Wireless Neighborhoods

Business Plan for an Internet Cooperative

Prepared for the Wireless Neighborhoods Working Group

by

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I. Introduction

Mission: The purpose of the Wireless Neighborhoods project is to empower communities -- to provide access to information technology resources to enable communities to become competitive in education, human development, workforce development, health care and economic opportunity. Many communities, especially those in low-income urban areas, lack the resources required to succeed in these activities, especially in the new era of information technology. Wireless Neighborhoods provides the resources to develop necessary human skills and network infrastructure to help community groups enhance their programs and work collaboratively with schools and other community groups.

A. A Search to Satisfy Unmet Needs. Over the past three years, a determined group of leaders from a broad range of community groups has been working together to bring their residents into the information age. The challenges facing the groups in their efforts to improve kids' educational skills and their neighborhoods' prosperity have always been difficult. The ability to function and succeed in the information age, however, requires new skills and infrastructure, which are lacking in the leaders' neighborhoods.

Looking to the present as well as the future, they recognized they needed to build capacity to use information technology, both within their community groups and throughout their communities. To do so, they needed to acquire resources -- training for staff and the people who use their programs and infrastructure to make the programming possible.

On the programming side, the leaders are collaborating to develop educational projects together, enabling them to share expertise and other resources and to expand the projects' reach into other neighborhoods. On the infrastructure side, they are developing a high-bandwidth wireless network to provide the infrastructure and services (affordable high-bandwidth Internet access and a high-bandwidth Wide Area Network linking the groups to the school district and each other) to support their programming vision. The services they sought were either unavailable from traditional service providers or, where available, were offered at market-based prices they couldn't afford.

With the help of grants from the Heinz Endowments, the groups decided to pursue their own services. They installed the initial elements of a high-bandwidth wireless network and are now exploring the business structure of a cooperative to implement it on a larger scale and make it sustainable.[1]

The following document focuses on the infrastructure side of the Wireless Neighborhoods Project. The document is a business plan to use the cooperative model to

[1] Cooperatives have their origins as organizations established to satisfy unique needs of their members when those needs have been overlooked by traditional markets. Cooperatives are owned and run by their members for the explicit purpose of satisfying their members' needs, and prices are usually favorable because they're established upon the basis of the coop's costs rather than the market-based prices of for-profit service providers.

provide the high-bandwidth Internet and network services sought by the organizing groups. The programming efforts are being developed in a series of parallel efforts tailored to the specific interests of each Wireless Neighborhood group.

B. Goals

The organizers of the Internet Cooperative have outlined the following minimum goals for the project (See Table I-1).

1. Programming and community group collaborations. Technology developers often present flashy displays of what their technologies can do, but skeptics ask whether the technologies will actually be useful for things people need. People often complain that organizations buy expensive computers, video-conferencing equipment and other technology but they fail to use them productively.

The organizers of the Wireless Neighborhoods Working Group want to integrate the Internet and WAN technologies deeply into their programs -- to help kids read and write better and to help their communities retain and attract businesses. The Wireless Neighborhoods groups are using the Internet and the WAN in exciting new educational programs, such as the digital community newsletter, the Green Roof Project and shared software initiatives. They're also integrating the technologies into economic development programs, such as efforts to incorporate modern telecommunications infrastructure and access to high-bandwidth network services into office building renovation projects. These human programs will be supported by the physical network.

2. Infrastructure and services.

a. Infrastructure and services to support education and workforce, economic and human development. The organizers want to develop infrastructure and services through the creation of a cooperative that will enable them to use technology to enhance their abilities to provide programming in education and workforce, economic and human development.

b. High-bandwidth Internet access. The organizers wanted Internet access at bandwidth rates greater than those offered by current service providers. They wanted Internet access at the minimum of the 10 Mbps connection available through the Smart Building, instead of DSL and cable modem connections, which lack the bandwidth required for data-intensive applications using the Internet.

c. Wide Area Network connections between users. The organizers also want high-bandwidth network connections among themselves over a Wide Area Network (WAN) at data rates equal to the rates available over a typical office Local Area Network (LAN). This goal will make the same uses of a network possible among collaborating community groups as are possible among the workers in a typical office, enabling innovative collaborative projects in education and community and economic development. DSL and cable modem services are not sufficient for these purposes.

d. Prices affordable by small organizations. The high-bandwidth services currently available from traditional service providers are priced far above the means of small non-profit and for-profit organizations. The organizers wanted to devise a way to bring the prices down to affordable levels.

e. Prices to recover recurring costs without long-term subsidies (sustainability). The organizers wanted to develop a plan that would enable them to receive the desired services at the desired price levels on an ongoing basis -- without the need to rely upon continuing subsidies. Thus, the organizers sought foundation and government grants for initial, capital costs but wanted to make the operation sustainable by recovering recurring costs through user fees.

f. Service available everywhere. The organizers wanted to be able to provide service in neighborhoods throughout the City -- inside and outside the Central Business District.

g. Responsiveness to community needs. The organizers want to control the infrastructure to be able to provide the services they want on the terms that satisfy their needs.

h. Dedicated technical assistance. The organizers wanted to obtain affordable technical assistance, using the Smart Building model of a shared support staff, whose prices per user would become affordable by spreading the costs among a large number of users.

C. Additional Operational Goals.
In the course of developing the business plan, the following additional operational goals were identified.

1. Ability to serve for-profits (for econ. development & sustainability). The ability to serve for-profit companies was acknowledged as an important goal for two reasons. First, economic development is a key goal of organizers, and the presence of high-bandwidth infrastructure and services into distressed neighborhoods is considered an important means to attract and grow small businesses. Second, the sustainability of operations (i.e., the ability to recover recurring costs through user fees) depends upon a scale of operations (i.e., number of customers) sufficient to generate revenues that will recover the project's recurring costs. Serving for-profit organizations might contribute to the necessary scale and recovery of costs.

2. Ability to charge higher rates to large users (and potentially to for-profits). The ability to charge higher rates to larger users (and potentially for-profits) than to smaller non-profit customers can also generate additional revenues toward the goal of sustainability.

3. Eligibility to raise funds from foundations and public agencies. Since the business plan relies upon grants from foundations and public agencies to fund the project's capital costs, the organizational structure must accommodate such fund-raising. This involves two dimensions -- the organization's compliance with eligibility standards of funding

organizations and the ability of the organization to receive grants without incurring tax liabilities.

4. Ability to purchase from Smart Bldg contract. The sustainability of the operations depends upon the minimization of all costs. One of the most important elements of recurring costs consists of the upstream Internet connection. The Smart Building's upstream Internet connection is provided at a relatively, low price, which is made even lower through the further downstream contract for the WQED Tower Project. The contract for the Smart Building's upstream Internet connection, however, limits the direct customers to non-profits, such as a cooperative.

D. Strategies

1. Programming strategy. The organizers will conduct their programming efforts in parallel with the infrastructure effort. The network infrastructure will make collaborative projects possible among end users of the networking services scattered throughout the City, and the interactions that occur in the development and implementation of the infrastructure effort will promote those collaborations.

The programming efforts will be coordinated by individual organizations interested in particular projects. The groups will maintain a continuing relationship with the cooperative that installs and operates the physical network in their capacities as customers/members (with the right to vote on the governance of the cooperative) and through project-by-project collaborations to ensure that the groups' needs on individual projects are satisfied. The groups will also collaborate with the cooperative to raise funds.

2. Infrastructure strategy. The overriding goal of the groups that eventually became the organizers of the proposed coop has been a publicly-owned infrastructure for the deployment of a high-bandwidth network The original strategy was to obtain a fiber optic infrastructure through means such as the recent renewal of the AT&T Broadband franchise agreement with the City of Pittsburgh. As it became clear that the fiber optic infrastructure would not immediately be possible, the organizers investigated the feasibility of a high-bandwidth wireless network and discovered newly emerging wireless technologies with increased bandwidths and reduced costs.

The result is a proposed high-bandwidth wireless network, supplemented as necessary with fiber optic and other cabling. The initial network will have its primary hub on the WQED Tower in Oakland and will use secondary neighborhood hubs at sites strategically located to reach customers that lack clear lines of sight to the WQED Tower[2]. Individual customers will connect to the WQED Tower or neighborhood hubs with subscriber units (packages of antennas and radios) to be installed on the roofs or other prominent points of participating sites. The network will have a 60 Mbps wireless backbone linking the RET, the WQED Tower and the neighborhood hubs and use a combination of 10 and 60 Mbps technologies as "last mile" connections from the hubs to individual users.

[2] As the network grows, the backbone may be expanded to additional tower sites or to prominent buildings with high elevations.

Fiber optic cabling may be used to connect several adjacent buildings with a single subscriber unit. Similar cabling may be used to reach buildings in areas where fiber is available on an affordable basis or where the buildings lack clear sight lines to a hub on the wireless network.

The network will link to the Smart Building's 10 Mbps upstream Internet connection and will provide local network connections between users at the minimum rate of 10 Mbps (See Table I-2).

3. Business strategy. The business strategy has three primary elements -- (1) to use funds from foundations and public agencies to finance the project's capital costs, (2) to use revenues from services to finance recurring costs, and (3) to use the cooperative form of business organization to promote community control, community responsiveness to maximize fundraising opportunities and to use cost- versus market-based pricing. As a cooperative, the strategy uses aggregated demands for bulk purchases and discounts, shared resources/services to obtain low average costs per user and cost-based pricing to produce affordable but sustainable pricing.

II. Operational Plan

A. The Unmet Needs -- High-Bandwidth Services at Affordable Prices Plus Community-Controlled Infrastructure.

The organizers came together originally in 1999 with the goal of persuading the City and AT&T to include a requirement for a community institutional network (i.e., Community I-Net) in the cable television franchise agreement being renewed at that time. The organizers were aware of the value of telecommunications infrastructure in the emerging information economy and wanted AT&T to install the same high-bandwidth fiber optic infrastructure in the neighborhoods that AT&T and other for-profit service providers were installing in central business districts. The infrastructure would provide a physical foundation for the provision of advanced Internet and telecommunications services -- services presently available and services to be developed in the future. They believed that such services (and the infrastructure that makes the services possible) were essential to the prosperity of their communities.

At the time, the service on which the organizers were most focused was high-bandwidth access to the Internet. High-bandwidth Internet connections enable people to gain the full use of the increasingly data-intensive applications being developed for the Internet. The organizers saw these high-bandwidth uses of the Internet (e.g., streaming video, data downloads, etc.) as being necessary for the programs their organizations were developing in education, economic development, health care and community building.

As they worked together more closely on the issues of infrastructure plans and the uses they were going to make of the infrastructure, they also became aware of the value of high-bandwidth network connections between their organizations. As their organizations began to work together more closely on specific projects, they realized that a high-bandwidth Wide Area Network (WAN) that routs traffic entirely over local infrastructure (without going out through the Internet) will have consistently high transport rates and make it possible to work with other organizations in the same ways they work with people inside their offices over their office Local Area Networks (LANs). Multiple organizations can share servers and the software and data files located on them -- applications that are difficult to accomplish over the Internet due to the inconsistent data transport rates available over the Internet. The organizations can also use high-bandwidth applications such as high-quality streaming video and video-conferencing, which initially attracted their interest.

As a further result, the organizations also became impressed with the value of controlling the information infrastructure. They came to understand that any number of services can be provided over advanced infrastructure at any number of prices. The party controlling the infrastructure, however, determines which services are provided and the prices at which they are offered. Their experiences showed them that for-profit service providers don't always provide the services desired by their customers, especially at prices the groups consider affordable. Other factors, such as embedded investments in legacy infrastructure and the lack of competitive forces, often enable traditional service providers to provide *the services that the providers most want to sell* to particular segments of the market and to establish price points for their various services in a way

that will promote (and not cannibalize) *the services the providers want to sell*. The community groups learned that, while their initial needs included high-bandwidth Internet access and then local high-bandwidth network connections, their ownership of information infrastructure would enable them to constantly re-define the services provided over the infrastructure as the needs of the organizations change.

Table II-1 outlines the Internet-related services currently sold by traditional for-profit service providers and their prices. The table shows that high-bandwidth Internet access and high-bandwidth local network connections are not offered at prices affordable to small non-profit and for-profit businesses. The business plans of traditional service providers sell relatively low-bandwidth services (256 to 768 kbps of DSL and cable modem services) to customers considered to be small businesses, and the price points ($100-$350) selected by the service providers for these services are the prices at which this class of customers can afford to purchase a service. The same business plans sell high-bandwidth services (1.5 Mbps of T1 and higher services) at far higher prices ($1,100 to $6,000) to larger customers with greater resources. The service providers are able to enforce this separation because the market is relatively non-competitive.

The unsatisfied niche to be served by the cooperative, therefore, includes high-bandwidth services at low prices -- the prices traditional service providers charge for lower-bandwidth services, such as DSL and cable modem services. The coop can serve this niche for three reasons. By owning its own infrastructure, it can determine which services to provide to best serve the needs of its members. The coop lacks the legacy infrastructure and services that discourage traditional service providers from providing new services. The coop prices its services based upon its costs (compared to the market-based pricing of for-profit service providers). The additional need here is for the funding and organization to enable the cooperative carry out its infrastructure strategy and provide the services at the desired prices.

B. Services

There are at least three general categories of services that might be provided by the cooperative --Internet access and network connections, services hosted on local servers and various forms of technical assistance. Each level requires particular personnel functions and equipment and thereby incurs different levels of cost for the cooperative. Affordable high-bandwidth services are the key services to be offered by the cooperative. See Table II-2.

1. Internet access.

a. Shared, burstable high-bandwidth Internet access by the coop. The initial plan is to purchase an upstream Internet connection through the Smart Building Project and resell the connection to the wireless customers as a shared, burstable service. With such a service, customers share a common Internet connection, with each customer getting access to the bandwidth available at any point in time. Given the intermittent nature of Internet use, customers often have access to the full peak bandwidth of the connection. The result is an effectively higher-bandwidth connection at a price lower than the price

for a dedicated, discrete block of bandwidth.[3] This is a service that is not generally provided by traditional service providers.

The plan is to maintain the 10 Mbps upstream Internet connection as a minimum and to expand it as demand requires. Most of the non-profit members will likely use this service due to the relatively low price at which it will be offered compared to the prices of the discrete blocks of service discussed below.

b. Wide Area Network connections and "Local Loops". The wireless connections serve two functions. They link each customer to the others (WAN connections); and they connect customers to an upstream Internet connection ("local loops"). For most non-profit customers, the WAN connection and local loop will be bundled into a packaged Internet access service. However, local loops can also be sold independently without the *cooperative's Internet connection* -- to ISPs that would bundle the local loops with the *ISPs' upstream Internet connections*. The coop's advantage here is its ability to charge a lower price than the high-bandwidth local loops from traditional providers. The bandwidth of the local loops will range from the 10 Mbps connections provided with the 802.11b technology to the 60 Mbps connections provided through direct wireless connections to the WQED Tower.

c. Dedicated, dialable service blocks. Unlike the shared, burstable services described above, discrete blocks of service -- for Internet access and/or local loops -- reserved entirely for a single customer will also be provided as a service. The cooperative will protect the guaranteed rate against overuse by the subscriber and prevent intrusion by others through networking equipment designed for those purposes. This service is more costly to provide and will be provided, accordingly, at higher prices to members and non-members.

