiber drops to serve the East/West customers.
- The network will be built everywhere in the City. However, the large businesses downtown will not be an initial priority for the network. These buildings already have fiber or can easily get fiber today. When the network is built downtown we assume it will use the existing City Light conduits to get access to buildings.

Customer Distribution

- Used connectorized drops. This allows for customer drop wires to be plugged in instead of spliced, saving cost and time.
- Buried drops are used where other utilities bury drops today and aerial drops are used where other utilities use aerial drops today.
- Assumed every customer would get an individual ONT. This results in a high estimate of costs since there are many situations where customers can share an ONT. For example, the cost per ONT is lower for apartments where multiple customers can share an ONT. Also, many small businesses

can use residential ONTs, which cost less, but the model assumes all businesses will use more expensive business ONTs.

- Average drop length is estimated at 170 feet. Most homes in Seattle are relatively close to the street and the long drop length covers customers living on East/West streets.
- ONTs are powered with customer power. The ONT will be equipped with battery backup in case of a power failure.
- Deliver inside homes is done using MOCA, a technology that uses existing CATV coaxial cable in the home to deliver video and data. For about the same price we could also use Broadband Over Powerline to deliver data using existing inside electrical wires. Telephone service would be provided using existing telephone wiring.
- Customers who buy the equivalent of today's analog TV (60 channels) will not require settop boxes. Every digital customer gets a settop box. This is a conservatively high estimate since the industry is migrating to including the settop box electronics in new TVs. Over time many customers will opt out of using the retail provider's settop box.

Major Cost Assumptions

Following are some of the cost assumptions used in the engineering estimate:

- Used $10.90 per foot for aerial fiber construction.
- Used $20.40 per foot for buried fiber.
- Used $20 per major fiber splice (48 to 72 splices).
- Cost to bore a 2-inch conduit is $14 per foot.
- Average cost for an aerial residential drop is $292
- Average cost for a buried residential drop is $615
- Average cost for an aerial business drop is $1,255.
- Average cost for a buried business drop is $1,504
- Initial cost for an installed residential ONT is $613. The assumption is that this will decrease in price over time.
- Initial cost for a business ONT is $2,468. The assumption is that this will decrease in price over time.
- Note that the cost of loops and ONTs is success driven. These costs are only incurred when customers are connected to the network. More customers means more capital.
- A major cost component of building in Seattle is the sales tax of 8.8% that is charged for most of the network. This makes the network more expensive than in other jurisdictions.

City Assets Required

The assumption is that some City assets ought to be made available to the network, regardless of the ultimate operator. To the extent required by law, such assets would be leased at going market rates. Some of the City assets that could contribute to the network:

- Six to eight fiber pairs on the existing Power Light core fiber ring.
- Use of land at the existing electric substations or use of other City land in adjacent neighborhoods if available.
- Use of existing City Light conduits where available.
- Use of existing City Light building entrances downtown if the network is extended to the large downtown buildings.
- Potentially the use of an existing City building to house network employees and the headend.

The Retail Model

The first business plan studied by CCG was a retail business plan. Retail in this case means that the network operator would both build the network and then sell retail services to customers. The retail provider could be some commercial entity, like a Verizon, or it could be some entity created by the City. Business plan options will be discussed below.

The retail option was studied for several reasons. First, it is important to understand retail profitability in the market. Every market is different and one can't understand the potential for profitability without looking at detail at local prices and local costs. The retail model was developed to show how a standalone operator might operate. Large companies that already operate large networks elsewhere would probably have an economy of scale and could be even more profitable than shown in the model. Understanding profitability lets us understand the potential for either attracting a major network operator to the City or justifying the City's entry into the business.

The retail model also let's us understand the amount of cash that can be generated by a fiber business in the City. Understanding cash is essential if we are to evaluate wholesale options, because in a wholesale environment there must be sufficient cash for both the retailers and for the network owner.

The analysis of the retail model shows that there is the potential for significant profitability from bringing a modern fiber network to the City. If we were to bring a commercial entity or create a new entity to provide these services, such a business could provide tremendous benefits to the City while also being profitable.

Services Provided

The model assumes that a retail provider in the City would utilize the fiber network to provide a full array of products to consumers as follows:

Residential Customers

The model assumes that the retail provider would offer the full triple play of voice, video and data to residential customers. The key assumption in the model is that the retail provider would offer a 20% discount compared to today's prices, across the board. Such savings would be a tremendous boon to the local economy and would inject around $2 Billion into the local economy over 20 years.

Other Cities in the fiber business have enhanced services compared to the incumbents. For example, a typical City provider will offer more channels of cable programming than the incumbent, and for a lower price. City telephone products typically include a number of features included in the base rate. City data speeds would be far faster than the incumbent products. The data products on the fiber network should be much faster than offered by the incumbents.

The network provider would be expected to offer all of the bells and whistles available by other competitors. In cable TV today that would include such things as Video-on-Demand, DVR, HDTV and other such advanced features. The network provider would be expected to remain current with future developments and introduce new products as available.

The most immediate and largest long-term benefit to residential households would be from greatly enhanced data speeds to the Internet. As an example, today Verizon offers fiber residential download speeds of 5 Mbps, 15 Mbps and 30 Mbps. A fiber network is capable, with today's technology, of even greater speed. In Provo, Utah customers today have peer-to-peer capability, within the City network of 100 Mbps. Offering the fastest speeds possible would revolutionize the City and would allow for the residents of the City to take full advantage of new technologies. A fiber network would bring Seattle into the forefront in world competitiveness.

Small Business Customers

The retail provider would also bring the triple play to small businesses. However, many businesses would only be interested in voice and data services. The small business market is generally hungry for competition. Today there are many providers offering services to large businesses and to the downtown high rises, but competition typically bypasses small businesses. The retail model also envisions a 20% price discount for this market.

The largest benefit to the small business market would also be increased data speeds. Seattle businesses would have a leg up over other communities because of cheaper and faster data.

Large Business Customers

There is already significant competition for large businesses. Large businesses in Seattle and the downtown high rises already have fiber or easy access to fiber. Large companies have complex needs that require complex solutions. CCG always recommends that if a City gets into the network business that they do not try to compete head-to-head for the largest businesses in town. The complex needs of large businesses are best handled by specialized competitors who work only in this market niche.

The biggest benefit of a City-wide fiber network would be an overall decrease in town of data prices. The retail model anticipates that large data circuits would be made available to large businesses. Today that would mean 10 Mbps and 100 Mbps connections. In the future that would mean 1 Gbps connections. The network operator ought to sell these products either directly to the large businesses or to those carriers that serve these businesses such as CLECs and ISPs. The retail model assumes prices of $400 per month for a 10 Mbps connection and $1,400 per month for a 100 Mbps connection. These prices are far cheaper than what is available today and would bring tremendous benefit to the City's large businesses.

The City

The model assumes that the City would become an anchor tenant of the new fiber network. During the RFI process many of the respondents stressed that they thought this was key to the success of the network. The financial analysis shows it is not essential, but is still something the City ought to do in order to promote a fiber network.

The City would benefit tremendously from a fiber network. Every City location would be brought onto the high-speed network. Every school and library could have affordable 100 Mbps connections. The model assumes a 20% discount for the City services, like received by other customers.

Note that if the City gets into the retail business that the City gets nearly free communications service. This is one of the benefits of a City network. If the City were the retail provider, it would still bill itself for services, but since the revenues would stay within the City and the true cost of City services would be small incremental cost of providing service.

Market Share

As part of the study we performed a market survey of residential customers. The survey was presented to a random sample of households and in a way to deliver statistically significant results. The results of the survey have a 95% reliability, plus or minus 5%. This is the same reliability gotten from most business and political surveys. The purpose of this survey was to estimate the market acceptance of a fiber network. The survey showed that there is tremendous demand among City residents for in the City for cheaper and faster data products and other communications services.

Detailed results of the survey are included in a separate report. The highlights of the report are shown from the results of a key question, which is how many households would subscribe to services if provided on a City fiber network. The responses were as follows:

	Yes	No	Maybe
Basic CATV	66%	23%	11%
Digital CATV	54%	33%	13%
Local Phone Service	69%	14%	17%
Telephone Features	68%	16%	16%
Long Distance	63%	21%	16%
High Speed Internet	61%	24%	14%

CCG has performed a large number of surveys nationwide for both municipalities and for commercial firms. The results of the Seattle survey are very positive and are higher than the results seen in many other surveys we have conducted. We guess that the high positive response is a result of a combination of some underlying dissatisfaction with the current providers or else a very positive feeling about the City.

These positive responses indicate a much larger potential for residences to purchase service from a City network than was predicted in any of the financial models used to look at the potential for profitability for a City network. Every business plan we looked at would be improved with a higher customer penetration rate.

It is our experience at CCG that the questions asked in this survey are a good indicator of how customers will respond in the real market place. We have been doing these surveys for many years for both Cities and commercial providers and we have been able to see how the networks then fare in the real marketplace. We would warn that achieving the kind of success predicted by the survey will require great execution of a business plan. Customers will only change service providers if they perceive the new provider to have good customer service and superior performance and reliability. What the survey really tells us is that the households in Seattle will respond extremely well to a competitive provider of the triple play services, assuming that provider offers lower rates and provides good customer service.

We did not survey business customers. Our experience shows that business surveys are not an accurate predictor of business behavior in the real marketplace. This disconnect

between what businesses say on surveys and what they do in real life is due to several factors. First, it's very hard to get businesses to take a survey. And when they do take surveys, it's very difficult to find and interview the real decision maker in a company. Finally, A business's decision on buying telecom products is a complex one and until confronted with a real competitive option, a business generally does know how they will respond.

Our retail study looked at two arbitrary market penetration rates, as measured by residential Cable TV penetration. - 30% and 40% market penetrations. Looking at different penetration rates makes it possible to understand those variables that are most important to the success of such a venture. It's comforting to know that the survey suggests a much higher penetration rate.

Understanding the potential for business penetration rates is more complex. For most businesses, price is not the primary reason to change providers. Businesses rely on their telephone and data connections to conduct their business, so they value network reliability more than price. In our experience, businesses are slow to accept a new network, but over time, if they see it is reliable, businesses will eventually migrate to a new network. The study uses a sales-driven approach to achieve sales to small businesses. In our experience, the only way to sell to businesses is to knock on their door, so the model projects salespeople who visit and sell to small businesses. In our experience, a sales force with a superior product will always succeed, and in this case the product should be both price competitive and technologically superior to the competition.

One of the key variables in the study is the speed with which the retail business gains new customers. The study shows that it is essential to get customers quickly if the business is to be able to support debt. One of the key aspects of building a fiber network is that there is s significant capital cost expended for each customer added to the network. The initial network consists of fiber on each street plus core electronics. These costs represent roughly half the capital costs of building a network with the remaining capital spent to add fiber drops and ONTs at the customer premises. The business does best if it adds customers quickly, thus generating some of the cash needed to pay for the capital.

There are a number of ways that a new network could get customers quickly. Other cities have used sign-up lists during the construction period so that a large numbers of customers are pre-sold even before service is available. The retail model assumes that 2,000 customer per month can be added to the new fiber network. This speed is achievable, but will require significant marketing and an efficient organization on behalf of the new company.