2. Services hosted on local servers. A second level of services (beyond Internet access and WAN connections) consists of services that entail the use of servers and personnel to manage them. See Table II-2. These services primarily include email and web hosting, but they can also extend to the sharing of software and files and special kinds of web hosting, such as streaming audio and video.

a. Email. Email services will be made available through a mail server located initially in Info Ren's offices in the RET. Several varieties of email service are available -- the normal kinds of email (IMAP and POP3) and email through Microsoft Exchange. Email

[3] Discrete blocks of capacity are touted as providing constant access to the full transport rate purchased. A 100 kbps connection, for example, is supposed to provide a consistent 100 kbps at all times from the customer to the Internet and back over a path reserved solely for that customer. In reality, however, the traditional service providers' services are also shared services due to the practice of "overselling." Instead of providing upstream transport and Internet connections to actually ensure that each customer always has access to the contracted amount of bandwidth, traditional service providers sell more discrete blocks of service in the aggregate than they have capacity to serve at one time. DSL, T1 and T3 providers oversell the upstream connections from the telephone companies' central offices. Cable modem providers oversell the local loops and the upstream connections.

is usually offered in packages with traditional service providers' sale of Internet services. Alternatively, the users can obtain email services through third parties.

With Internet Message Access Application Protocol (IMAP), a user copies email messages to his or her PC or device from the remote mail server, but the mail server retains the messages. This is useful if a user anticipates accessing email from more than one location. On the other hand, IMAP places a greater need for storage on the email server. With Post Office Protocol 3 (POP3), the user's download of email messages removes the messages from the mail server, such that the downloading device becomes the sole repository of the messages.

Microsoft Exchange is a special kind of email. Email through Microsoft Exchange can be structured to operate in IMAP and POP3 formats, and Exchange also provides several additional features. These features include calendaring, whereby users can see the schedules of other users and schedule meetings on others' calendars. The disadvantage of Microsoft Exchange may be its typically higher prices and its lower level of security.

The cooperative's services might be differentiated from the services of traditional providers on the basis of the storage space provided per email account, on the basis of price and through the development of security features to reduce the amount of spam received by users.

b. Web hosting. The project can provide traditional web hosting services and streaming services. The high-bandwidth Internet connection and local network backbone provide the necessary bandwidth for web serving. The servers can be located in Info Ren's offices in the RET.

The high-bandwidth enables the web sites to include either traditional static web pages or web sites with interactive, data-intensive features and streaming audio and video. The shared nature of a building-owned server allows its costs to be spread over a large number of users. The server's management by on-site technical staff helps ensure that the server will be secure and well maintained.

The high-bandwidth Internet and local network connections of the cooperative provide a special service not offered on an affordable basis by traditional service providers. Most web hosting companies do not even advertise the data rates of the web hosting services, except for web hosting services at the highest data rates. The cooperative's high-bandwidth telecommunications links provided at affordable prices will provide a valuable service here.

c. Video-conferencing. Video-conferencing is not by itself a "server-based" service, but it probably deserves to be mentioned in this section, given the specialized equipment the coop would require if it wanted to provide the service of facilitating video-conferencing sessions. The coop could provide a variety of "video-conferencing services."

The coop could rent to customers the equipment required to perform a video-conferencing session, and the coop could provide the technical help to set up and conduct the session.

Secondly, video-conferencing among more than two participants generally requires the use of a "bridge" -- a special piece of equipment that ties the participants together into a single conferencing session. The coop could purchase a video-conferencing bridge and provide the bridging service for a fee.

d. IP addresses. Internet Protocol (IP) addresses are numbers that identify devices, such as servers and workstations, that are connected to the Internet. The addresses, when matched with domain names, enable one user to reach another specific user out of the millions of users on the Internet. Dialup and many DSL services, including those offered by Verizon, assign different IP addresses to each user each time the user accesses the Internet. This inconsistency of IP addresses does not, therefore, work well if the user has a server that requires a consistent address (e.g., for email, web hosting, streaming video) or for video-conferencing sessions. The domain name relationships with the addresses would have to be constantly updated throughout the day to enable users to reach the intended server or the workstation to be used for the video-conferencing session.

With the growth of the Internet, IP address space is rapidly becoming a scarce commodity. Each allocation of address space must be justified under increasingly, difficult standards. As a result, service providers attempt to minimize the number of addresses allocated to individual customers.

As noted above, Verizon does not provide any static IP addresses to its customers under its DSL services. Some providers, such as Stargate, provide a limited number of IP addresses and offer additional addresses for an additional charge. Stargate, for example, offers 5 addresses with its symmetric 384 Kbps DSL service and blocks of 4 additional addresses at $25 per month per block.

Info Ren's arrangement with Verio, however, allocates 1,024 addresses to Info Ren. This is a relatively large number and is valuable to potential customers using servers that interact with the Internet and for video-conferencing.

New arrangements (e.g., IP Version 6) are being discussed to resolve the issue of scarce IP addresses. The coop can monitor these developments and request a block of routable addresses if necessary.

3. Technical assistance. The third category of service is technical assistance. See Table II-2. Technical support (i.e., "LAN maintenance", user support and consulting) is often a valuable service, especially for small businesses and non-profit organizations too small to afford their own technical staffs. Hiring employees and contracting with consultants can be expensive. Small businesses also often are intimidated in their dealings with consultants by their lack of technical sophistication and they often fail to take best advantage of the consultants.

One solution, used in the Smart Building project, entails the use of a service provider's on-site technical staff. An on-site user support staff is similar to the shared upstream Internet connection obtained through a bulk purchase. Both are shared resources to be used by all tenants, and the price per user drops as the quantity purchased increases. The on-site staff also encourages the use of technical assistance by presenting a familiar and consistent set of on-site technical support staff.

The collaborative nature of a cooperative and the members' shared interests suggest a number of collaborative ways to provide technical support. In addition to training members to be able to perform some of their own technical support, the cooperative can train its members to help perform some of the functions required to operate and maintain the cooperative. The members could thereby be enlisted to help provide an escalation path for the resolution of technical problems. Members' staff might be trained as the first level of response for other members' technical questions. Issues beyond the first level of expertise can be escalated to the higher level of expertise in the cooperative's staff or contractors.

The Smart Building Project, however, had a source of funding assigned for this purpose. No such funding source currently exists for the wireless network. As a result, the provision of technical assistance by a dedicated support staff will be phased in as the customer base grows or as funding sources are identified to cover the costs.

C. Customers and Competitors

The cooperative's sustainability will depend upon its ability to enroll enough customers to recover the project's recurring costs through user fees. This means that the organization will need to seek customers from practically all sources. The only physical limitation to the pool of potential customers is the need for a clear line of sight between the customer and an upstream wireless access point.[4]

1. Sales directly to end-users (non-profits, for-profits & residential customers). The primary form of sales will be made directly to end-users, such as non-profit organizations and for-profit customers. See Table II-3. Indeed, one of the reasons for investigating the idea of the cooperative was to identify an organizational model that, unlike a 501(c)(3), could provide Internet services to large numbers of non-profits and to for-profits without jeopardizing the organization's tax-exempt status.

The cooperative will also be open to the idea of sales to individuals. Current cost estimates to install the necessary subscriber units suggest that individuals may not be likely customers at this point. However, one of the reasons for the choice of 802.11b technology as the distribution technology from neighborhood hub sites is the substantial competitive activity underway to develop inexpensive subscriber equipment. This

[4] Access points are installed on the WQED Tower and at additional neighborhood hubs at strategically-located high points, such as the East Liberty Presbyterian Church and Highland Building in East Liberty. Additional connection possibilities include fiber optic cabling from buildings lacking a clear line of sight to buildings that already have wireless connections to an access point.

competition may soon result in affordable equipment and installation options that might enable individuals to become customers. One of the issues to be explored by the proposed ongoing research and development effort is the exploration of the issue of individual, residential connections.

2. Sales to "anchor" customers. The cooperative may want to focus part of its organizational efforts on a special class of large customers that might be called "anchor" customers. In addition to building a large base of small customers, the cooperative can attempt to achieve a sustainable scale of revenues by attracting a smaller number of large customers. The large "anchor" customers might contribute a disproportionate amount of the organization's revenues. These customers could include large public institutions, such as the City, County, schools or libraries, or large for-profit institutions. The services can include primary or back-up network connections and technical assistance offered at prices below those available from traditional service providers.

3. Sales for resale (ISPs and building owners). The cooperative can also sell service to resellers. The cooperative can sell an entire package of high-bandwidth service (i.e., local loop and upstream Internet access) or merely the high-bandwidth local loop -- providing a high-bandwidth network connection from the customer to a point on the ISP's network from which the ISP can transport the customer's traffic to the Internet. Services sold for resale will be sold at a price that represents a discount from the market-based retail price for such services but above the incremental cost of providing the service. The results should be a wholesale price that is nevertheless substantially higher than the target cost-based prices for the coop's member services and a substantial contribution to the cooperative's recurring costs.

The cooperative may also make sales for resale to building owners. Building owners may choose to develop mini-Smart Building projects of their own, comparable to the Smart Building Project in the RET. With a building-wide network, the building owners can replicate the benefits of the Smart Building by purchasing and sharing a large upstream Internet and network connection among their tenants. Such projects may be an effective way to attract high technology tenants to their buildings and to provide services to tenants at prices lower than the tenants could purchase the same services directly from the cooperative. Indeed, one of the tasks funded by the recent grant from the Heinz Endowments was the preparation of a Mini-Smart Building tool kit to encourage the development of such projects.

4. Members versus non-members. The customers of a cooperative are generally also the members of the cooperative. Members have the rights to vote on governance issues and to purchase services at cost-based prices. However, cooperatives can also limit the types of customers that are eligible for membership and can charge above-cost market-based prices to non-members. The designation of customers as members or non-members and the establishment of higher rates for non-members may be important means to help recover the cooperative's recurring costs on a sustainable basis.

5. Competitors. As noted initially, the cooperative's organizers are attempting to satisfy an unmet need. Accordingly, there are no service providers presently offering a truly competitive service in terms of the combination of service and price. Some providers offer high-bandwidth services at prices too high to be affordable. Others offer services at affordable prices, but the bandwidth is lower than desired. See Table II-3.

Services and prices of the existing service providers are established on the basis of marketing considerations, as opposed to cost. Each company's choice of services to be provided and the prices at which they will be offered are determined in relation to providers' business and marketing plans, which consider a number of factors:

-- Prices of competitors offering similar services.
-- Market analysis of potential customer needs and ability to pay.
-- Embedded investments in existing products and facilities.
-- Costs of providing services.

Table No. II-1 shows the services and prices of traditional service provider pricing.

Non-traditional service providers, such as 3RC, provide services and pricing similar to those of traditional service providers. Except for the Smart Building, 3RC doesn't provide its own services. 3RC's non-Smart Building services generally consist of services from traditional service providers that 3RC resells -- based upon a wholesale discount that 3RC obtains from the service provider. The prices to the end users, similarly, are based upon the prices of the underlying service providers, usually with a small discount.

3RC's dark fiber arrangements are not clear. If 3RC is leasing dark fiber from DQE, 3RC has the ability to provide high-bandwidth services (Internet access and local traffic exchange among subscribers). Affordability, however, depends upon the price at which 3RC leases the dark fiber and which 3RC must pass along to customers. Apparently, though, 3RC is offering a service using the dark fiber for $750 per month -- which is beyond the price range of most small non- and for-profits.

The competition that exists, therefore, is primarily between providers selling different services to the same targeted customer class at similar price points. For example, the coop will be selling high-bandwidth services at the same prices to the same customers that traditional service providers and 3RC (for its resold DSL and cable modem services[5]) will be selling lower-bandwidth services. 3RC will also be competing on the basis of price to the extent it uses its subsidy program to provide free service for the first year of service.

Moreover, 3RC and the coop will be competing on the basis of price for a similar service with respect to 3RC's fiber optic-based services. Both services are true high-bandwidth

[5] 3RC works with local providers to introduce users to DSL and cable modem services. 3RC subsidizes the payments for the services for the first year, and the community group picks up the full cost thereafter.

service options, but the coop's prices will be substantially lower -- except to the extent that 3RC uses grant funds to subsidize its prices.

One key will be for the cooperative to explain the higher quality and lower prices of its services compared to the traditional service providers. This will also include a demonstration of the credibility of the coop as a service provider and the reliability of its services.

The other key will be for the cooperative to develop a strategy to counter the subsidized, promotional services offered by 3RC. This task is to show convincingly that the 3RC services -- although free -- will not satisfy the customers' short- and long-term needs. Another approach may be to develop an arrangement with 3RC through which the funds used for the subsidies help to support the cooperative.

D. Equipment.

1. Equipment for Internet access & local loops.

a. Base station units. The heart of the network is the wireless backbone, which is comprised of proprietary 60 Mbps equipment manufactured by a company named Proxim and 802.11b standards-based 10 Mbps equipment manufactured by a number of companies. The 60 Mbps links form the backbone of the network as well as several key subscriber connections. The 10 Mbps links are used as distributive technology from neighborhood hub sites.

The 60 Mbps technology consists of point-to-multipoint equipment. Info Ren has installed two base station units on the WQED Tower. See Table 1. Each base station has a coverage of 60 degrees, such that six base station units can cover a full 360 degrees of coverage. Each unit can serve 1,000 subscriber units. One of the currently-installed base station units faces the East End (i.e., the Penn Avenue and East Liberty areas). The other base station unit faces west toward downtown -- to connect to the upstream Internet connection at the RET. This second base station unit, however, can also cover parts of the North and South Sides, including the network hub for the Pittsburgh Public Schools. To reach the customer numbers required to make the network financially sustainable, the additional four base station units to complete the 360 degree coverage will likely have to be installed.

The WQED Tower aggregates all of the traffic from the subscriber units to which it links and sends it upstream to a switching center at the RET where traffic is routed to the Internet or to local destinations. The aggregated traffic for the Internet currently shares the same 60 Mbps link that will connect customers in the downtown-facing sector with the WQED Tower. As the number of customers in the downtown-facing sector grows, the west-facing link will become congested with Internet traffic from the other sectors plus the local traffic in the downtown-facing sector. There will, accordingly, be a need to upgrade the upstream connection to the Internet (through the RET) to use a separate base station panel or a dedicated fiber link.

b. Neighborhood hubs. Neighborhood hubs will be installed for two purposes -- to serve customers lacking direct sight lines to the WED Tower and to use a standards-based distribution technology that will likely see improvements in quality and declining installation costs. A further set of base station units is required for customers lacking sight lines to the WQED Tower, and the choice of 10 Mbps 802.11b technology over 60 Mbps proprietary technology is driven by cost and performance. The proprietary base station units cost approximately $9,500 per panel installed (including equipment and installation)[6]. The 802.11b base station units cost approximately $3,500 to $5,400 per panel (installed)[7]. In terms of performance, 10 Mbps is sufficient for the key expected applications, such as shared software and files, streaming video and video-conferencing.

Similarly, the cost of 802.11b subscriber equipment is substantially less than that of the proprietary 60 Mbps units. The 60 Mbps subscriber units cost approximately $6,500 per unit (installed) compared to the 802.11b units which can range from $3,300 to $5,000, depending upon the equipment needed at the installation point. Further, the competition within the standards-based market may drive costs down even faster. This reduces the equipment cost portion of an installation immediately, and equipment is expected soon that can be installed by customers without the need for a contractor and the associated installation costs.

A goal in this regard is to enable customers to connect with window sill installations they can perform for themselves instead of rooftop installations by contractors. Windowsill installations may be feasible with neighborhood hub panels that "wash" the walls of nearby buildings.

c. Subscriber units. Subscriber units (antennas and radios, separately and bundled) will consist of a mix of 60 Mbps and 10 Mbps units. Decisions on which to deploy for specific customers will be based upon the customer's preferences, lines of sight and the customer's resources.

d. Switches and routers. The wireless technology requires a series of switches and routers to direct and manage data traffic. A switch is currently deployed at the WQED Tower and at the RET. Routers are deployed and will be required at each customer site. Routers also provide an opportunity for traffic shaping (i.e., limiting data rates) for customers wanting not to exceed the consumption rates for their chosen rate class.

e. Spare equipment. Equipment may be damaged or require repairs on an unexpected basis. Without the availability of spare equipment, repairs and replacements take time and expense, especially if the repairs and replacement units are ordered on an expedited basis. Outages may also be extended if the necessary repairs and replacements are not available on a prompt basis. These concerns can be addressed with maintenance contracts that ensure prompt deliveries of replacements. However, the costs of the

[6] These costs do not include the effort in site visits to check feasibility, to perform design (i.e., which units to deploy, installation locations and wiring pathways), coordination of installation work.

[7] There can be savings, however, when multiple base station panels are installed simultaneously. We received a budgetary quote of $6,500, for example, for a two-panel, two-access point installation.

contracts can be more expensive than merely purchasing several spare units for use when needed. Accordingly, to avoid extended outages and the costs of expedited repair and replacement contracts, it is preferable to purchase several spare base station and subscriber units -- both for the 60 and 10 Mbps technologies.[8]

f. Reserves and replacement equipment. The expected service lives of the wireless equipment -- base station units and subscriber units -- is unclear. Some in the industry estimate five years as the service life of equipment generally, but this estimate is based as much upon the usual estimates of life until technological obsolescence as much as its physical operability. People actually using similar equipment report service lives of 10 years or more. Planning (reserves) and fundraising, accordingly, must be undertaken to purchase and install replacements when needed.

g. Network monitoring and management equipment. Hardware and software to monitor and test the network and to shape data traffic will also be required. These can include a cable meter, a LAN tester, a digital cable analyzer and Timbuktu and sniffing software.

2. Equipment for services hosted on local servers.

a. Servers (email, software (applications), file sharing and web hosting). Servers will be required for email, file sharing and web hosting when the project decides to provide these services. The web hosting would include traditional web sites and streaming applications. Info Ren currently maintains servers for these purposes (except for Microsoft Exchange), and these could be used to provide the services.

b. Video-conferencing equipment. If the coop offers rentals of video-conferencing equipment, it will need a stock of cameras, tripods, microphones and software and perhaps monitors. If it wants to facilitate multiple-party video-conferencing sessions, it will need to purchase a video-conferencing bridge.

E. Operations, Maintenance & R&D. The actual operation and maintenance of the cooperative will require the performance of the following distinct functions. The tasks are described generally below. Details as to the amount of activity required at various times are described in the Personnel and Recurring Costs sections below.

1. Operations and maintenance of wireless network. The wireless network must be operated on a day-to-day basis. Operational activity consists of monitoring the network for performance and making adjustments as needed. The activity is needed on an irregular basis as circumstances warrant.

The various elements of the wireless network (base stations, neighborhood hubs and subscriber units) will also require maintenance over their service lives. This may include site visits to investigate apparent problems, reconfiguration and/or re-pointing of the antennas, repairs and replacements of units damaged by weather or other causes. The

[8] An initial set of spare base station and subscriber units is being funded through the recent Heinz grant.

work will be performed with a combination of manufacturer warranties and service plans plus live technical support

2. Operations and maintenance of data network. The wireless network has two dimensions -- a physical dimension that uses radio technology to transport data and a network dimension that uses Internet protocols to rout data traffic from user to user and between users and the Internet. The preceding discussion addressed the physical dimension of the network. The additional task of operating and maintaining the network dimension is a distinct, additional task.

After the initial establishment of the network design, this task entails the operation and maintenance of the network. Unlike the operation and maintenance of the wireless infrastructure, which might, at times, require the physical repair and replacement of equipment, the operation and maintenance of the data network will mostly entail monitoring and the adjustment of configurations. Operations consists of the regular monitoring and adjustments to add and delete users and to ensure optimal performance.

3. Systems administration for servers (Unix). If the cooperative provides the "services hosted on local servers" discussed above, the cooperative will have to maintain the hardware (i.e., servers and related equipment) used to provide the services and monitor and maintain them operationally, including the regular preparation of backup tapes. This will also include daily customer service functions, such as setting up new computers and accounts and assistance with passwords.

4. Technical support. The cooperative requires staffing to provide technical support to its members. This function may also include training of members to perform technical support functions on their own or in the context of an escalating system of technical support resources.

5. Design. Design work is required throughout the cooperative's operations. It is required initially and on an ongoing basis for the wireless network -- to determine the technologies (60 Mbps vs. 802.11b 10 Mbps) to be used throughout the network, the location of hubs, the opportunities for fiber optic connections to subsidiary hubs and the technologies and installation plans to be used at neighborhood hubs and subscriber sites. The subscriber design also includes site visits and discussions with potential customers to learn about their needs, to educate them on the potential benefits of the network and to determine the best way to connect them.

Design work is required initially and on an ongoing basis for the data network -- to determine and update the architecture, to select additional equipment as necessary and to keep the network up to date technologically. It is also required initially and on an ongoing basis for the server plan -- to choose the servers to be purchased, to determine which services to be deployed on each of the servers and how to do so.

6. Research & development. Change is a fact of life in information technology and a requirement. Information technology changes (and improves) at a rapid pace, and the

technology (and infrastructure) the cooperative uses to provide service must change as well if the needs of the members are to be properly served. In addition, there is also a need for internal innovation to devise technological solutions to the members' unique problems and needs. Indeed, one of the organizers' initial beliefs is that ownership of the information infrastructure would enable the organizers to define and provide services to satisfy the members' needs. Without internal research and development, the services provided over the infrastructure will stagnate and the infrastructure itself will not stay apace of newly-developed improvements.

An internal research and development function is, therefore, essential. The research and development function must stay current with changes in wireless and networking technologies and incorporate valuable changes into the cooperative's network. Equally important, the cooperative must maintain an ongoing research and development activity that identifies local concerns and either finds already-available solutions or develop new independent solutions to address members' needs.

Issues to be addressed could include the development of a productivity suite of applications, measures to monitor and shape data traffic, security issues (including mandated features for HIPPA and other programs), new features such as Ipv6 and IP multicasting, and the efficient provision of spam control and virus protection.

7. Project management. The initial establishment of the cooperative will entail the work of transferring equipment, contracts and customers from Info Ren to the cooperative, the hiring of staff and contractors and fund-raising. After the initial establishment of the cooperative, the project manager will be responsible for the execution of the business plan, including the responsibility to ensure that all of the identified functions are performed.

8. Marketing. If the cooperative's sustainability depends upon the enrollment of a sufficient number of customers to fully fund the cooperative's recurring costs, a large customer base must be assembled. And, of course, an effective education and marketing effort will be required. This function is discussed in more detail in section F below.

9. Fundraising. The coop's capital strategy to use grant funds to purchase infrastructure will require an organized and sustained fundraising effort. This function may be undertaken by the members themselves, through contractors or by staff.

10. Web design and administration. The coop will use a website to provide information about services and to enable its members to communicate with the cooperative and, perhaps, each other. This will require a design effort for the website and a continuing effort to maintain and update the site.

F. Marketing.

The cooperative will need to develop a marketing plan to educate the public about the coop's services and attract the scale of customers required for sustainability. The plan

will focus on the unique benefits enabled by the coop and the mechanisms to enroll customers. See Table II-4.

1. Coop advantages.

a. Unique services. One of the underlying purposes of the cooperative is to provide services that are desired by its members but are not available in the usual markets. This is, therefore, one of the distinctive features of the cooperative's services for marketing purposes. These unique services include the following:

-- Low-cost high-bandwidth Internet access.
-- High-bandwidth WAN connections.
-- High-bandwidth uplinks for web hosting
-- IP addresses to facilitate video-conferencing and applications reliant upon servers.
-- Member input into cooperative management.

b. Low, cost-based prices. A cooperative's prices are based upon the cooperative's costs of providing service. A traditional for-profit provider's prices are based upon the provider's business plan and the level of competition from other providers that allows the provider to stick with its business plan or not. As a result, the prices of cooperatives for services offered by cooperatives and for-profit providers are generally lower than the for-profits' prices. The coop, for example, is attempting to provide a service that will allow individual users access to a full 10 Mbps of Internet service in burstable intervals for a $100 per month rate. Full-time access would cost at least the $4,500 per month market price of commercial providers. Instead of using market prices charged by commercial providers for comparable services, the coop is pricing its services at the level commercial providers are charging small business customers for the lower-performing DSL services. See Table II-5.

c. Responsiveness to community needs. In most cases, the customers of the cooperative are also its members, and the members are the cooperative's ultimate governing authority. This makes the cooperative uniquely responsive to the interests of the people using the service. Customers of traditional service providers have far less influence over the providers' services and prices. Customers of traditional service providers influence their providers through their decisions to purchase or refuse to purchase the providers' services, but customers are really free to exercise this choice if competing service providers are available to provide the desired services.

d. Community collaborations. The cooperative encourages collaborations based upon two factors -- the physical telecommunications network that links the organizations together and the human network that develops from the interactions in the cooperative's operations. In terms of the physical network, the infrastructure establishes 10 or 60 Mbps links between each of the member organizations. These links make a broad range of network and, therefore, also human collaborations possible. The high-bandwidth links make it possible to share the information on each others' servers as if the organizations were in the same office. They also make it possible to publish and receive high-

bandwidth applications such as streaming video, video-conferencing and shared software applications.

The human nature of the cooperative -- organizations with a shared interest in the coop's services -- also encourages the people within the organizations to work together. Organizations active in the cooperative get to know people from other organizations and the programs they are each offering. This familiarity results in collaborations in programs, as evidenced by the community literacy program being developed by the Community House, Hill House and Bloomfield Garfield Corporation. Community groups, such as the Community House, with particular expertise in topics such as digital storytelling can share their expertise with others.

e. Community building, economic development and empowered organizations. The overriding purpose of the Wireless Neighborhoods project is to build communities through empowered residents and community groups. Participation in the cooperative will provide customers with resources that will help them achieve these goals.

2. Marketing strategies.

a. Employees and contractors. A marketing plan can be undertaken directly with employees and contractors hired explicitly to sell services. It can also be undertaken less directly through a variety of other arrangements discussed below. See Table II-6.

b. Coop members. The organizers of the cooperative and, eventually, its members, could organize potential members in the course of their regular programming and with explicit sales efforts. The members can be paid commissions for sales, and/or their organizing activities can be funded with grants.

c. Collaborations with the United Way, the Pittsburgh Technology Council and other local membership and trade organizations. The United Way, the Pittsburgh Technology Council and other similar organizations undertake a variety of programs to serve the common interests of their members. The programs include the direct provision of services, forums and other activities to educate and facilitate collaborations among members. Indeed, one of the organizers chairs the United Way's technology committee, whose purpose is to educate members about technology issues and resources and help members coordinate their activities.

These membership organizations could participate in the cooperative as resellers of services to their members, as potential "anchor members," or as active collaborators with the intent simply to ensure that their members have access to the cooperative's services.

An "anchor member" could be particularly useful for the cooperative. An "anchor member" would be a large customer that uses the cooperative to provide a service that would contribute a significant amount of revenues to the cooperative. The United Way, for example, could purchase its technical support services from the cooperative or contract with the cooperative to perform a special service unique to the United Way's needs.

The third category -- "active collaborations" -- could include special, discounted rates for the organizations' members, the provision of special services tailored to the members' interests, the identification of new funding sources and the development of new programs. Indeed, initial discussions with United Way officials indicate that the organization is interested in working more closely with the cooperative.

d. Office building owners. Owners of office buildings are coming to appreciate the value of the availability of high-bandwidth Internet and networking services as a tool to lease office space. These owners can participate in the cooperative's efforts in several ways -- as a reseller to their tenants or by collaborating actively with the cooperative to ensure the availability of the service in their neighborhoods.

Building owners can attempt to replicate the theory of the Smart Building project - the resale and sharing of a large upstream Internet connection among a large number of tenants to make a high-bandwidth service available at an affordable price. Indeed, one of the tasks funded in the most recent Heinz Endowments' grant is the creation of a "Mini-Smart Building Tool Kit", which will outline the factors owners should consider in deciding whether to create a Mini-Smart Building and will show them how to do it.

Where building owners do not wish to pursue a Mini-Smart Building, the cooperative will sell directly to individual tenants, seeking the building owner's active collaboration. This collaboration could include assistance with the installations (e.g., cooperation with the installation of equipment and wiring on roofs and inside buildings, no rental charges for equipment installations) and promotion of the services to tenants. The promotions could range from the provision of information about the cooperative at the time of the rental and thereafter to the enrollment of the tenant at the time of execution of the lease. This could include a special term in the lease or merely the execution of a membership form at the same time as the lease is executed.

The cooperative can target specific building owners and work with the local office of the Building Owners Management Association (BOMA) to advertise the coop's services and the opportunity for their members and their members' tenants to obtain better service at lower prices. High-rise apartment buildings may also be a good place to start reaching residential customers.

e. Resellers. Since only a few service providers actually own their own telecommunications facilities, most Internet service providers actually resell the services of others. Stargate and most other ISPs, for example, have their own routers and contracts for upstream Internet access, but they contract with Verizon and others for the telecommunications ("local loop") facilities required to provide DSL services. Some service providers, moreover, contract entirely with another service provider on a wholesale basis to provide a service in the reseller's name. These resellers attempt to make a profit on the margin between the wholesale price and the retail price they ultimately charge the end user.

The high-bandwidth services offered by the cooperative would be an attractive service for resellers. Instead of reselling the standard DSL options of traditional service providers, resellers could add the cooperative's high-bandwidth wireless connections to their list of services. The resellers could package high-bandwidth wireless local loops purchased from the cooperative with the reseller's own upstream Internet access service, or they could simply resell the entire Internet and/or network connection service package offered by the cooperative.

The prices charged by the cooperative would have to be sufficiently low (i.e., lower than the market prices for similar services considered competitive) to enable the reseller to earn a profit margin sufficient to motivate the reseller to sell the services. This issue and the wholesale prices that might be charged are discussed in more detail in the pricing section below.

f. Technical support consultants. The cooperative can also advertise its services to private technical support consultants that serve potential customers. These consultants work with organizations to develop technology plans. Since the cooperative's services will be better and less expensive than the services currently available on the market and since the consultants' clients will be receptive to the consultants' recommendations, it will be important to educate consultants about the availability of the services and their unique features.

3. Mechanisms.
The marketing plan will involve a mixture of personnel (employees or contractors), educational programs (which might be funded through foundation grants) and written material (website and perhaps printed material).

G. Personnel/staffing/contracting options:
1. Generally. The operational functions of the coop outlined in section 2D can be performed through a variety of options -- through employees, contractors, members and/or a combination of them. Employees can be paid salaries. Contractors can be paid a fixed fee (i.e., hourly rate, monthly or annual fees) or a share of revenues or profits.

A cooperative also suggests the possibility for the performance of work functions by members. The shared interests of the members may result in resources acquired by the members and made available to the cooperative. The personnel for this work might be trained by the cooperative's staff. Work from members might be compensated by credits against the member's bills for service or perhaps through funding provided to the members for these purposes from other sources.