We finally note that the retail model predicts that the first retail customer would be installed 18 months after the financing is obtained for the project. This 18-month period would be used for engineering, construction and creation of the retail provider's backoffice. We have seen a few networks beat the 18-month time frame, but it is a pretty typical time lapse between financing and delivering service.

Revenues

Revenues in the retail model are very straightforward. For the most part the revenues are the product of customers buying retail services.

Sales and marketing are different for each market. The best initial marketing plan for households would start by widely announcing the plans to launch the fiber network and then starting a sign-up list during the construction period. The early adapters will be excited about the data speeds and many households will be excited about the savings. Most other Cities who use sign-up lists have gotten 20% or more of the market with almost no marketing costs. Subsequently marketing to residential will be done in the traditional ways – doorknockers, mailings and phone calls. Sales to small businesses will be done strictly with salespeople. The experience of the various CLECs is that very few businesses will sign up for a network without talking to somebody live. Businesses are also going to be a little slow in accepting a new network provider. Many businesses wait a few years to make sure the new network is stable and reliable.

Residential rates in the retail are 20% lower than today's competition. Data products would offer vastly superior bandwidth for lower rates. Following is a sample of residential rates used in the retail model. Obviously, final rates would not be set until the business launched. These data rates are illustrative, but achievable.

Single Line Telephone	$14.67
10 Mbps Data	$39.99
20 Mbps Data	$49.99
50 Mbps Data	$99.99
Basic Cable	$ 9.84
Basic and Analog Cable	$39.40
Digital Cable	$49.58

Small businesses also would get 20% discounts compared to today's market prices. Data products would offer vastly superior bandwidth for lower rates. Following is a sample of small business rates used in the retail model. Obviously final rates would not be set until the business launched. These data rates are illustrative, but achievable.

Single Line Telephone	$ 26.18
PBX Trunk	$ 26.58
15 Mbps Data	$ 59.99
30 Mbps Data	$ 99.99
100 Mbps Data	$199.99

The retail model assumes that large businesses would be served on a wholesale basis. The network would only sell large data pipes to either the businesses or to the carriers that serve them. The model assumes two data products initially as follows. These prices cost more than the small business products since these data products are not shared among many users.

10 Mbps Data	$ 400.00
100 Mbps Data	$1,400.00

The retail model assumes there will be no hook up charges for customers. Customers will be able to switch to the fiber network at no cost. However, most fiber networks run credit checks and require deposits from customers with bad credit.

Operating Expenses

The retail model assumes that one company builds the network and operates it. As a retail provider, this company would incur the normal industry expenses for operating a triple-play network. Following is a description of the major costs:

- One of the largest costs is cable programming. Today most small cable companies buy programming from NCTC, a cooperative. However, the cooperative has had a moratorium on new membership since November 2005. The model assumes that the business could either join the cooperative or would be able to buy at cooperative prices through an existing coop member. If programming is purchased a la carte it would cost 30% more than is shown in the model.
- Another significant expense is labor. To be successful, this venture would need to focus on good customer service. Thus, the majority of employees are in two groups that deal with customers. The largest customer care group is customer service representatives who take orders, answer customer questions and resolve billing issues. The number of customer service reps grows as the business grows and eventually there are 92 customer service reps for a 40% penetration. The other customer group is the help desk. This group of employees answers technical questions and takes trouble calls. The help desk grows to 43 people at a 40% penetration.
- The remaining employees are needed to operate the back office, maintain and monitor equipment and run the network. The model assumes that installation would be done using contractors. Most such networks utilize contractors since they don't want to lay off a bunch of employees after the initial build-out in completed. Total employees grow to 203 with a 40% penetration.
- Another significant expense is the Internet backbone. Since the company offers robust data products it will require a very large pipe to the Internet. The model predicts the cost of Internet backbone growing to nearly $8M per year by the tenth year.
- The company would invest in modern software that would allow for efficiencies. For example, software exists today that will automatically provision the voice switch, data service and cable service. Thus, customers could see product changes immediately while talking with a customer service rep. The company also should invest in a robust billing/OSS system to create efficiencies in order taking, provisioning and billing.
- The company should have typical other operating expenses for such things as vehicles, computers, travel, training, supplies, insurance, etc.

- One significant expense is the cost of debt financing. The retail model assumes a municipal bond at an interest rate of 5.2%, which is higher than today's rates. A municipal bond should be able to fund 100% of the business with no required cash from the City. If the business is financed at commercial rates, the interest rate will be higher and equity will probably be required.

Network Costs

Equipment costs are the primary cost of launching this business. Network costs can be put into major categories – costs of the core network and costs to provision customers. The core fiber network consists of building fiber to every part of town and the cost of the fiber network is estimated at $194M. In a retail model the core also includes FTTH electronics, a voice switch, a data headend, and a cable TV headend and antennae to receive programming. The cost of the initial FTTH electronics in the core is around $42M. The other core assets, including a building, vehicles, computers, furniture, a switch and a headend are around $10M.

The remaining network costs are success driven. This means that costs are only added as the network adds customers. The two primary costs to obtain a customer are fiber drops and ONTs (the electronics on the side of the home). The assumed cost of these items in the model is as follows (before sales tax):

- Average cost for an aerial residential drop is $292
- Average cost for a buried residential drop is $615
- Average cost for an aerial business drop is $1,255.
- Average cost for a buried business drop is $1,504
- Initial cost for an installed residential ONT is $613. The assumption is that this will decrease in price over time.
- Initial cost for a business ONT is $2,468. The assumption is that this will decrease in price over time.

Following is the capital required during the first five years using the three assumed penetration rates:

	1st 5 Years	1st 10 years
30% Penetration	$345M	$444M
40% Penetration	$353M	$482M

One final note on capital - the model assumes there will be two major equipment upgrades during the first 20 years. While fiber equipment today is robust and can easily deliver 100 Mbps of data or more, improvements are expected in the future. The model assumes replacement of much of the core electronics. Customer ONTs are expected to need software upgrades or chip replacement. To the extent that two upgrades don't happen during this time period, more cash would be generated than shown in the models.

Summary of Key Assumptions

Some key assumptions in the retail study:

- The study assumes that the first retail customer can be served 18-months after receipt of financing.
- Rates are basically 20% less than the incumbent's rates today. Data speeds are assumed to be vastly faster than incumbents with lower prices. For example, initial residential data speeds might be 10-Meg, 20-Meg and 50-Meg, symmetrical. Over time the City will probably increase speeds but hold prices steady.
- Rates for telephone and data are never increased. Rates for CATV are raised 7% every second year. (Comcast has been averaging 6% to 7% increases every year).
- The study assumes that telephone penetration rates will erode over the years due to VoIP and cell phone usage.
- The study uses six full-time salespeople to sell to small and medium businesses. The study assumes that the only sales to large businesses are large data pipes – serving such businesses is too labor intensive and complicated.
- For modeling purposes the study assumes that the business will have the same product offering for 20 years. Obviously over 20 years there will be new products in the marketplace. The study assumes that the company will technologically be able to match anything offered by others, and if one revenue stream erodes, any shortfall will invariably be made up in new product lines.
- The study assumes two major asset upgrades during the first 20 years with a replacement of fiber electronics and software.
- Residential installations have been set at 2,000 customers per month. This is aggressive and will require outsourcing to contract installers. Even at that speed it takes over five years to reach a 40% market penetration.
- The company will perform its own customer service and help-desk in-house.
- The study assumes a 20-year bond with capitalized interest for two years and no principle repayment for the first two years. The model assumes financing at an interest rate of 5.2%, which is slightly higher than current market rates. Commercial loans would be more expensive.
- If the City was the provider it could borrow all of the money required and should not need to make additional cash contributions unless penetration rates go higher than expected (cost of success).
- Salaries and expenses grow at inflation.
- The household growth rate is assumed at less than ½% per year per the last Census.
- The study shows no in-lieu-of-taxes on revenues or profits paid to the City, but there is sufficient net income to fund such payments to the City. Such payments would probably not begin for 5-7 years after launch until the business is solid.
- The study assumes the business will collect the same taxes from customers as the incumbent providers today.

- The study does not show any withdrawal of excess cash. Excess cash could be reinvested in the business, used to further lower rates, or used to accomplish social goals to solve the economic divide and other issues.
- The study assumes that cable programming can be obtained at the NCTC cooperative rates. The business could either join the programming cooperative or else find a partner to bring cheap programming rates. Otherwise, the programming expenses would be 35% higher than in the model.
- The network is assumed to be a PON network. However, the cost of other technologies would be roughly the same.
- The engineering design saved significant network costs in two ways. First, it assumes that the existing fiber network can be used for the core. Second, it assumes that in most of the City that fiber must be built only along the long length of city blocks since the short sides can be served with drops.
- The study assumed a new building is needed to house the headend.
- The study assumes that office space could be found for employees.
- The study assumes that the City would be an anchor tenant on the network and that the business would take over City voice and data services after a few years of operations.

Breakeven Analysis

It is always important to understand the breakeven point for a new business. The breakeven point is where the business has enough cash to be self-sufficient and has further earned enough cash to retire the debt.

The retail model shows a breakeven at a 24% residential penetration if we assume the City is the provider. This penetration level will actually generate enough revenue to repay the borrowing in a little less than 20 years, but if the penetration is any lower the business runs out o cash in years six and seven. Since the surveys show a much higher interest in a fiber network, it should not be difficult for a retail provider to get a 24% market penetration.

Breakeven is harder to define if the provider was a commercial firm. Each commercial firm will establish its own criteria to define success. For example, a non-profit corporation would probably have almost the same breakeven as a municipal entity. However, for-profit commercial firms expect a return over and above debt payments. Thus, each commercial firm would expect some internally set goal of profits. We speculate that a breakeven for a commercial firm would be around a 30% penetration.

Summary and Profitability

Following is a summary of the key findings of the retail model.

	24%	30%	40%
Size of Required Bond	$455M	$468M	$478M
20-year Internal Rate of Return	9.0 %	10.8%	12.8%
Cash at end of 20 years	$129M	$270M	$488M
Bond Breakeven	18 Years	16 years	14 years
20-year customer savings	$1.9B	$2.0B	$2.1B
Year-10 investment per home passed	$1,309	$1,385	$1,501
Year-10 employees	138	157	190

As this summary shows, the amount of financing required is dependent upon the expected penetration rate. The more customers added to the network, the higher the network costs. This is referred to as the cost of success.

Profitability is defined differently for a municipal venture and commercial firms. A municipal business generally defines ‘profits’ in terms of cash generated. If a municipal business can fully support its own costs including operating costs, capital and debt, then any excess cash is considered as profit. Municipal utilities generally roll excess cash back into the business or else give it to the general fund of the City. Municipal ventures also often use the cash to support social goals. With this sort of network, one potential social goal might be to get broadband to every child in the City.

Commercial firms generally define profitability in terms of dividends made available to investors. Each firm will have its own earnings goals, so there is no universal definition of profitability.

The retail business defined in this study is very profitable by municipal standards. Once customer penetration rates exceed 24% the business generates significant excess cash. There is nothing significant about the use of 40% as the top penetration rate and it is certainly possible for the business to exceed that penetration rate, and thus generate even more cash. The market survey predicts that penetration might be as high as 60%.