The advantages of employees are the control the cooperative has in their selection, the immediate response time of an on-site employee and the familiarity that develops from the employees' long-standing involvement with the project. A stable set of employees can also acquire a reputation for excellence unmatched by the changing crews of contractors. The disadvantages are the risks that the project might not have work

sufficient to warrant the employee's costs and that a contractor arrangement might, therefore, be more cost-effective.

The advantages of contractors are potential efficiencies resulting from the owner's ability to acquire only the amount of service required and the potentially lower price resulting from the competition in awarding the contracts. The disadvantages are the potentially higher costs if the amount of work exceeds the initial expectations, the lack of familiarity resulting from the lack of consistent personnel provided by the contractor and the potential lack of responsiveness due to the contractor's lack of on-site presence.

The advantages of member-supplied resources are their potentially lower cost and the enthusiasm and collaboration that results from such work. The disadvantages are the potentially lower reliability and quality of the services rendered.

2. Recommendations.
The recommended personnel plan includes a combination of employees and contractors and, as is the case with other costs, the types and number of required personnel increases as the coop advances through the three potential levels of services and as the cooperative gains customers.

a. Internet services only. For the first level of service, Internet Services only, we recommend the use of three employees -- a network manager, a staff person to concentrate on design and engineering for new customers and a project manager. The network manager can perform the functions of wireless operations, network operations, network maintenance, network design, research and development and training. The staff person focused on design and engineering will interact with potential customers and contractors to plan and implement customer connections. The project manager can perform organizational and administrative activities, including contracting and purchasing, fund-raising, education, and supervision of employees and contractors.

The coop can contract for the balance of the services -- maintenance of the wireless network, accounting, bookkeeping, billing and marketing.

This level of staffing should be adequate for the first three years of service -- assuming the enrollment of 50 customers per year.

b. Internet services and services hosted on local servers. The addition of services hosted on local servers requires several additional sets of skills, depending upon the services selected. Email, web hosting, shared software and streaming technologies involve a range of skills. These might be performed by existing employees (to the extent the existing employees have the necessary skills) or, when operating on a small scale, the tasks might be better performed with contractors.

The specific staffing requirements will depend upon the pace of the customer enrollments and the services purchased and sold. In the first year of operation (enrollments up to 50 customers), we recommend the use of the network engineer to manage the email services

and the use of a contractor for web hosting services. We recommend the use of the contractor for all services after enrollment of 50 customers.

c. Internet, services hosted on local servers and technical support services. The provision of technical support services is better handled with employees because the continuing attention of the employees results in a familiarity with the types of customers served and their problems. A cooperative business, however, also presents the opportunity to develop an escalating system of technical support that relies upon the training of coop members to address questions involving their organizations and others and the referral of only the more difficult issues to the technical support employees. The escalation system, however, requires a continuing educational process.

We recommend the hiring of user support staff specifically for this purpose. The rate at which the staff is hired and the service is offered will depend upon the cooperative's ability to raise funds to recover recurring costs. We recommend the use of a single staff person for the first 20-30 customers, the hiring of an additional parttime staff person for the 50 to 75 customers and the use of two staff people thereafter.

d. Streaming video and video-conferencing. We recommend the hiring of a staff person to facilitate the use of streaming video and video-conferencing beginning in year one.

III. Financial Plan:

A. Breakeven Strategy and Timeline

"Breakeven" means a business's revenues equal its expenses. The term, however, has a slightly different significance for cooperatives than for for-profits. For-profits generally start with losses and strive to increase revenues to a breakeven basis in the course of their attempts to exceed breakeven revenue levels and achieve profitability and increasing levels thereof. Cooperatives, however, operate on cost-based pricing. They are not allowed to earn "profits" over the long run (except to finance capital costs). Instead, coops charge prices sufficient to recover their costs. The prices cannot be higher or lower than necessary to recover their costs. As a result, the cooperative's goal is generally to operate at a breakeven level of revenues.

Achieving the level of revenues at which a coop first breaks even, however, is the greatest challenge for the sustainability of the proposed cooperative. The coop must achieve a scale of customers and revenues sufficient to recover the project's recurring costs (and to fund ongoing capital improvements to the extent of any shortfalls in fundraising). The keys to achieving this goal are (1) the enrollment of a sufficient customer base, (2) the ability to raise the capital funds for the required number of customer installations and (3) the ability to raise the funds required to subsidize the recurring costs until the breakeven level of revenues is reached.

Based upon a proposed initial pricing level of $100 per month per 100 kbps of average use and the provision of Internet services, services hosted on local servers and technical support, the business plan estimates that the cooperative can reach a breakeven level of revenues with 175 customers, the raising of $1 million for capital equipment and $425,000 for recurring costs over the 4 years required to enroll the breakeven level of customers (Table III-15).[9]

Breakeven number of customers	Approx. 175
Capital costs for the breakeven level of customers	Approx. $800,000
Price for Internet access	$100[10]
Time to reach breakeven	Approx. 4 years
Recurring cost subsidy until breakeven	Approx. $425,000
Total funds required to reach breakeven	Approx. $1.2 million

Tables III-15 and III-15 shows breakeven levels of customers based upon a variety of other assumptions -- fewer levels of service, higher prices. The tables show that with fewer levels of service (i.e., Internet service only, Internet service and services hosted on local servers), the breakeven levels of customers, capital costs and interim recurring costs

[9] The estimated capital costs required to achieve a breakeven number of customers is based upon the assumption of the spending levels of the coop's customers, i.e., the coop customer spending levels will equal the spending levels of the non-profits in the Smart Building. The estimated recurring cost subsidy required until the coop achieves a breakeven status is based upon the enrollment of 50 customers per year *and* coop customer spending being equivalent to Smart Building spending.

[10] The price quoted for Internet access is the price for the first (or basic) level of service. Customers expecting to use more than the basic level of service will be assigned to service levels at higher rates.

all increase. The tables also show unsurprisingly that with higher prices the breakeven levels of customers, capital costs and interim recurring costs all decrease.

B. Costs and Expenses

1. Capital costs

a. Internet and network services. As discussed in the operational plan, the primary equipment used to provide Internet services and the local network connections consists of the various elements of the wireless infrastructure:

-- Additional base station panels for WQED Tower (60 Mbps Proxim).
-- Additional hub sites (10 Mbps 802.11b)
-- Additional subscriber units (60 Mbps Proxim and 10 Mbps 802.11b)

Four additional base station panels will be required to complete the 360 degree build-out from the WQED Tower. Additional neighborhood hub sites will be required as the deployment proceeds and costs and lines of sight require. Estimated costs are outlined in Table III-1.

Additional subscriber units will also be required for each connection. For each installation, however, the cooperative must decide whether to install a 60 Mbps Proxim connection or a less expensive, lower-bandwidth option, such as a 10 Mbps 802.11b connection. The costs of the 802.11b equipment are currently less than the costs of the Proxim subscriber units; and they have the potential to decline even further, in view of the competition underway in the 802.11b standard. This can mean reduced equipment costs for rooftop installations and, potentially, installations in office windows avoiding a large share of the installation costs. For budgeting purposes, we assumed that 80% of the subscriber units will be 802.11b equipment.

b. Services hosted on local servers. The capital costs for the server-based services include the costs of servers and related equipment. A single server can be used to provide Email, web hosting and streaming services. However, for reasons such as security and performance, separate servers for these functions are desired. The costs per server are outlined in the attached budget.

c. Technical support. The primary cost of providing technical support lies in the personnel providing the support. The capital costs associated with technical support are considered negligible.

2. Recurring costs. The estimated recurring cost scenarios are outlined in Tables III-2, 3 & 4.

a. Upstream Internet connection. The source of the project's initial upstream Internet connection was the Internet connection of the Smart Building project in the RET. This would give the project shared use of the Smart Building's 10 Mbps Internet connection. The pricing was based upon consumption -- $100 per average consumption of the first 100 Kbps, $100 per average consumption for the second 100 Kbps, and $50 per average consumption for additional increments of 100 Kbps.

After the first year of service, however, the Smart Building changed its pricing model, charging customers based upon their peak uses measured over a month. Accordingly, Info Ren found a local provider, ASPStation, located on Penn Avenue in Garfield, which sells high-bandwidth connections based upon average consumption measured over a month. The ASPStation prices produce monthly charges that are substantially lower than available through the Smart Building.

ASPStation sells 10 and 100 Mbps connections, but, as noted, charges customers based upon their average consumption. Since we want to ensure that customers have an adequate level of "headroom" to be able to burst to high-bandwidths, our agreement provides for the switch to a 100 Mbps connection when our average consumption grows to 3-4 Mbps.

We are also working with the Smart Building to develop a mechanism that enables each network to use the other for a redundant connection -- for access in the event of an outage of our respective upstream providers. This will result in a substantial savings for both networks.

b. WQED Tower rental. The usual rental rate for the WQED Tower is $350 per month per antenna. WQED was willing to treat our configuration -- two antennas mounted on a single Table to the tower -- as a single antenna, and they were willing to give us an initial discount to $275 per month. We also pay approximately $20 per month for electricity to operate the base station units.

The initial arrangement, however, was for one year and only for the initial installation. At the end of the first year, we discussed our plans for the addition of a second installation; and WQED agreed to allow us to install the second set of panels at the same rate $275 per month as for the first.

We still need to negotiate the rate for the third set of antennas when we're prepared to install them. Based upon our current practice, we're budgeting another $275 per month for the final set of antennas.

c. Maintenance. The largest element of recurring cost -- next to the cost of personnel -- is maintenance of the wireless network. The various elements of the wireless network (base stations, neighborhood hubs and subscriber units) will likely require maintenance over their service lives. Maintenance can include site visits to investigate problems, reconfiguration and/or re-pointing of the antennas, and repairs and replacements of units damaged by weather or other causes. Resources for maintenance include at least three components -- warranties, service plans and technical support.

First, manufacturers issue standard warranties that cover the cost of repairs and/or replacement of defective products for a specified period. There is generally no extra charge for the warranties. The warranty for the 60 Mbps equipment covers the repair or replacement of defective products for a period of one year. It does not cover the costs of

taking down and re-installing the equipment. The contractor we used for the installations warrants its work for 90 days for defects in material and workmanship.

Second, in addition to the warranties, manufacturers also offer "service plans." Service plans for the 60 Mbps equipment (called "ServPaks") add time to the warranty coverage, provide expedited support and shipment times for repaired and replaced equipment and provide upgrades for firmware and software. The annual price of a ServPak for a base station unit ranges from $129 per unit to $800 per unit (depending upon the response time chosen). The annual price of a ServPak for a subscriber unit ranges from $89 to $129 per unit.

Third, the manufacturer and others provide live technical support with support engineers and on-the-ground labor to investigate and resolve problems. This may be necessary for engineering and labor not covered by warranties. The manufacturer provides support at the rate of approximately $200 per hour, plus the cost of travel from the manufacturer's offices in California. The contractor that has installed the initial connections, ASCC, provides support through a variety of its own plans -- a basic hourly rate for service as needed and a pre-paid service plan at a discounted hourly rate. Its normal hourly rate is $125 per hour (non-guaranteed response time) and $187.50 for emergency responses. ASCC's prepaid plan comes in blocks of 40 hours per year at the rate of $100 per hour ($4,000). The prepaid plan provides same day responses for calls received before noon and next morning responses for calls received after noon. Half of any unused hours in any year can be transferred into the coming year.

The recommended plan is to use a combination of warranties, service plans, spare units and bulk purchase of maintenance. For the first year, the warranties will serve the cooperative's needs for the repair or replacement of defective equipment. The purchase of spare equipment will the serve the needs that the service plans would otherwise satisfy for quick equipment response and shipping times. Further, the purchase of technical support as needed will likely be more cost effective than the prepaid plans until the cooperative reaches a scale at which it will actually need the 40 hours of annual assistance. We recommend that we start with the pay-as-you-go approach and make further decisions as our maintenance experience suggests.

A further alternative is to trade a portion of the network's bandwidth for the contractor's maintenance efforts -- a proposal the contractor has suggested. This makes sense if the cooperative needs to minimize its cash expenditures, if the network has spare bandwidth and to the extent that the value of the maintenance exceeds the cost of the bandwidth. This will depend upon whether the contractor wants to merely obtain the local loop or the local loop plus Internet access and the amount of the bandwidth needed. The market value of a T1 loop ranges from $3,600 to $8.400 per year (depending upon distance). As noted above, the annual price of ASCC's maintenance package is $4,000 for 40 prepaid hours.

Having discussed these maintenance and warranty options, it is still unclear how much maintenance will actually be needed (and amounts spent) on an annual basis. Based upon

our research, it appears that 10% of the installed cost of the equipment (materials and labor) is an approximate and conservative estimate of the annual cost of maintaining an item of equipment. This includes routine repairs and replacements of damaged products. It does not include the normal depreciation of the equipment.

The 10% estimate may be overly conservative, however. The experience of our contractor -- who recommended the use of the 10% figure -- has been that the equipment is very reliable. Most problems result from exposure to the weather, such that equipment installed at high elevations subject to wind and lightning risk will have greater need for maintenance. This item of cost will be monitored closely as we begin operations.

Finally, there is also the issue of the party -- cooperative or member -- who should be responsible to maintain various portions of the network. The coop is the logical party to maintain the base stations and neighborhood hubs, since these elements serve more than a single customer. Individual customers, however, could reasonably be assigned responsibility to maintain their individual subscriber units. On one level, maintenance responsibility may simply follow ownership.

The owner of equipment is generally responsible to keep the equipment in adequate working condition to be able to provide and/or receive the service. That means, of course, that the cooperative will be responsible for the base station units and the neighborhood hubs. If the customer purchases its own subscriber unit with its own or donated funds, the presumption will be that the customer owns the equipment, and maintenance will be the responsibility of the customer. The cooperative may provide the maintenance service to the customer for a service charge. If the cooperative owns the subscriber units, maintenance will be the responsibility of the cooperative.

Assigning maintenance responsibility to the customers may also ease the cooperative's apparent financial responsibility for maintenance. Instead of bearing responsibility for the maintenance costs (and the risk that the actual maintenance costs will exceed the average amounts included in the budgeted rates), the coop can eliminate the maintenance charges from rates (leading to reduced rates) and charge the customer for the maintenance work as needed.

However, the assignment of maintenance responsibility to customers for their subscriber units carries risks. First, the division of responsibility can set up a natural line for disputes -- with the customer and cooperative claiming that any problem is really the fault of the other. Second, assigning maintenance responsibility to the customer will give the customer the authority to have another party perform maintenance on the subscriber unit. This third party will not be subject to the cooperative's control or supervision. The cooperative will have no ability to judge the third party's qualifications to perform the work; and poorly performed work may thereafter reflect on the perceived quality of the cooperative's service.

For budgeting purposes, we used two scenarios. The first scenario simply budgets 10% of the installed costs of the equipment (base station units and subscriber units) as

maintenance expenses. The second scenario excludes the maintenance costs of the subscriber units -- under the assumption that those costs will be borne directly, if at all, by the customers. See Table III-5.