The business is only moderately profitable by commercial standards. However, a large company that already operated other similar businesses elsewhere would achieve an economy of scale and could be expected to do better than predicted in this model. Such a company would already have software systems, programming arrangements, customer service centers, etc. The business as predicted in the model is a standalone business, and it would be more efficient than shown in the model if the venture was part of a larger company.

One significant set of figures to note is the cost per home passed. Seattle is a large enough City that any network there achieves economy of scale. The cost per subscriber predicted by this study is lower than for any existing fiber network in the U.S. today.

The Wholesale Model

A wholesale model requires City participation. In a wholesale model, the City would build the core network and would then sell capacity to other retail providers. Capacity could be sold to retailers by leasing loops, leasing bandwidth or some combination.

In a wholesale model the City would build the identical fiber network used in the retail study. Fiber would be built past every home and business in the City. The City would then provide the fiber drop and customer electronics for each customer added to the network.

Under a wholesale model the City would not be an anchor tenant of the network since the wholesale business would not offer voice or data services, just access to the network.

The analysis shows that a wholesale network can work, but the key factor for success is the speed at which the retail providers add customers.

Market Share

The City, as the network operator would sell services to large service providers like cable TV companies, ISPs, burglar alarm companies and anybody else wishing to utilize the fiber network to gain access to customers in Seattle. The only customers of the City would be these large service providers.

The analysis shows that the key variable to define success for the wholesale model is the speed at which the retail providers would add customers. If they don't sell to customers fast enough, then the City will find itself unable to make bond payments. The success of the wholesale model is solely determined by the success and speed to market of the retail providers.

Market Share

The studies were done at two market penetration rates, 30% and a 40%. Both of these versions were eventually profitable. Again, the biggest key for success of the wholesale model is the speed at which the retailers can add customers to the network.

The model assumes that the retailers add 1,500 customers per month for a number of years. This is an aggressive assumption, and the City runs out of cash if the retailers build slower than this.

In today's environment it may not be possible to find retail providers who are willing to sustain such a growth rate. The biggest issue with the wholesale concept is that retailers tend to cherry pick. The wholesale model shows that the City must collect at least $40 for access to a residential customer in order to pay for the network. If a retailer pays $40 to the City, then they are only going to want to sell to customers that spend at least $75 per month on services, and they will want customers that spend even more than that. Thus, there is a danger that the wholesale model would create a fiber network that would only be marketed to those customers with the largest communications bills. Households that spend $40 or $50 per month would be excluded from the fiber network since no retailer would choose to serve them. If the cost to access customers is set lower, the City would not have enough revenue to make bond payments.

The wholesale process of selling access to the retailers creates a Catch-22 situation. The City needs the retailers to sell to many customers. However, by charging $40 per month to get to a residential customer the City ensures that the retailers will cherry pick, and not sell quickly enough. The wholesale model looks to be very risky for the City since there is a high risk that the retailers won't add customers quickly enough to the network.

Revenues

In the wholesale model the City sells access to retail providers to reach customers on the fiber network. Such access could be sold in the form of loops or of bandwidth. The charges to various retailers will be negotiated and will vary. One would expect quantity discounts for retailers who add large numbers of customers to the network.

The model assumes average chargers per wholesale end-user customer as follows:

Residential Customer	$ 40 per month
Small Business Customer	$ 75 per month
Large Business Customer	$150 per month

For this business plan to be successful there would have to be numerous retail providers. A customer might use one company for cable service, another for data services and a third for burglar alarm service. Thus, each of these providers would not pay $40, but the City would want to collect $40 in aggregate for that customer from all providers. If a provider wanted to sell a total bundle to customers the fee would need to be $40 for access to the customer.

Additionally, the model anticipates that the City would be charging non-recurring revenues for hooking up each new customer. The model assumes that the one-time fees are 3.5 times the monthly access fee. This up-front payment helps to offset the cost of the fiber loop.

Finally, the network provider would get some revenues from selling collocation space and connectivity to the retail providers. The model assumes that each retail provider would be billed $5,000 per month as a generic connection fee. This sort of fee would

make certain that any retailer that signed up for the network would be serious about selling into the market place. It would be too costly for the City to allow retailers on the network that might only have a handful of customers.

Operating Expenses

The physical wholesale fiber network is essentially the same as the retail network. The network still places fiber near every home and business in the City. The City would still build a fiber loop and place an ONT for any customer added to the network.

The City would not directly offer any retail services, so there would be no voice switch, data headend or cable TV head end.

The City still needs employees to operate and maintain the network, but there would no longer be any need for customer service reps or help desk for the public. The wholesale business requires some employees to take loop orders from the retailers. The model requires only one salesperson to deal with the handful of retail providers. The business now needs just over 30 employees to operate the wholesale network, instead of the hundreds required in the retail model.

The business also no longer has to buy programming or connect to the Internet. Those costs are borne directly by the retail providers.

Essentially the costs of operating a wholesale network are the manpower needed to maintain the network and the normal costs of operating and maintaining a fiber network.

The model still assumes that installation of fiber drops and ONTs would be outsourced to contractors.

Breakeven Analysis

The wholesale model requires an overall market penetration of just under 30% in order for the City to have enough cash to make bond payments.

However, as mentioned earlier, overall penetration alone is not a sufficient indicator of success. It also matters that the retailers get sufficient customer during the first few years to help pay for the network. Thus, the key to breakeven is a 30% overall market penetration achieved quickly enough to create cash flow for the City.

Summary of Assumptions

Some key assumptions in the wholesale study:

- The study assumes the City builds the fiber network. It assumes the City is responsible for fiber drops and ONTs.

- The retailers would provide the assets needed to supply telephone, cable TV and Internet services. The retailers would supply settop boxes, modems or other customer devices.
- The City sells access to the network to retail providers. These providers might be CLECs, cable providers, ISPs or other companies wanting access to customers through the fiber network.
- The model assumes that retail customers can be on line 18-months after receipt of financing.
- The City staffs to operate the network. Projected staff is 33 full-time employees.
- The retailers need to collectively sell 1,500 customers per month in order for this venture to be successful for the City. Slower growth creates cash shortfalls for the City.
- Financing is done using a 2-year construction loan followed by a 20-year bond with capitalized interest for one year and no principle repayment for the first year. The model assumes financing done by bond with a rate of 5.2%, which is slightly higher than current market rates. The construction loan is needed to extend the period for which the bond can pay for capital. There is a risk that bond rates would be higher when waiting for two years to set the bond rate.
- The Company can borrow all of the money required and should not need additional cash unless the retailers sell slower than expected.
- Salaries and expenses grow at inflation.
- Household growth rate is assumed at less than ½% per year per last Census.
- The model does not show any withdrawal of excess cash. Excess cash could be reinvested in the business, or used to further lower rates.
- The network was designed with PON technology. However, the cost of alternate technologies is roughly the same.
- Assumed that office space could be found for employees.

Summary and Profitability

Following is a summary of the key findings of the wholesale model.

	30%	40%
Size of Required Bond	$459M	$459M
20-year Internal Rate of Return	6.4%	8.5%
Cash at end of 20 years	$7M	$156M
Bond Breakeven	20 years	18 years
Year-10 employees	33	33

The first fact to note is that the size of the wholesale bond is nearly as high as the retail bond, but with greater risk. The high cost of the wholesale network is due to several issues – first, the same fiber network must be built. Secondly, there is less revenue to offset the cost of construction. Finally, the cost of financing the wholesale model is higher.

The wholesale model will cover bond costs if the retailers sell to enough end-user customers. The wholesale model eventually generates excess cash for the City, but this cash comes near to the end of the bond cycle.

One of the biggest concerns with a wholesale model is that there is no mature set of retailers in the U.S. waiting to provide services over this type of open access network. There is a budding retail market in Europe, but the only open access network in this country is in Provo, Utah and they have attracted only one service provider. The eventual vision for an open access network would be to have dozens of service providers offering a wide array of different services. Such a network would be high in innovation and have enough competition to keep prices very competitive. The wholesale concept loses much of its appeal if there are only a few retail providers. If the handful of providers fails, then the City fails. It would be particularly troublesome to rely on retail providers that are trying this economic model for the first time. There is little downside to such a company abandoning the market, but a huge downside for the City.

Comparing the Retail and Wholesale Models

Cost to Build

From a borrowing perspective it costs nearly the same to build a retail or wholesale network. Both networks require the identical fiber network.

For an expected 30% penetration, the bond needed for the retail network is $468M and the wholesale network bond is $459M.

Profitability / Cash Generation

Both models will satisfy a municipal definition of profitability – that is, both a retail and wholesale model ought to generate enough cash over 20 years to pay for operating expenses, pay for debt and fund needed capital upgrades.

However, from a commercial perspective, the retail model is far more profitable than the wholesale model. At a 30% market share the retail model would generate $270M in excess cash over 20 years while the wholesale model would generate only $7M. At a 40% market penetration the retail model would generate $488M while the wholesale model would generate $156M in excess cash.

While the profitability on the retail model is modest by commercial standards, it still might be possible to attract a private firm to build and operate the network. However, during the RFI process the City did not identify a commercial firm willing to commit to building a fiber network in Seattle.

Public Benefits

The discount on prices would be greater with a retail model. If the City was the primary service provider, the feasibility study suggests that the City could offer across-the-board 20% discounts on all telecommunications services. Today the FCC reports that in competitive markets today that cable rates average 17% less than surrounding communities. The experience with CLECs around the country is that they offer around a 15% discount compared to the incumbents. Thus, the overall discount under the wholesale model ought to be around 15% to 17%. This is still a good discount, but not as good as what the City could offer. Further, if the City ran the business like a utility, over the years excess cash could be used to further reduce rates. Note that the retail model assumes a cable rate increase of 7% every second year, while Comcast has been historically raising rates 7% per year. Under a retail model the discounts ought to increase over the years.

One of the most significant reasons to build this network is customer savings. If the network cuts rates by 20% and the incumbents in town lower rates by 10% to stay competitive, then the savings over 20 years is around $2 Billion for consumers in the City. That is a gigantic boost to the local economy.

One issue that would be expected with a wholesale business plan is cherry picking. Cherry picking is where the retail providers would choose to sell only high-priced bundles of services. Since the average cost to use the wholesale network to access a residential customer needs to be around $40 per month, retailers would be expected to only want to sell to customers who spend more than $75 per month. In the retail model the City would probably install fiber to anyone with a total communications bill as small as $40 per month. It is likely under the wholesale scenario that the only customers on the network will be businesses and residential customers with the largest monthly bills.

If the City is the retail provider, it could make high bandwidth a goal of the network. Large commercial providers tend to shy away from large bandwidth. Today, Verizon offers residential products on its fiber network of 5 Mbps, 15 Mbps and 30 Mbps, although their network is capable of greater speeds. Additionally, Verizon's products offer far faster download speeds than upload speeds. In a wholesale environment one might expect the same sort of behavior from the retail providers. Large companies don't think consumers 'need' big bandwidth. However, if the City was the retail provider it could offer the largest bandwidth products possible. Upload speeds could be much faster than the competition. Over time the City would probably have the goal of increasing speeds even more as its costs decreased or as technology improves. A whole paper could be written about the benefits of greater speeds. The short version of the story is that greater data speeds will promote innovation and make Seattle cutting edge in the world economy. Seattle's competition in Japan and Korea are building 100 Mbps networks today.