After discussion, the Executive Committee of the Wireless Neighborhoods project decided that the cooperative should be responsible for the maintenance of the subscriber units -- including both the 10 and 60 Mbps units. Assigning maintenance responsibility to the subscribers, especially unsophisticated groups with few resources, would discourage enrollments and create confusion and dissatisfied customers when maintenance was required.

d. Accounting and bookkeeping. This function will include the annual costs of an audit, the filing of tax returns and the invoice and payment functions related to the organization. We estimated $5,000 for the audit and tax returns and an increasing set of monthly payments for the other functions as the number of customers rises -- with the initial level set at $300 per month ($3,600 annually) and rising proportionately with the number of customers. A substantial amount of education and marketing is included in the design component of each installation, which is reflected in the project's capital costs. This design work is a combination of technical analysis and customer education. It might be classified as a recurring expense, but the funding model, which seeks to raise external funds for installation costs, suggests the classification here as a capital cost.

e. Education and marketing (and/or organizing). The costs of this function are uncertain until a marketing plan is developed. In the meantime, we budgeted $1,000 per month for this task.

f. Taxes (state and local). As a 501(c)(12) organization, the cooperative will be exempt from federal income taxes. It will not necessarily, however, be exempt from state and local taxes. These issues will require further analysis. Cooperatives in Pennsylvania may be organized as "not-for-profit" or "for-profit" corporations -- classifications that are independent from the tax-exempt classifications under the Internal Revenue Code. If eligible to organize as a "not-for-profit" corporation, the cooperative may be exempt from certain state and local taxes but be responsible for others. Further, regardless of its classification as a not-for-profit or a for-profit, cooperatives' general practice of returning "profits" (called "patronage") to the cooperatives' members will eliminate state income tax liability -- although the cooperative will likely still be liable for taxes based upon the corporation's gross revenues. Taxes may also be owed if the cooperative owns any real estate.

In the case of the cooperative, however, the tax liability will likely be negligible. The cooperative will not earn substantial net income. The scale of revenues is too low to generate substantial gross receipts tax liabilities, and the coop will not likely own any real estate.

g. Personnel.
The personnel plan in Table II-6 corresponds to the three levels of service that might be provided by the cooperative. Under the first level involving solely Internet access and local loop services, the personnel would include a network manager, the design and engineering staff person and a project manager. This level also includes the Research and Development function.

The second level of service, adding Server-based services of email and web hosting would require the additional skills of a systems administrator. The level of effort here could be phased in over a period of time as demand warrants. The position could start as a contracted position and evolve to a full-time position as the number of users increases.

The third level of service, adding technical support services, would require additional user support effort as the number of customers increases.

All positions were budgeted at the rates used for the Smart Building. Benefits were estimated at the rate of 30% of salaries. These would include health benefits, payroll taxes and retirement.

Other services would be contracted for as the need requires or because it is more feasible to obtain the services on a contracted basis. See Table II-6. Examples include the tasks of accounting, bookkeeping, marketing and web design.

h. Indirect costs (rent, supplies, etc.). Instead of directly estimating costs for rent, supplies and other miscellaneous costs, we used a proxy of 25% of the costs of salaries and benefits. In all likelihood, the cooperative would, at least in its early stages, not have separate office space and related functions of its own. It would likely use the space, supplies and benefits of an existing organization. The 25% estimate would then be a fair estimate of the value of these elements.

i. Contingency. We also included a monthly contingency item of $1,000 to account for unforeseen expenses.

B. Revenues
1. Capital funds. The sources of capital funds are outlined below and in Table III-6.
a. Foundations and public agencies. As noted initially, the primary business strategy to fund capital costs is through government and foundation grants. This will include both the network backbone of base station units and neighborhood hubs and as many subscriber units for which funds can be raised.

b. Cooperative-advanced funds.
A secondary funding strategy will also likely be required, however. This alternate strategy is needed to cover shortfalls in fundraising and for for-profits and non-profits with sufficient resources to pay their own connection costs. For this latter group of customers, the coop can provide the installation for a one-time, upfront fee or through a lease arrangement. Under the lease arrangement, the coop can finance the cost of the

connections and repay the borrowing through a series of monthly surcharges. The underlying funds for such a plan might be obtained from a traditional funding source or from a foundation such as the Local Initiatives Support Corporation (LISC).

The subscriber units consist of a package that includes a radio and an antenna. The costs of the equipment and its installation total approximately $6,000 for a 60 Mbps connection and $3,500 for a 10 Mbps connection. These costs may prevent many groups from becoming members unless they have financial assistance. Where grant funds are not available, the cooperative might finance the costs of the equipment and recover its costs through monthly charges over a defined time period, perhaps five years. Subscriber unit installations costing $3,500 (10 Mbps) and $6,000 (60 Mbps) might be financed at a total monthly rate that is affordable to the organization.

LISC's practice of providing loans instead of grants can help facilitate this financing mechanism. LISC, for example, could lend $100,000 to the cooperative, which the cooperative could use to finance the purchase of subscriber units and their installation. The cooperative would assess a monthly surcharge to the customer receiving the unit to recover the cost of the equipment plus interest. The cooperative would make periodic payments to LISC to repay the loan. Examples of potential surcharges for this purpose are outlined in Table III-7.

To satisfy LISC's restriction that its funds be used for "charitable purposes," the awards can be structured in a variety of ways. One option is for the cooperative to establish the financing mechanism to help customers interested in participating in programs that pursue "charitable purposes." The cooperative might establish the fund, for example, to assist customers participating in Internet-based educational program or some other program that promotes a charitable purpose.

c. Corporate partners.
Cooperatives can have corporate or other partnerships in formal and informal ways. Formal mechanisms can include investments through the issuance of loans -- at low or zero interest rates. Informal mechanisms can include donations, either outright donations of money or equipment or donations through tax incentive programs such as Pennsylvania's Neighborhood Assistance Program administered by the Department of Community and Economic Development.

d. Separate 501(c)(3) organization to receive funds to subsidize connection costs for customers. A further option is for foundations to contribute funds to independent 501(c)(3) organizations, which would, in turn, help organizations fund their connection costs. These connection costs could be funded as an element of the costs of a separate "charitable" program involving education, health care, employment, etc.

e. Member contributions. Many cooperatives require an initial capital contribution from members as a condition of membership. The contribution serves as a source of funds for the coop's operations, and the member is entitled to its return when the member

terminates its membership. Contributions are also often viewed as a means to demonstrate the member's commitment to the organization and its principles.

Membership contributions might also be used for the Internet cooperative for the same purposes. The organizers, however, should weigh the additional one-time funds they might receive from the contributions against the potential loss of recurring revenues if the required contributions are set at a level that discourages organizations from becoming members.

2. Recurring revenues

a. Affordable but sustainable prices. To meet the project's goals, the cooperative needs to set prices that low enough to be affordable to the cooperative's members and high enough to generate revenues to recover the cooperative's recurring costs. The first analysis below analyzes the prices the members may find affordable. The second analysis will address the establishment of prices sufficient to recover the cooperative's recurring costs -- within the affordability parameters discussed below.

b. Affordability & market research. The analysis of affordability begins with the identification of the likely customers. The likely customers are not a monolithic group. They have a surprisingly, diverse range of resources and, hence, also, ability to pay. They include small community-based organizations with 1 or 2 employees, larger non-profits providing social and economic development services with 10-50 employees, small, medium and potentially large for-profit businesses, and large non-profit institutions, reseller ISPs and other service providers. These organizations will have different price points considered to be affordable. The four apparent customer classes are outlined in Table III-8.

We have market research available from three sources -- the Smart Building project, the site surveys conducted for the wireless network and the actual pricing of traditional service providers for this group of customers.

(i) The Smart Building. The Smart Building project suggests four surprising and significant points for the wireless network -- (i) the average monthly expenditure totals $226.00, (ii) less than half of the monthly expenditures are for Internet service -- the remainder being spent for email, LAN maintenance, web hosting and similar services, (iii) 74 percent of the customers have 10 or fewer employees, and (iv) despite the relatively common size of the organizations' staffs, the organizations span a broad range in the monthly expenditures each group is willing to make. See Table III-9 & Table III-9-1.

As of January 2002, the Smart Building project had enrolled 43 customers (including 3 external customers served by wireless connections) out of a potential of approximately 80 tenants.[11] These customers generated $9,706.00 in revenues each month, for an average per customer for all services of $226.00.

[11] The remaining tenants failed to subscribe for a variety of reasons -- primarily, pre-existing contracts, connections provided by parent organizations based outside the building, and limited financial resources.

The average bill solely for Internet purchases, however, was only $108.00. The large majority of the customers (27 customers or 63%) subscribed to the 100 kbps level of service at the rate of $100 per month. The next largest group (10 customers or 23%) subscribed to the lowest level of Internet service -- a variety of desktop connections (per computer versus LAN connections) at less than $100 per month. Six organizations subscribed at higher Internet service levels -- three at 200 kbps and three at 300 kbps.

Nevertheless, the average total monthly expenditure for all services was $226.00 per customer, with 14 customers (33%) spending between $100 and $150 per month and a second substantial group of 12 customers (28%) spending in the range of $250 to $400 per month.

This monthly average was supported through the purchase of Email, LAN maintenance and Web hosting services.

	No. tenants	% of total	Monthly revenue	% of total
Internet access	43	100%	$4,675	48%
Email	22	51%	$2,660	27%
LAN maintenance	16	37%	$1,800	19%
Web hosting	8	19%	$ 446	5%

This suggests that a significant number of organizations are aware of the value of the other services and have the resources to afford them.

An important point to note, however, is the stratification of the market. Although the average monthly bill exceeded $200, 8 customers (19%) spent less than $100 per month -- and this does not include the organizations that chose not to subscribe because they preferred the $20 per month price of dialup accounts to the Smart Building's $40 per month price of desktop service.

(ii) Site surveys of groups outside the Smart Building. Our market information about organizations outside the Smart Building is not exact as it is for Smart Building customers. Over the past 9 months, Info Ren conducted site surveys of more than 18 sites to determine the feasibility of connecting the organizations to the wireless network. The organizations were primarily in East Liberty, Friendship and Garfield.

The surveys addressed physical feasibility issues (i.e., lines of sight, wiring pathways) and the organizations' uses of the Internet and other information technologies. The organizations were asked about their Internet connections, their email and Web hosting services and their sources of technical support. The answers we received, however, were not always complete. Some people knew the answers and provided them. Others appeared to know the answers but were cautious about providing them. Still others did not know the answers -- although some checked further and provided the answers later and others failed to follow through with further responses.

The general impressions we obtained from the site surveys was that there is still quite a range of diversity among community organizations outside the central business district (as there is inside the Smart Building), that the organizations outside the Smart Building also use the Internet and related services and that some organizations expend substantial sums on information technology and incorporate technology into their programs quite effectively. In general, however, we obtained the impression that there is a larger number of groups outside the Smart Building with low levels of resources to spend on technology than there is inside the Smart Building. The likely result is that the average expenditure per organization will be lower than for Smart Building tenants.

In terms of hard data, however, our surveys showed that, of 18 groups, 6 groups used dialup connections, 12 used DSL connections and higher-bandwidth services, and none used cable modems -- since AT&T has not completed the fiber optic upgrade in the East End and is not offering the service there at this time. Organizations with multiple offices often used a combination of services.

The information on ancillary services was more sketchy. It appears that most groups obtained email services from their Internet service provider as part of the provider's regular bundled service package, or they used web-based email. It was not clear how many purchased a la carte email accounts.

The groups also used a variety of sources for Web hosting. Some used the hosting services bundled with the regular service packages of their Internet providers. Others contracted with web hosting companies for the service. None hosted its own web site.

The groups obtain technical assistance from a variety of sources -- staff positions, volunteer help, a la carte purchases of services from consultants, and ongoing relationships with consultants. The smallest organizations seemed to have the largest unmet need. The market prices for technical support services range from $125 to $200 per hour, which the smaller organizations may not be able to afford.

(iii) Traditional service provider pricing. The pricing of traditional service providers directed to this group of customers appears to confirm these measures -- if prices are based upon the points at which companies consider customers willing (and able) to purchase their products. As noted in Table II-1, traditional service providers price their DSL and cable modem services in the range of $150 to $350.

c. Sustainable pricing.

(i) Generally. The ultimate goal in pricing for a cooperative is to establish a set of prices for a corresponding set of services that will generate average revenues per user sufficient to recover the coop's recurring costs -- or 85% of the revenues from members.[12]

[12] Coops are allowed to sell services to non-members and to sell services to the non-members at prices higher than the coop's costs, but the coop may receive no more than 15% of its total revenues from these non-members.

Prices to members are supposed to be based upon the cost of providing the service. Revenues received in excess of costs must be returned to the members. This translates to the idea that the prices paid by each member should approximate the cost of providing service to the member. This means that services that are more costly to provide should be priced at higher rates than lower-cost services.

Accordingly, if the cooperative were providing only a single service and the costs of serving each member were relatively similar, prices could be determined simply by taking the coop's total monthly costs of providing service and dividing it by the number of members. The average cost of providing the service would equal the price.

Where, as here, however, the cooperative will likely be providing a number of services and the costs of serving each member will differ, a more detailed analysis is required. Costs should be allocated to each service to the extent reasonable, but the overriding objective is to determine a set of prices for the cooperative's services that will, in sum, produce a level of monthly revenues that will cover the cooperative's monthly costs. Stated slightly differently, the prices must produce an average monthly revenue per customer equal to the cooperative's average monthly costs.

(ii) Initial pricing.
Table III-11 shows the pricing model currently used by Info Ren for the sale of Internet access from the WQED Tower. In addition, the table shows the prices charged by the Smart Building for server-based and technical support services as a starting point to determine the prices of the coop's other services. The likely revenues generated by these prices are discussed in the breakeven analysis in the following section.

Internet access. The underlying pricing goal is to sell a very high-bandwidth service -- a service with bandwidth far greater than with DSL service -- at prices that are comparable to the prices for business DSL services.

The Coop's services and pricing are fundamentally different from the services and pricing of traditional service providers. Traditional service providers sell finite quantities of bandwidth that the service provider claims it will make available for the user at all times. The providers establish prices for the finite amount of the bandwidth purchased. Thus, a user purchasing a 128 kbps DSL service may use up to 128 kbps of Internet access at any point in time but can, in fact, use no more than 128 kbps of service at any time.

The Coop, however, sells users shared access to the full amount of the capacity that is available over the network at any time; but the Coop charges users only for the bandwidth they use. User's consumption is also measured on an average basis -- instead of the peaks to which they burst -- to eliminate the impact of spikes in use over the month. Thus, a Coop user purchasing a 100 kbps level of service can use up to the full amount of the network's upstream Internet access (currently pegged at 10 Mbps -- or

10,000 kbps). This is almost 80 times greater peak capacity than is available with a 128 kbps DSL connection.

Coop pricing, accordingly, encourages people to use bandwidth and to make the uses affordable. Further, the Coop will increase the upstream capacity as needed to prevent the congestion that might occur with increasing numbers of users.

A basic rate class is established at the $100 per month level for the average consumption of 50 kbps or less. This level is consistent with the consumption of small users (customer class 1) in the Smart Building (See Table III-7). A second rate class is established at the 100 kbps level for $150 per month and thereafter at 100 kbps and $100 per month increments.

A customer's rate class and price are determined on a prospective basis tied initially to the customer's reasonable expectations. Prices are not determined retroactively based upon actual use. The network manager will monitor use and contact the user if its use exceeds the contracted level. If it appears that the customer's spending patterns are normal and likely to continue, the parties will discuss whether to transfer into a higher rate class, to use consumption-limiting technologies to restrict the customer's actual use or to identify other options.

Services hosted on local servers. These revenues are based upon the prices and spending patterns in the Smart Building.

Technical support. These revenues are based upon the prices and spending patterns in the Smart Building.

Maintenance charges. The cooperative may also want to offer maintenance service for the members who own their own wireless equipment. This charge should be based upon actual costs -- either approximated through a flat annual fee or through a la carte charges.