In the long run a wholesale model probably will bring more innovation to the City than if there was only one provider on the network. However, today there is no robust industry

of retailers ready to bring service to a wholesale network, so initially the City will be hard pressed to find more than one or two providers for a wholesale network. One can envision where the old Qwest commercial finally comes to fruition, with Seattle having a network that can offer "every program every made, delivered at any time". The fiber network would support such a technology, but these kinds of content providers do not yet exist.

Benefits to the City

If the City entered the retail business, it could essentially get City telecommunications services for free, or at least at a tiny incremental cost. While a City broadband business would probably still render a bill to other branches of the government, payments from one branch to another eliminate upon consolidation.

A City-run network would also insure that the City gets the best data speeds and the best technology. A City-operated network would also connect all City locations together, including small and remote locations.

Probably the largest benefit to the City of operating a retail network is the possibility of generating significant new cash for the City. Such a business could be operated as a utility, and as such could generate cash to the City as is done today by City Light. Cash could also be generated by such a business through taxes. Many other municipal utilities pay 'in-lieu-of-taxes' from revenues generated. Since the retail network generates far more cash than a wholesale network, the opportunity for the City is far greater with a retail network.

Social Goals

The retail network, if operated by the City, has the opportunity to promote a number of social goals. These goals would be difficult to pursue with the wholesale model. Some of the more important possible goals the City could pursue:

> Net Neutrality. The largest carriers are trying to implement a scheme whereby they will charge Internet content providers to get 'priority' deliver of signal. If these carriers can implement this idea they will have vastly changed the Internet. Only the largest players like Yahoo and Google will be able or willing to pay for speed, and new companies will have a difficult time gaining real access on the web. A City network could maintain Net Neutrality as it exists today, thus bringing the best innovation to Seattle. We think most customers would value a network that kept network neutrality.
>
> Solve the Digital Divide. If the City operates a retail network it could use excess cash to help provide high speed Internet for any home that needs it. Seattle could become one of the first cities where every child has an equal shot at the Internet and all the benefits this will bring. Note that even with a retail model this will not

be possible on day one, but once sufficient cash is generated this could become a top priority.

Make Bandwidth a Priority. As mentioned above, the City could make high bandwidth a priority. Other providers are more likely to just offer enough bandwidth to be just a little better than the incumbent competition. The City as a provider can make Seattle competitive with the rest of the world.

Economic Development. With a retail network that goes to every home and business, the City will be in a position to spur economic development for firms who care about bandwidth. With fiber everywhere the City can be very creative and can offer solutions and prices not available anywhere else.

Hybrid Model

CCG also looked at a hybrid model. This model assumes that City is the sole initial retail provider. The City is given exclusive use of the network for seven years. This creates a chance to capture a significant amount of market share and to generate enough revenues to insure successful repayment of the bonds. At the end of seven years, or whenever certain financial parameters were met, the network would then be opened to other competitors.

This model takes the best from both the retail and wholesale concept. It uses the profitability component of the retail model to make sure that bond obligations can be met. It opens up the network to full competition, thus allowing for innovation and serious price competition. It also keeps the City in the retail business so that social goals can be pursued.

This model avoids the pitfalls of the wholesale model, and yet ends up with the same open access competition. The wholesale model's biggest problem is that there is no robust market today of retailers ready to compete on an open access network. With only a handful of competitors, it is very likely that customers will not be added quickly enough to satisfy the City's bond obligations. Further, under a pure wholesale network there must be a high fee of at least $40 per month to get access to a residential customer. This price will cause providers to cherry-pick and serve only those customers with large monthly bills. Further, cherry picking will insure a small market penetration since providers will concentrate only on the premium customers.

The hybrid model avoids the pitfalls of the wholesale model. First, the City as the initial retail provider can aggressively seek retail customers. The market surveys predict a tremendous interest in a City fiber network among Seattle households. The City could easily get to the penetration needed for breakeven, meaning that bond payments were assured. The City also can control the speed at which customers are added to the network.

One would hope that there will be more retail providers available when the City opened the network to competition. Today there are very few retail providers willing to sell on this type of network. Interestingly, with the hybrid model the City would no longer need to charge $40 for wholesale access to a residential customer. The model suggests that the access fee could be closer to $25 per month. While a rate that low still may not stop retailers from cherry-picking, it gives a retailer the opportunity to be profitable with smaller customers. Finally, under the hybrid model the City stays in the retail market, competing against other providers. As such the City will have the opportunity to use profits to pursue social goals such as solving the digital divide.

From a financial perspective, the hybrid model costs nearly as much to start as the retail model. In the long run the hybrid model will make more money than the wholesale model but less money than the retail model. A comparison of the three models at a 40% penetration is as follows:

	Retail Model	Wholesale Model	Hybrid Model
Size of Required Bond	$478M	$459M	$473M
20-year Internal Rate of Return	12.8%	8.5%	12.4%
Cash at end of 20 years	$488M	$156M	$427M
Bond Breakeven	14 years	18 years	14 years
Year-10 employees	190	33	161

Major Findings

Following are some of the major findings generated by the feasibility studies:

- A single retail provider can be successful in Seattle. Such a provider could finance, build and operate a fiber network profitably. If the City or a non-profit company was the retail provider they could give a 20% discount over today's market prices and still break even with a 24% market penetration. A commercial firm probably needs a 30% penetration to be successful. Higher penetrations generate significantly higher profits and more cash.
- The City could be successful with a wholesale model. In this model the City would build the network and sell access to the network to large service providers. A wholesale model would achieve breakeven at around a 30% market penetration of retail customers. However, it is important that the retailers sell significant numbers of customers in the first few years or the wholesale business would run out of cash. Thus, the wholesale model carries a large amount of risk.
- Possibly the best scenario is for the City to begin as a retail provider and then open the network to other competition on a wholesale basis. The study called this the hybrid option. The hybrid option avoids the pitfalls of the wholesale model and yet also gets the best benefits of an open access network.