Related equipment and installation costs. In addition to the monthly charges for Internet service and local loops, the cooperative will have to determine how to charge subscribers for the one-time costs of the equipment and its installation required to receive service. As discussed earlier, the general plan has been to seek foundation and government grant funds for these purposes, and it remains the primary plan. However, the cooperative should also develop an alternate plan to address the organizations that fail the cooperative's criteria for subsidized connections or that, for whatever reason, want to use their own resources.

The most reasonable plan is to charge the organizations a fee based upon the cooperative's costs -- for the equipment, its installation and the associated administrative costs -- or to finance the costs over a period of years. Separate fee schedules would be determined for the alternate technologies and for the specific equipment the organization requires.

In-kind discounts. The cooperative may want to establish a set of tasks that its members can perform and receive in exchange a credit to the price of their monthly service.

Non-member pricing. Table II-1 shows that market-based prices for high-bandwidth Internet services are substantially higher than the cost-based prices the cooperative plans to charge its members. For a variety of reasons -- perhaps, most importantly, the possibility of boosting the cooperative's efforts to recover its recurring costs -- the cooperative may want to provide service to non-members and charge them a higher market-based price for the cooperative's services. This pricing, however, will be subject to the requirement that no more than 15% of the cooperative's revenues be derived from non-members.

The cooperative may wish to sell to end users directly or to resellers who will then sell the services in their names to end users. The coop can sell shared services and/or discrete blocks of bandwidth. In any sales, however, the cooperative's prices must be discounted from market-based price levels in amounts sufficient to motivate the purchase and above the cooperative's incremental recurring costs of providing the services to ensure a positive contribution to the recovery of recurring costs. Discounts to end users should be in the range of approximately 25%. Discounts to resellers should be in the range of 40 to 50%. Based upon the market prices depicted in Table II-1, these sales can be made at the rates shown in Table III-10 -- producing substantial incremental revenues.

IV. Organizational Plan

A. Origins, Functions and General Features of Cooperatives.

Cooperatives had their origins in the U.S. where traditional for-profit companies failed to provide needed products and services. The gaps were usually the result of the for-profits' projections of likely costs, revenues and profits for the desired products and services and their determination that the profits were either non-existent or insufficient to justify the necessary investments.

Cooperatives, however, have a different decision-making calculus. Unlike for-profits, which seek to recover a profit in addition to the costs of providing service, cooperatives seek merely to recover their costs. Indeed, cooperatives are generally limited to the recovery of their costs. Excess revenues must be returned to their member customers.

Rural electricity and telephone services are examples. Cooperatives were formed to install the facilities that traditional for-profit companies would not install. The facilities were often installed with the help of government loans to subsidize the cooperatives' efforts.

Many of the rural electric and telephone cooperatives still operate today. Additional cooperatives, however, also provide goods and services where traditional market forces and for-profit companies don't seem to provide the unique goods and services desired by consumers. The East End Food Coop in Pittsburgh, for example, serves the unique needs of consumers seeking organic and vegetarian foods -- a market that larger, traditional groceries historically didn't believe was sufficiently profitable to enter.

The economics of high-bandwidth Internet access -- even in urban areas -- are similar to the neglected markets just described. The organizers of the cooperative want high-bandwidth Internet access and a high-bandwidth network that will connect them to each other, and they want the services at prices they can afford. The traditional for-profit companies, however, have business plans that either don't include these services or include them at high, unaffordable "market-based" prices. Traditional service providers have other services (i.e., DSL, cable modems) they want to sell to the community group market. They don't want to provide services that will cannibalize their investments in the services they currently provide. Given the general lack of competition in the market for high-bandwidth services, the traditional service providers don't feel the pressure to abandon their current services prematurely and provide the services the organizers desire or to provide them at affordable prices.

This past Spring, the organizers decided to investigate the idea of a cooperative as a means to achieve their goals. Cooperatives are corporations that are owned and operated on behalf of their members. The members form the cooperative to conduct business for the benefit of the membership. The members can be producers or manufacturers of the goods and services sold; or they can be consumers of goods and services purchased. In each case, cooperatives aggregate the supplies or demands of their members to secure better prices for their members. Purchasing cooperatives buy in bulk and obtain discounted prices. Producer cooperatives aggregate supplies and may provide common storage/warehousing and marketing functions. Both are able to spread the fixed shared costs of marketing and other technical functions among larger numbers of people, reducing the per-unit costs for their products and services.

As a customer, the members of an Internet cooperative would have two relationships with the cooperative -- as customer and owner. Users would receive service from the cooperative and pay monthly charges for the service through service agreements. As an owner, the members have ownership interests in the cooperative with the power to manage the cooperative's business. This governing power is exercised through the election of a board of directors and the officers or managers hired by the Board. The terms of this second relationship are spelled out in the Articles of Incorporation and By-Laws.

Cooperatives can also serve non-members. However, the Internal Revenue Service limits the revenues that can be received from non-members to no more than 15% of the cooperative's total revenue.

B. General Advantages.

The general advantage of cooperatives in this situation is their ability to focus on the interests of their members. Cooperatives are established with the specific goal of obtaining a service that meets the members' needs and that, for whatever reason, for-profits fail to provide. The services, therefore, are deliberately designed to satisfy the members' particular needs. This focus on member needs stems from the members' ownership of and power to manage the cooperative.

C. Special Advantages.
A newly-formed cooperative would also not be constrained, at least initially, by legacy infrastructures and services. Unlike the standard services offered by traditional service providers (which services are based upon embedded technologies and business plans), an Internet cooperative can offer Internet products tailored to match the members' needs.

Traditional service providers, for example, generally sell Internet access in blocks of Kilobits per second (Kbps) and Megabits per second (Mbps).[13] A cooperative, however, can allow its members to share the full amount of the cooperative's bulk purchase, recognizing that no member is likely to dominate the connection given the intermittent and burstable nature of most Internet use. This is similar to the product offering in the Smart Building project, which provides all customers with equal access to the full 10 Mbps of the project's Internet connection, instead of selling discrete Kbps segments of the connection. The result is lower prices for a higher bandwidth connection.

An advantage over non-profit service provider is the cooperative's ability to serve for-profits -- increasing the scale of the business and the cooperative's ability to cover its recurring costs. The tax-exempt status of a 501(c)(3) organization would be jeopardized by serving for-profit organizations for a fee.

An advantage over a for-profit organizational form is the cooperative's establishment of cost-based prices versus the substantially higher market-based prices charged by for-profit service providers. The cooperative's rates are determined by the members' elected representatives, and, as noted earlier, cooperatives are not allowed to charge rates to members in excess of the cooperative's costs. Excess revenues must be returned to members. In addition, as a federally tax-exempt organization, a cooperative will likely stand a better chance of meeting eligibility standards for foundation and government grants than a for-profit organization. Its tax-exempt status makes it eligible to purchase directly under the Smart Building's upstream Internet contract. Finally, a cooperative can qualify under section 501(c)(12) for tax-exempt status for federal income taxes.

There are also several, potential disadvantages that require attention when forming the cooperative organization. The first is the ability to use for-profit or large customers as a source of subsidies. The second is the challenge of continuing the original focus and goals of the founders. The third is the ability to satisfy the eligibility conditions of foundation and government grant programs and to avoid tax liabilities for grants received.

D. IRS Requirements for Internet Cooperatives. The IRS has recently determined that the provision of Internet service is an appropriate function for a cooperative organized under section 501(c)(12) of the Internal Revenue Code. The IRS has also established guidelines for the organization and operation of such cooperatives.

[13] One Kbps = 1,000 bits per second. One Mbps = 1,000,000 bits per second

Section 501(c)(12) provides tax-exempt status for mutual life insurance associations, mutual ditch or irrigation companies, cooperative telephone companies, electric companies and "like organizations." 26 U.S.C. 501(c)(12). Recent IRS guidance concludes that Internet service providers can be considered as "like organizations," if they comply with cooperative principles. IRS Manual, at 12-10 to 12-11.

There are three basic tests -- (i) the cooperative organizational and operational test, (ii) the activities test, and (iii) the income source test.

1. Cooperative organizational and operational test. This test requires that the organization be organized and operated as a cooperative. This test has eight elements:

a. Democratic control by members. A cooperative satisfies this by periodically holding democratically conducted meetings, with members, each with one vote, electing officers to operate the organization. According to the IRS, ISPs must function with true democratic control by members and operate on a true mutual and cooperative basis within the meaning of this section. (Rev.Rul. 57-420). Nevertheless, the IRS also appears to accept voting arrangements based upon criteria such as the amount of business a member does with the cooperative. However, the IRS requires that such alternative arrangements be explicitly authorized by the state's statute on cooperatives.

b. Operating at cost. The cooperative must return the excess of net operating revenues over its cost of operations to its members. It must not operate either for profit or below cost. The excess is usually called "savings". Savings belong to the members, and the cooperative must allocate the savings in proportion to the amount of business it did with each.

c. Subordination of capital. This requires that contributors of capital to the cooperative, in their status as equity owners, neither control the operations nor receive most of the pecuniary benefits of the cooperative's operations. So, members own the savings, rather than shareholders or equity investors. The cooperative must limit the return on capital (e.g., dividends to shareholders) to insure savings or pecuniary benefits benefit members rather than shareholders.

d. Records of members' interests. The organization must keep adequate records of each member's rights and interest in the assets of the organization.

e. Distributions in proportion to members' interests. The organization must distribute any savings to members in proportion to the amount of business done with them (based on the operation at cost principle).

f. Distribution of excess revenues. The cooperative must not retain more funds than it needs to meet current losses and expenses (also based on the operation at cost principle).

g. No forfeiture upon termination of membership. The cooperative cannot forfeit a member's right and interest in the organization upon termination of membership.

h. Distributions upon dissolution. Upon dissolution, the cooperative must distribute any gains from the sale of any appreciated asset to all who were members while the cooperative owned the asset in proportion to the amount of business done with each, so far as practical.

See Rev.Rul. 72-36; Michael Seto and Cheryl Chasin, "General Survey of I.R.C. 501(c)(12) Cooperatives and Examination of Current Issues, Exempt Organizations Continuing Professional Education (CPE) Technical Instruction Program for FY 2002 (October 2001), at 177-179.

2. Activities test. The cooperative must conduct activities described in section 501(c)(12) and its regulations. The IRS has approved the provision of Internet services as activities within the scope of this section.

3. Income source test. The cooperative must derive 85 percent or more of its service income from sales to members. Grants and donations are not considered income for this test.

E. Cooperative Models Used in Other Locations. As noted above, the IRS has specifically approved the provision of Internet services as a permitted activity of a 501(c)(12) cooperative. However, it is unclear how many Internet cooperatives have actually been formed.

Info Ren found a number of inter-related Internet cooperatives in Colorado. The cooperatives operate on two levels. The highest level is the Colorado Internet Cooperative Association. The Association buys Internet services in bulk on a large scale and sells both to other service providers and directly to end users. It has been operating since 1994. It has more than 150 members and provides service to more than 40 percent of the ISPs in the Denver metro area and most of the ISPs in Colorado.

The Association has an executive director, a membership director and a technical staff, some of which are employees and some of which are consultants. The Association has a board of directors elected by the members and a volunteer technical review committee appointed by the board.

The prices are higher than the target prices proposed for the Pittsburgh coop. The Association, fore example, charges $128 per month for a 128 Kbps connection, $640 per month for a T1 connection and $3,690 per month for a 9 Mbps (fractional T3) connection. See www.coop.net.

One of the purchasers of the Association's services is the Northern Colorado Internet Cooperative (NCIC), serving Fort Collins, Loveland and Greeley along the Northern Front Range of the Colorado Rockies.

NCIC provides services through a variety of technologies -- ISDN, T1 and Ethernet. It bases its prices on an average consumption model similar to that proposed for the Pittsburgh cooperative. NCIC has a standard $90 monthly charge with a $135 per month charge for the first 256 kbps of consumption. Additional increments of 256 kbps average consumption cost an additional $135 per month.

F. Issues.

1. Governance (continuing focus as number of members increases and interests diverge). The success of the wireless network, to date, has been the result, in large part, of the unified vision and commitment of the organizers. Similarly, a large reason for some of the sputtering of earlier efforts with the I-Net, for example, has been the divergent visions, interests and commitments of the participants.

One of the primary characteristics of a cooperative is its governance on democratic principles. The members have voting power over the governance of the cooperative, and membership is, with limited exceptions for service to non-members, determined simply by the purchase of services. As the cooperative's membership grows (i.e., growth is required for sustainability), the direct influence of the organizers will diminish.

The diminution in the organizers' influence may not be a bad thing. After all, if one of the goals of the cooperative is to be responsive to member interests (and, therefore, also presumably community interests), the increase in member/community representation should satisfy the community's interests more effectively. However, the diminution in the organizers' influence also presents the risk that the forces gaining increasing influence will promote increasingly narrow, private interests (not community interests). These other interests might be special interests unique to certain areas of the city or unique to the nature of the class of customers. Narrower, for-profit interests, for example, might emerge and start to dominate the membership.

Other corporate forms of organization (apart from cooperatives) can establish and maintain the control of the organizers more securely. These options might be explored further if the organizers are significantly concerned with this issue. The other organizational forms can be structured to obtain many of the advantages of the cooperative, but some advantages -- community control and responsiveness, cost-based pricing and access to grant funds -- may be lost. See discussion below.

2. Fundraising.

a. Minimum eligibility criteria for foundation and government grants. Since the coop's business strategy is to rely upon foundation and government grants to fund the organization's capital costs, the coop's eligibility to receive such grants is a crucial issue.

(i) Foundation grants. Foundations often announce that an eligibility criterion for grants is an applicant's status as a 501(c)(3) organization. But what is the source of the criterion? Is it mandatory? And by whom is it imposed? If imposed by the foundation, can it be waived? If imposed by another source, can it be waived?

On one level, the IRS regulates the purposes and organizations to which private foundations can give money. Funds granted contrary to the IRS's guidelines may make the foundation liable to the IRS for penalties known as "excise taxes." The permitted purposes generally are characterized as "charitable purposes." Accordingly, grants to charitable organizations (i.e., 501(c)(3) organizations) are presumptively valid. Grants may nevertheless be made for charitable purposes to other organizations, including for-profit organizations, but foundations are required to exercise adequate controls over such grants to ensure that the funds are actually used for the intended charitable purposes. 26 CFR 53.4945-5. "Charitable purposes" includes the same religious, charitable, scientific, literary or educational purposes for which a 501(c)(3) organization can be formed. 26 U.S.C. 170(c)(2)(B).

Apart from the fundamental requirements of the IRS, foundations may establish their own policies to deal with these issues. The policies may be more restrictive than the IRS policies to avoid the need for the greater grant supervision and the associated risks, or they may merely address the issues on a case by case basis.

In any event, a 501(c)(12) cooperative would not qualify as the type of charitable organization for which a foundation grant would be presumptively valid. Nevertheless, grants could be made to the cooperative (consistent with the IRS requirements) for purposes considered charitable in nature, but the grants would likely be subject to the additional IRS requirements discussed above. Individual foundation grant programs would have to be reviewed on a case by case basis to determine whether the foundations would be willing to award funds to a cooperative.

(ii) Government grants. Eligibility standards for government grant programs aren't governed by the "charitable purpose" limitation affecting foundations. Government standards are based upon the goals of specific programs. They, therefore, vary in the scope of eligible organizations and in the specificity with which they describe eligible organizations. Some programs distinguish between "non-profit" and "for-profit" organizations. In addition, the term "non-profit" is often used loosely without regard to whether the standard applies to "non-profit" organizations as established under state law, as "tax-exempt" organizations as approved under the Internal Revenue Code, or as the special class of "charitable organizations" established as tax-exempt under section 501(c)(3) under the Internal Revenue Code.