- The cost of creating a wholesale or retail business will require a bond of over $400M. It costs nearly as much to create a wholesale business as it does a retail business.

Potential Financing Mechanisms

The City should be able to borrow money for either a retail or wholesale venture with traditional municipal bonds.

For the retail model the study contemplated a 20-year bond. The bond had an interest rate of 5.2%, slightly higher than today's market rate. The bond had capitalized interest for the first two years.

A wholesale model would require more creative financing. It is anticipated that the retailers in a wholesale model would not build to customers as quickly as a single retail provider. This means that the capital needed to add customers would stretch beyond the normal 5-year period allowed by law for bonds. The financing method that looks to work best for a wholesale model would be to obtain a 2-year temporary construction loan followed by a 20-year traditional bond. Both parts of the loan package could be negotiated together upfront. However, delaying the bond for two years always introduces the risk of interest rate increases when the bond is finally marketed.

There are other options to consider with financing. It's possible that the retail or hybrid option could be funded with a standalone revenue bond. Such a bond would rely solely upon the revenues of the telecom venture and would not require the pledge of any other City revenues. A standalone bond would demand a slightly higher interest rate, but would eliminate financial risk for the City. Since the revenues and margins are smaller in a wholesale model, it looks as if getting a standalone bond for wholesale is unlikely.

It's also possible to finance the retail or hybrid model with a normal municipal bond and then buy bond insurance to guarantee the payments. Such insurance is expensive and effectively is the same as paying a higher interest rate. However, some level of insurance would reduce the City's risk.

In today's market, commercial interest rates are significantly higher than municipal bond interest rates. It's possible this venture could be financed with a commercial loan. However, such loans generally have more stringent loan covenants. Commercial loans seem to be the least attractive option.

Of course, if some commercial enterprise were to build the network there would be no risk for the City. We did not identify any such an entity during the RFI process, but it still is possible, using the results of this study, to attract a commercial partner. The commercial returns on this venture look to be okay, but not spectacular. That probably explains why we didn't attract a serious operator during the RFI process.

Risks

In terms of risk, there will be less risk to the City to create a retail network or a hybrid network instead of a wholesale network. The feasibility study shows that a retail or hybrid business plan can pay for itself with a 24% market penetration.

A wholesale network can pay for itself with something around a 30% market penetration. However, with the wholesale model it is essential that the retailers bring customers to the network quickly. If they don't sell fast enough, then the City would not have sufficient cash to make bond payments. Since there is chance the retailers will engage in cherry-picking, there is significant risk of cash shortfalls under the wholesale model.

Customers must also be brought on board quickly with the retail model, but in this situation the City would control the whole process. The City has no control of sales in a wholesale environment. But with a retail model there are a number of steps that can be taken to bring on retail customers early. The City could have sign-up lists during the construction period and it's a reasonable goal for the City to have signed-up enough customers during the first year or two to guarantee financial success. One key to understanding this risk would be to perform a survey of residential customers in order to understand the potential market for a retail network.

One way to avoid the risks of the wholesale model but still gain the benefits of an open access network would be to pursue the hybrid model. This option has the City starting as a retail provider until it has generated a large enough market share to ensure that bond payments can be made. At that point the network would be opened to competition, getting all of the benefits of a wholesale network, but with far less financial risk.

There is another option that could reduce risk for the retail model. Several other Cities today are considering standalone bonds for communications ventures. This means that any bonds raised for this venture would not be backed by other City revenues, but would be backed only by telecommunications revenues. Such bonds demand a premium interest rate, but the large underwriters have expressed interest in these sorts of bonds. Since the revenue streams are far riskier in the wholesale model it is unlikely that standalone bonds could be used to finance a wholesale network.

Finally, risk can be mitigated in some cases with bond insurance. Such insurance is expensive, but effectively reduces the risk to the City of a default. Effectively, getting bond insurance is like paying a higher standalone interest rate.

Recommendations

After carefully analyzing the financial results of the various studies, and when also considering other goals such as meeting social goals, CCG makes the following recommendations.

First, the best outcome for the City would be if a commercial retail provider showed up, made the investment to build the fiber network and offered a full array of services over the network. No such player emerged during the RFI process. However, now that we have financial results that we can share with providers it might be worth a second attempt. The City should consider issuing an RFP that would include the results of the financial analysis. This analysis shows that a commercial provider could make an acceptable profit in the City. We would further recommend that the City first authorize some surveys to determine the market appetite for the services that would be supplied by the network. The best chance at attracting a commercial operator would be by showing them that the demand exists and that there is profit to be made with a fiber network.

Second, a retail model where the City is the retail provider looks to be the best way to guarantee that there will be sufficient revenues generated to make bond payments. However, an open access wholesale network looks to be the best long-run network for the City since multiple service providers will maximize innovation and competition. Thus, CCG recommends the hybrid approach. First the City should build the fiber network. The City, or a non-profit corporation created by the City, ought to be the sole retail provider for a period of 5 to 7 years until such time that the network has sufficient revenues to guarantee bond payments. At this point the network should be opened up to multiple providers as an open access network. The City business would continue and would compete for customers, but with a host of new retail providers.

Today there doesn't look to be any strong retail players ready to step in and serve customers on the fiber network. If the City were to start a wholesale model with the wrong retail partners it could be a disaster. There is very little cost to a retail provider to walk away from the network, but the City must make bond payments, even under a standalone financing, or face a lot of political pressure.

In a hybrid model, if the City stays in the business as a retail provider it can still pursue the various social goals such as economic development and solving the digital divide. Any commercial network is unlikely to seriously pursue these sorts of goals.