The following are examples:

-- Pennsylvania "Digital Divide" grant program (Dept. of Community and Economic Development)(March 2002): "Non-profit community and economic development organizations, including educational organizations, that can facilitate one or all of the following: high speed Internet capabilities, increased computer access and technology skills training for low-income Pennsylvania residents."

-- CTC grant program (U.S. Dept. of Education)(Fiscal Year 2002): "Community-based organizations, including faith-based organizations, State and local educational agencies,

institutions of higher education, entities such as foundations, libraries, museums and other public and private nonprofit organizations or for-profit businesses."

-- Technology Opportunities Program (U.S. Dept. of Commerce)(Fiscal Year 2002): "All non-profit entities (including, but not limited to, faith-based organizations, national organizations and associations, non-profit community-based organizations, non-profit health care providers, schools, libraries, museums, colleges, universities, public safety providers) and state, local, and tribal governments are eligible to apply. Although individuals and for-profit organizations are not eligible to apply, they are encouraged to participate as project partners."

Cooperatives can be organized as either "non-profit" or "for-profit" under state laws, and they are usually established as section 501(c)(12) tax-exempt organizations under the Internal Revenue Code. The type of business activity in which a particular non-profit engages, however, will determine whether it can qualify as a Pennsylvania "non-profit." It appears from some old case law that cooperatives formed to provide services at below-market prices for their members are considered "for-profit" organizations.

DCED also has grant and loan programs open to for-profit businesses. The Innovation Investment Fund program administered through the Ben Franklin Development Authority and its regional subsidiaries, for example, invests seed capital in the promising early stage technology companies. These programs are explicitly designed for for-profit businesses, however, such that the award criteria are focused primarily upon economic factors, rather than community needs.

b. Discretionary preferences for collaborative efforts. Apart from minimum eligibility standards, the collaborative nature of a cooperative -- combining and unifying the efforts of community groups and for-profits often in distressed areas -- may actually enhance the organization's ability to receive grants compared with other organizational forms. The TOP, CTC and Digital Divide grant programs all state describe collaborations of public and private organizations as a key factor in award decisions. The TOP program assigns the relative weight of 15% to the criterion of "community involvement." The TOP guidelines describe "community involvement" as an applicant's "partnerships" with unaffiliated organizations from the public, non-profit and private sectors as an ongoing and integral part of project planning and implementation. The CTC and Digital Divide guidelines also include collaborations as a significant factor in the decision-making process.

c. Tax liability for foundation and government grants. To the extent the cooperative relies upon foundation and government grants to fund capital costs, the cooperative benefits most if the grants received are not treated as "income" to the cooperative. If treated as income, the cooperative risks failing the 85% income test for the organization's tax-exempt status.

Internal Revenue guidance states specifically, with respect to government grants, that a grant is treated as a "contribution to capital", not "income", if it meets the following conditions:

1. The grant must become a permanent part of working capital.
2. The grant must not be compensation for specific quantifiable services.
3. The use of the grant is subject to conditions imposed by the grantee.
4. The grant must benefit the corporation commensurate with its value.
5. The grant must ordinarily be employed to generate additional income.

Rev. Rul. 93-16, 1993-1 C.B. 26; CPE at 188; 26 U.S.C. 118(a).

Conversations with IRS staff counsel indicate that the same conditions apply to the receipt of foundation grants.

d. Related 501(c)(3) organization as a funding conduit. As discussed earlier, the cooperative might partner with 501(c)(3) organizations to raise funds for programs that involve charitable purposes -- and are therefore eligible for foundation funds. These partnerships can involve educational, health care and employment programs, and the funds awarded to the charitable organizations can help subsidize customer connection costs and even the recurring costs of services related to the programs.

3. Definition of members and non-members. The definition of the organizations eligible for membership will carry at least two implications -- for pricing and for governance. As noted above, cooperatives use cost-based pricing for members and market-based (presumably higher) pricing for non-members -- subject to the limitation that only 15% of the coop's revenues can come from non-members. The establishment of a non-member customer class can, therefore, help generate revenues that can help keep members' rates low.

Second, members have voting rights in cooperative affairs. Non-members don't. The establishment of membership standards will, therefore, have an impact on the cooperative's policies. The impact is limited, however, since voting rights are generally established on a one-member one-vote basis rather than in proportion to the size of the members' purchases.

4. Other organizational options. In addition to the cooperative form of organization, Info Ren examined several organizational forms to determine whether they might more easily address the crucial issues affecting the cooperative. Info Ren examined the usual section 501(c)(3) organizational form, the usual for-profit form, and a for-profit organizational form with restricted ownership.

The analysis, summarized in Table IV-1, addresses the following issues:

-- Ability to enroll customers and to provide service at lower costs and prices
-- Community control and responsiveness

-- Fund-raising abilities

On all key issues, the cooperative form of organization is superior.

G. Recommended Cooperative Structure.
1. Governance. The governance of a cooperative is similar to the governance of a normal for-profit corporation, except that the ultimate holders of governing power are the cooperative's members, not its stockholders. Members elect the cooperative's board of directors, which has responsibility for the overall management of the organization. The board of directors can hire officers, employees and/or contractors to carry out the cooperative's daily operations. Table IV-2.

The governing structure will be spelled out in the Articles of Incorporation, in the by-laws and in the member agreement. The member agreement can be included in the by-laws or established in a separate document.

2. Purchase of services.
Since the members of a cooperative that sells services to its members are the actual purchasers of the cooperative's services, the members also have a buyer-seller relationship with the cooperative. The terms of the contract by which the member buys service from the cooperative are set forth in the by-laws or in a separate membership agreement.

The membership agreement can be executed in a variety of ways. Individual customers can deal directly with the cooperative's staff, or, in the case of a building owner-facilitated memberships, the members can execute the cooperative's member agreement presented by the building owners. These building owner-facilitated agreements can be agreements on forms provided by the cooperative or by agreements incorporated into the building owners' lease documents.

V. Transition and Growth Strategies.
A. Formation and Organization of Cooperative. Several tasks need to be performed to establish the cooperative:

-- Fundraising sufficient for cooperative's capital and recurring costs.
-- Negotiation of transition agreement with Info Ren.
-- Approval of existing Info Ren customers to the transfer.
-- Negotiation of other contracts and hiring of personnel.
-- Incorporation and initial actions by the cooperative.
-- Application for approval of 501(c)(12) status from the IRS.

These tasks would be performed by the cooperative's incorporators, which would include some or all of the members of the Executive Committee, or the cooperative itself.

1. Fundraising sufficient for cooperative's capital and recurring costs. This is probably the most important step. The cooperative needs to raise the initial funds

required to start up the cooperative's operations. The cooperative needs at least to raise sufficient funds initially to cover the first year's capital and recurring costs. An ongoing effort must then be undertaken to raise the balance of the required funds. The initial fundraising can be done by the incorporators of the cooperative -- likely to be the Executive Committee -- prior to the formal incorporation of the cooperative.

2. Negotiation of transition agreement with Info Ren. The incorporators of the cooperative should negotiate an agreement with Info Ren to provide for the transfer of necessary assets and liabilities for the network. This needs to be completed to provide for the orderly transfer of service to customers.

The wireless network, as currently constituted, consists of equipment installed and owned by Info Ren with funds generated from a variety of sources. Info Ren may also have vendor contracts to be assigned to the cooperative. The network is also serving customers whose contracts would have to be assigned to the cooperative, with the customers' approval.

The cooperative and Info Ren will need to negotiate an agreement transferring the equipment and customer contracts from Info Ren to the cooperative. The parties will need to identify the equipment to be transferred and the terms of the transfer.

3. Approval of existing Info Ren customers to the transfer. Info Ren's agreements with the current wireless subscribers are assignable without the customers' consents, but the cooperative's membership agreement will have additional terms beyond those in the current service agreements. The agreements might be assigned to the cooperative as written with the customers being treated as non-members (i.e., not subject to the cooperative's membership agreement) or, to be considered coop members, the customers will have to consent to the coop's membership agreement.

4. Negotiation of other contracts and hiring of personnel. If the cooperative needs contracts in addition to those transferred from Info Ren, it or its incorporators need to negotiate and execute them. The cooperative also needs to hire necessary personnel.

5. Incorporation and initial actions by the cooperative. Info Ren will prepare a set of proposed Articles of Incorporation, bylaws and membership agreement as part of the business plan. The incorporators will approve and file the Articles of Incorporation, forming the cooperative. Thereafter, the cooperative will hold an organizational meeting, where the board will take formal action approving the bylaws and membership agreement and conduct any other necessary actions, such as authorizing contracts, ratifying contracts made by the incorporators and hiring personnel.

6. Application for approval of 501(c)(12) status from the IRS. A cooperative qualifies for tax-exempt status under section 501(c)(12) by conducting its activities in conformance with the statute and regulations. Prior approval of such status by the IRS before starting operations is not required. The IRS estimates that the application and approval process should be expected to take approximately four months. Nevertheless,

the IRS approval is generally desirable, but it need not hold up the establishment of the cooperative and the start of operations.

Attachments

Inroduction

I-1 Goals & Strategies

Operational Plan

II-1 Marketing Plan

II-2 Services & Prices

II-3 High-Bandwidth Cooperative Services vs. DSL Services

Financial Plan

III-1 Capital Costs

III-2 Recurring Costs

III-3 Breakeven Summary

Organizational Plan

IV-1 Alternative Organizational Models

IV-2 Organizational Structure

Attachment I-1
Goals & Strategies

Primary Goals:

1. High-bandwidth Internet access
2. Local high-bandwidth network connections between users
3. Prices affordable by small organizations
4. Prices to recover recurring costs without long-term subsidies (sustainability)
5. Service available everywhere
6. Community control of infrastructure and service
7. Responsiveness to community needs
8. Dedicated technical assistance
9. Continuing research & development to stay current & develop new technologies & applications

Additional Operational Goals:

1. Ability to serve for-profits (econ. development & sustainability)
2. Ability to establish rate classes
3. Ability to charge higher rates to large users
4. Ability to assist small non-profits
5. Eligibility to raise funds from foundations and public agencies
6. Ability to purchase from Smart Bldg contract

Strategies:

1. Infrastructure Strategy
    - High-bandwidth wireless network
        - High-bandwidth upstream Internet connection
        - 60 Mbps wireless backbone
        - 11 & 60 Mbps wireless distribution ("last mile") connections
    - Strategic use of fiber where feasible for backbone, between adjacent buildings and for difficult links

2. Business Strategy
    - Public funds for capital costs
    - User fees for recurring costs
    - Use of cooperative form of organization
        - Cost-based pricing
    - Grants for continuing R&D

Attachment II-1
Marketing Plan

Theme: Internet & networking services far surpassing DSL & cable modem services at the prices of DSL & cable modem services.

1. Unique Features of Co-op Services:

Unique Services
- Burstable high-bandwidth Internet
- Wide Area Network service
- Email
- High-bandwidth web hosting uplinks
- IP Addresses (for servers & video-conferencing)

Lower prices than for similar commercially-provided services
Community collaborations
Community-owned translates into services tailored for community needs.

2. Pricing

Member services priced at levels of DSL and cable modem services
Non-member services priced at discount from market levels

3. Customers & Marketing Strategies

Non-profits & neighborhood businesses

Solicited by community cluster coordinators
Collaborations with the United Way, the Pittsburgh Technology Council and other local membership and trade organizations
Office building owners

Resellers & other customers

Coop staff

4. Marketing Tools

Examples of community group programming
Website & FAQs
Printed materials

Attachment II-2
Wireless Neighborhoods
Services & Prices

High-Bandwidth Internet & Wide Area Network Service

Wireless Neighborhoods vs. DSL The pricing goal of Wireless Neighborhoods is to provide a very high-bandwidth service -- a service with bandwidth far greater than with DSL service -- at prices that are the same or lower than the prices for business DSL services.

Internet Access -- Burstable vs. Capped Services. The Coop's services and pricing are fundamentally different from the services and pricing of traditional service providers. Traditional service providers sell finite quantities of bandwidth that the service provider claims it will make available for the user at all times. The providers establish prices for the finite amount of the bandwidth purchased. Thus, a user purchasing a 128 kbps DSL service may use up to 128 kbps of Internet access at any point in time but can, in fact, use no more than 128 kbps of service at any time.

The Coop, however, sells users shared access to the full amount of the capacity that is available over the network at any time; but the Coop charges users only for the bandwidth they use. User's consumption is also measured on an average basis -- instead of the peaks to which they burst -- to eliminate the impact of spikes in use over the month. Thus, a Coop user purchasing a 100 kbps level of service can use up to the full amount of the network's upstream Internet access (currently pegged at 10 Mbps -- or 10,000 kbps). This is almost 80 times greater peak capacity than is available with a 128 kbps DSL connection.

Coop pricing, accordingly, encourages people to use bandwidth and to make the uses affordable. Further, the Coop will increase the upstream capacity as needed to prevent the congestion that might occur with increasing numbers of users.

WAN Service. In addition to Internet Access, the Wireless Neighborhoods Project provides its users with Wide Area Network (WAN) service. This is the ability to communicate with others in the WAN at speeds typical of a Local Area Network (LAN). WAN communications go directly from one user to the other over the high-bandwidth wireless backbone of the network -- without going out over the Internet and encountering the congestion there that slows data traffic. With transmissions at LAN speeds, users are able to collaborate extensively by sharing software and other resources and conducting high-quality streaming video and video-conferencing.

Wireless Neighborhods Service Levels. A basic rate class for Internet Access is established at the $100 per month level for the average consumption of 50 kbps or less. This level is consistent with the consumption of small users in the Smart Building. A second rate class is established at the 100 kbps level for $150 per month and thereafter at 100 kbps and $100 per month increments.

Based upon our experience to date, the typical small user will fit in the $100 per month rate class, although larger users with heavily-used computer labs may fall in the $150 per month class. Larger users replacing a T1 line may fall in the $250 to $350 per month rate class.

A customer's rate class and price are determined on a prospective basis tied initially to the customer's reasonable expectations. Prices are not determined retroactively based upon actual use. The network manager will monitor use and contact the user if its use exceeds the contracted level. If it appears that the customer's spending patterns are normal and likely to continue, the parties will discuss whether to transfer into a higher rate class, to use consumption-limiting technologies to restrict the customer's actual use or to identify other options. There is no additional charge for the WAN service.

Connection Costs. Users connect to the network with an antenna and a radio and a cable that plugs into the user's LAN. A router is also required. The antennas and radios have, to date, been installed on users' rooftops, and the cable has run from the roof through the most convenient wiring path to the LAN. We are also exploring the use of equipment that can be installed on window ledges to minimize installation costs. Several types of equipment are available, but all are relatively small and lightweight.

Connection costs are the responsibility of the user -- although we are constantly seeking grant funds to help defray those costs. Costs for 11 Mbps installations (including antenna/radio unit, cabling and router) approximate $2,500 to $3,500. Costs for 60 Mbps installations approximate $3,500 to $4,900. Costs vary depending upon the difficulty of the installation. Depending upon the availability of funds, users can also pay the connection costs over a multi-year period.

Wireless Neighborhoods Price List

Members:

1. Membership Fee

One-Time Membership Fee	$100.00

2. Internet access -- Shared burstable service & WAN connection

a. Equipment & installation surcharges

Option 1	Actual costs funded by customer or grant
Option 2	Actual costs amortized over three years approx. $136 per month for 60 Mbps unit approx. $95 per month for 11 Mbps unit

b. Recurring charges:	Monthly price
First 50 kbps* **	$100
51 to 100 kbps	$150
101 to 200 kbps	$250
201 to 300 kbps	$350
301 to 400 kbps	$450
Additional 100 kbps increments	$100 each

* Average use

** Typical user

3. Email

a. Non-recurring charges:

Domain registration	Actual costs

b. Recurring charges:	$5.00 per email account $25 for packages of ten accounts

4. Web hosting

a. Non-recurring charges:	$25
b. Recurring charges:	
Basic service (100 Mbs of disk space; test & prod. site)	$40
Advanced service (Unlimited disk space plus consulting (40 hours)	$166

5. Technical Assistance

LAN maintenance	Negotiated monthly fee or
Subscriber unit maintenance	Time and materials
Smart building maintenance	

Attachment II-3
High-Bandwidth Co-op Services vs. DSL & Cable Modem Services

Internet	Bandwidth	One-Time Charge	Monthly Price	Email	Price	IP Addresses	Price	Key Differences
Verizon DSL								
	.768M/.128M	$159	$49.95	6 boxes	Initial boxes	None		Bandwidth too slow &asymmetric
	.768M/.128M	$159	$59.95	6 boxes	included	None		for high-bandwidth applications
	1.5M/.128M	$159	69.95	6 boxes	(additional	None		
	.384M/.384M	$159	$79.95	6 boxes	$6 for 5 MB	None		No IP Addresses=No Servers (Email, web hosting,
	1.5M/.384M	$159	$89.95	6 boxes	boxes;	None		streaming video); No Video-Conferencing
	.768M/.768M	$159	$129.95	6 boxes	$8.60 for	None		
	7.1M/.768M	$159	$204.95	6 boxes	10 MB boxes;	None		
					or are tied to web hosting purchases)			
Stargate DSL								
	.384M/.384M	$583-$793	$199	5 boxes	Initial boxes included	5	$25 per	Not enough bandwidth for high-bandwidth applications
			$189		$5 per box extra		month for each block	No local traffic exchange (extra charges for VPNs)
	.768M/.768M	$583-$793	$299	10 boxes	Initial boxes included	13	of 4 addrresses	Not enough bandwidth for high-bandwidth applications
			284		$5 per box extra			No local traffic exchange (extra charges for VPNs)
Comcast cable modem (business service)								
Small office (See note 1)	.7 Mbps (ave.) .256 Mbps	$200	$99	5 boxes		1		Not enough bandwidth for high-bandwidth applications No local traffic exchange (extra charges for VPNs)
Multi-User (See note 1)	.7 Mbps (ave.) .256 Mbps	$500	$249	5 boxes		1		Not enough bandwidth for high-bandwidth applications No local traffic exchange (extra charges for VPNs)
Multi-User (See note 2)	.7 Mbps (ave.) .512 Mbps	$500	$349	5 boxes		1		Not enough bandwidth for high-bandwidth applications No local traffic exchange (extra charges for VPNs)
Wireless Neighborhoods High-bandwidth Internet	10M/10M	$2,000 -$3,500 (or $69-$125 monthly surcharge for 3 years)	$100 & up		$5 per box	yes as needed	To be determined	Much higher peak performance than DSL at prices comparable to DSL. Plus IP addresses for servers & video-conferencing

Notes:

1. Up to 3 Mbps downstream, 700 Kbps ave. Up to 256 Kbps upstream. No servers permitted.
2. Up to 3 Mbps downstream, 700 Kbps ave. Up to 512 Kbps upstream. 15 users permitted. Additional charge for servers

Web Hosting	Storage Space	Price	Telecom Uplink	
Verizon				
	155 MB	$25.15 monthly $49.95 one-time	Not Specified	Comes with 10 5 MB email boxes No guaranteed uplink speed prevents high-performance sites.
	300 MB	$50.95 monthly $49.95 one-time	Not Specified	Comes with 20 5 MB email boxes No guaranteed uplink speed prevents high-performance sites.
Stargate				
Level 1	30 MB	$24.95	Not Specified	Comes with 10 5 MB email boxes
Level 2	60 MB	$49.95		Comes with 20 5 MB email boxes
Level 3	120 MB	$79.95		Comes with 30 5 MB email boxes No guaranteed uplink speed prevents high-performance sites.
Wireless Neighborhoods				
Basic	100 MB plus test site	$40.00	10 Mbps	
Advanced	Unlimited space, MySQL databases 40 hrs of consulting	$166.00	10 Mbps	

Attachment III-1
Capital Costs

	Starting Balance	Next 20 End User Installations	50 End User Installations (Next 25 units)	75 End User Installations (Next 25 units)	100 End User Installations (Next 25 units)	150 End User Installations (Next 50 units)	200 End User Installations (Next 50 units)
Additional WQED Tower costs							
Base station panels (Note 1)			$19,000	$19,000			
Miscellaneous equipment & installation			$12,000	$12,000			
Router & switch			$4,000	$4,000			
Point to point link (WQED Tower to RET)				$20,000			
Network monitoring & testing			$5,000				
Subtotal	$35,000	$0	$40,000	$55,000	$0	$0	$0
Neighborhood Hub costs							
$6,500 each for two access point hub							
Equipment package		$13,000	$13,000	$13,000	$13,000	$13,000	$13,000
Subtotal	$22,000	$13,000	$13,000	$13,000	$13,000	$13,000	$13,000
Subscriber unit costs							
60 Mbps subscriber units ($3,000 each installed)(20% of installs)		$12,000	$15,000	$15,000	$15,000	$30,000	$30,000
802.11b subscriber units ($2,200 installed)(80% of installs)		$35,200	$44,000	$44,000	$44,000	$88,000	$88,000
Site electronics ($500)		$10,000	$12,500	$12,500	$12,500	$25,000	$25,000
Subtotal	$30,000	$57,200	$71,500	$71,500	$71,500	$143,000	$143,000
Other costs							
Spare equipment		$6,000	$6,000	$6,000	$6,000	$6,000	$6,000
Replacement reserve							
Subtotal		$6,000	$6,000	$6,000	$6,000	$6,000	$6,000
Total	$87,000	$76,200	$130,500	$145,500	$90,500	$162,000	$162,000
Cumulative Total	$87,000	$163,200	$293,700	$439,200	$529,700	$691,700	$691,700
Cumulative Totals (minus sub. units)	$57,000	$76,000	$135,000	$209,000	$228,000	$247,000	$266,000
Ave. capital cost per subscriber	$17,400	$8,160	$5,874	$5,856	$5,297	$4,611	$3,459

Notes:
1. The capital expenditures for the base station units noted for the 50 and 75 end user installations will deploy four base station units on the WQED Tower, bringing the total to six for a full 360 degree range of coverage.

Attachment III-2
Recurring Costs

	20 Members		50 Members		75 Members		100 Members		150 Members		200 Members	
	Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual
1. Total Costs												
Recurring Expenses:												
Direct network expenses:												
Upstream Internet connection	$320	$3,840	$800	$9,600	$1,200	$14,400	$2,000	$24,000	$3,000	$36,000	$4,000	$48,000
Redundant Internet & IP addresses	$120	$1,440	$120	$1,440	$120	$1,440	$120	$1,440	$120	$1,440	$120	$1,440
WQED Tower rental	$275	$3,300	$550	$6,600	$825	$9,900	$825	$9,900	$825	$9,900	$825	$9,900
Maintenance (note 1)	$1,360	$16,320	$2,448	$29,370	$3,660	$43,920	$4,414	$52,970	$5,764	$69,170	$5,764	$69,170
Accounting & bookkeeping	$620	$7,440	$920	$9,200	$1,170	$14,040	$1,420	$17,040	$1,920	$23,040	$2,420	$29,040
Marketing (& organizing)	$2,000	$24,000	$2,000	$24,000	$2,000	$24,000	$2,000	$24,000	$2,000	$24,000	$2,000	$24,000
Subtotal	$4,695	$56,340	$6,838	$80,210	$8,975	$107,700	$10,779	$129,350	$13,629	$163,550	$15,129	$181,550
Average recurring cost per customer	$235		$137		$120		$108		$91		$76	
Personnel & G&A:												
Network management (including R&D)	$6,000	$72,000	$6,000	$72,000	$6,000	$72,000	$6,000	$72,000	$6,000	$72,000	$6,000	$72,000
Design & engineering	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996
Project management	$4,250	$51,000	$4,250	$51,000	$4,250	$51,000	$4,250	$51,000	$4,250	$51,000	$4,250	$51,000
Systems admin. (.5 FTE)	$1,667	$20,004	$1,667	$20,004	$1,667	$20,004	$1,667	$20,004	$1,667	$20,004	$1,667	$20,004
User support (1 FTE)	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996	$3,333	$39,996
User support (.5 FTE)			$1,667	$20,004	$1,667	$20,004						
User support (1 FTE)							$3,333	$39,996	$3,333	$39,996	$3,333	$39,996
Benefits (30% of salaries)	$4,075	$48,899	$4,075	$48,899	$4,075	$48,899	$4,075	$48,899	$4,075	$48,899	$4,075	$48,899
Indirect Costs (rent, supplies, etc.)	$4,414	$52,974	$4,414	$52,974	$4,414	$52,974	$4,414	$52,974	$4,414	$52,974	$4,414	$52,974
(25% of salaries & benefits)												
Other contract work	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000
Subtotal (Personnel)	$28,072	$324,869	$29,739	$344,873	$29,739	$344,873	$31,405	$364,865	$31,405	$364,865	$31,405	$364,865
Contingency	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000	$1,000	$12,000
Total	$33,767	$393,209	$37,577	$437,083	$39,714	$464,573	$43,185	$506,215	$46,035	$540,415	$47,535	$558,415
Average recurring cost per customer	$1,688		$752		$530		$432		$307		$238	
2. 85% of total costs												
With co-op maintaining SUs	$28,702	$344,427	$31,940	$383,284	$33,757	$405,087	$36,707	$440,482	$39,129	$469,552	$40,404	$484,852
Average recurring costs per customer	$1,435		$639		$450		$367		$261		$202	
Potential revenues from	$5,065	$60,781	$5,637	$67,638	$5,957	$71,486	$6,478	$77,732	$6,905	$82,862	$7,130	$85,562
non-members (15% of total costs)												

Attachment III-3
Breakeven Summary

With $100 for initial 50 kbps, $150 for initial 100 kbps, $100 for add'l 100 kbps increments	Year 1	Year 2	Year 3	Year 4	Year 5	Breakeven Totals
Internet Services Only						
No. of Customers	50	100	150	200	250	250
Capital Costs	$206,700	$236,000	$162,000	$162,000	$218,000	$984,700
Year-End Revenues	$83,484	$166,968	$250,452	$333,936	$417,420	
Breakeven Gap	-$69,056	-$178,318	-$123,904	-$55,720	-$14,243	
Revenues (Note 1)	$41,742	$125,226	$208,710	$292,194	$375,678	
Recurring Costs (Note 2)	$152,540	$345,286	$374,356	$389,656	$431,663	
Deficit/Surplus (Revenues & Expenses)	-$110,798	-$220,060	-$165,646	-$97,462	-$55,985	-$664,193
Internet & Services Hosted on Local Servers						
No. of Customers	50	100	150	200		200
Capital Costs	$216,700	$246,000	$162,000	$162,000		$786,700
Year-End Revenues	$127,454	$254,908	$382,362	$509,817		
Breakeven Gap	-$38,688	-$117,581	-$19,197	$92,958		
Revenues (Note 1)	$63,727	$191,181	$318,635	$446,090		
Recurring Costs (Note 2)	$166,142	$372,489	$401,559	$416,859		
Deficit/Surplus (Revenues & Expenses)	-$102,415	-$181,308	-$82,924	$29,230		-$366,647
Internet, Services Hosted on Local Servers & Technical Support						
No. of Customers	50	100	150	200		175-200
Capital Costs	$216,700	$246,000	$162,000	$162,000		$786,700
Year-End Revenues	$156,764	$313,528	$470,292	$627,057		
Breakeven Gap	-$34,878	-$126,954	$740	$142,204		
Revenues (Note 1)	$78,382	$235,146	$391,910	$548,675		
Recurring Costs (Note 2)	$191,642	$440,482	$469,552	$484,852		
Deficit/Surplus (Revenues & Expenses)	-$113,260	-$205,336	-$77,642	$63,822		$425,000

Notes:

1. Year one revenues reflect half of full year revenues due to gradual enrollment throughout the year. Revenues for subsequent years reflect full year revenues for customers connected in prior years and one half revenues for current year due to gradual enrollment throughout the current year.
2. Year one recurring costs reflect half of year end costs due to gradual startup.

Attachment IV-1

Alternative Organizational Models

	Tax Exempt		Taxable (For-Profit)	
	Non-Profit 501(c)(3)	**Cooperative 501(c)(12)**	**Normal**	**Restricted Owmership**
Goals:				
Community control	Board of Directors Control	Customer-Member Control	Shareholder Control	Local Shareholders Local Control
Responsiveness to community needs	maybe	Yes responsiveness to member needs; but if for-profits or large users interests dominate, their interests may dominate	Depends upon interests of stockholders	Yes with deliberate choice of stockholders
Ability to serve for-profits	No	Yes	Yes	Yes
Different rates to non- and for-profits	Yes	2 conditions: (1) different services with different costs or (2) sales to for-profits as non-members	Yes	Yes
Fundraising from foundations & public agencies	Yes	Yes if for "charitable purposes" or with help of related non-profit to receive donations	Yes if for "charitable purposes" or with help of related non-profit to receive donations	Yes if for "charitable purposes" or with help of related non-profit to receive donations
Ability to purchase from RET contract	Yes	Yes	No	No
Issues:				
Continuing focus	No	Focus may diverge as customer base grows (& if large users, for-profits & special interests dominate	Can retain focus but risk of non-community focus	Can retain focus
Indirect requirement for uniform prices	No	Yes, unless: (1) different services or (2) sales to for-profits as non-members	No	No
Fundraising				
Funder eligibility standards	Yes	Gov. generally yes Foundations yes if for "charitble purposes" & with adequate controls (expenditure respnsibility)	Gov. sometimes Foundations yes if for "charitble purposes" & with adequate controls (expenditure respnsibility)	Gov. sometimes Foundations yes if for "charitble purposes" & with adequate controls (expenditure respnsibility)
Tax liability to recipient	No federal, state or local taxes for purposes of 501(c)(3)	No fed. taxes Maybe state & local	Yes unless through related non-profit	Yes unless through related non-profit
Tax exemption risks to 501(c)(3) members	Tax exempt status jeopardized; can't serve for-profits for fees	No	Not if properly structured	Not if properly structured
General Comments:				
Business Risk	Limited to non-profit corporation	Limited to cooperative & member investments	Limited to corporation and shareholder investments	Limited to corporation and shareholder investments
Sources of Funds	Grants & service revenues	Grants, service revenues debt, membership contributions & non-voting stock	Grants, service revenues, debt, stock	Grants, service revenues, debt, stock

Attachment IV-2
Organizational Structure

Membership
Defined -- Members and non-members
Customers
Governance
Membership agreement

Board of Directors
Elected by members
Makes cooperative decisions
Hires officers, employees & contractors as appropriate
Delegates authority to officers as appropriate

Officers
Hire employees

Corporate Sponsors
Non-voting members
Debt

Articles of Incorporation and By-Laws spell out relationships.