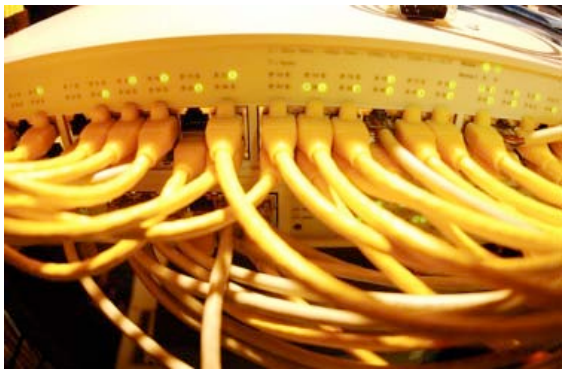
Broadband Strategies for the LDDs

Northwest Commission Recommendations



Prepared for
The Local Development Districts of Pennsylvania

January, 2007

DESIGN NINE
broadband architecture + engineering

Prepared for the Local Development Districts of Pennsylvania

Disclaimer

The telecommunications business is continually evolving. We have made our best effort to apply our experience and knowledge to the business and technical information contained herein. We believe the data we have presented at this point in time to be accurate and to be representative of the current state of the telecommunications industry. Market changes and new technology breakthroughs may affect our recommendations over time.

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State of the Telecom Industry in Rural Areas

Review of SSM Report

We agree with the Spots, Stevens, McCoy report that the Pennsylvania definitions of "broadband" and "advanced services" are inadequate. These definitions will limit the economic opportunities of Pennsylvania communities, especially smaller and rural communities that are already underserved. As other parts of the United States and other parts of the world move toward digital road systems with 100 and 1000 times the capacity of systems defined by Pennslyvania as "broadband" or as "advanced," businesses will be harder and harder to recruit and retain in the Commonwealth.

In Section 8.0 of the SSM report, we also agree that a minimum capacity of "100 Mbps or more will become the norm." It is important to recognize that we regard this as the basement or lowest possible acceptable bandwidth. As we noted in in Part One of this report, we recommend the following definition of broadband:

Broadband is whatever amount of bandwidth is needed to support a business' ability to compete in the global economy.

The key phrase in the SSM recommendation is "*or more*." While 100 megabit capacity is entirely adequate for a full range of services expected over the next seven to ten years, Gigabit Ethernet (1000 megabits) is already an off the shelf standard, albeit still very expensive for FTTP (Fiber To The Premise) applications. But some businesses are already demanding bandwidth well in excess of 100 megabits. A local hospital in the Northwest Commission LDD is having trouble securing reasonable prices for it current requirement of 200 megabits of bandwidth. Medical imaging applications and services are driving bandwidth needs in the healthcare industry, and doctor's offices, medical labs, clinics, and other non-hospital medical facilities will be early adopters of high bandwidth services when they become affordable.

The SSM report also provided key data in other areas. Pennsylvania has an unusually high number of cable television firms (67, from Figure 1.6.C in the SSM report). Of these only three are large national firms, and one of them listed is Adelphia. Adelphia's assets have been sold, and most service areas are now owned by either Time Warner or Comcast. The large number of local and regional providers suggests that if open service networks are adopted in the LDDs, there will be opportunities for these small and medium-sized companies to come onto the community systems and sell both to existing subscribers as well as reach a wider range of potential customers that were formerly too expensive to reach. Some firms may not be able to make the transition to a digital IP TV delivery system, but having so many smaller firms suggests that at least some of them would be able to compete successfully with larger national providers on a common, high performance digital roadway managed by the community or region.

The fiber map provided by SSM in figure 1.6.E is useful. The "miscellaneous" suggests that there is some potential to connect community-level and regional broadband projects using existing fiber already in place, either by securing long term leases for inter-city bandwidth, dark fiber

connections, or in some cases possibly purchasing fiber assets outright. Using existing fiber assets saves money and enables faster aggregation of local markets into larger groupings that can attract more service providers and create more competition (which lowers prices for services).

The table in Section 1.9 that catalogues typical current prices for broadband is accurate and illustrates the kind of costs that Pennsylvania businesses face today. However, it is important to keep in mind that tables like this are not a useful predictor of future prices, and such data has limited usefulness in designing viable business models for community-managed digital road systems.

In Section 8.0 (page 305) SSM states that "...running fiber to the home is too expensive in many typical residential applications." We do not agree, and the bulk of our LDD analysis is designed to show that there are ample funds in all LDD regions that are already committed to telecom service purchases. The challenge is to change the way those funds are being spent.

Telephone/DSL

DSL (Digital Subscriber Loop) technology utilizes existing copper twisted pair telephone lines to provide broadband services. There are many variants of DSL, and the differences among them are primarily bandwidth and distance. Most DSL systems are limited to a maximum of 18,000 cable feet from a telephone switch or remote access module (DSLAM). Faster variants of DSL are limited to as little as a few thousand feet, making the service areas inconsistent from a subscriber perspective. A neighbor a few houses away from a home with DSL service may be told that no DSL service is available (because of the cable limitations). Current low cost DSL residential service offerings are priced competitively compared to cable modem service, but also tend to be much slower.

Because of the requirement to deploy DSL equipment close to subscribers, rural areas are at a distinct disadvantage for DSL. It is not uncommon in rural areas to have cable runs of many miles (from a telephone switch), making DSL impractical without substantial equipment upgrades. Another problem in rural areas is the age of the telephone cable plant. Even if a home or business is located within the prescribed distance to DSL equipment, older copper twisted pair cable may not be capable of handling the DSL signal properly. In some cases, speed of the service is degraded, and in other cases, DSL may not work at all.

The primary problem with DSL is the lack of capacity over the long term. In an optimum DSL situation, with high quality cable plant and subscribers close to DSL switches, the fastest DSL is limited to 15 to 20 megabits *under these optimum conditions*. Most homes will never be able to receive DSL services at those speeds because of sub-optimal service conditions. DSL cannot provide the capacity needed by businesses and residents in the near future.

Cable Systems

Cable systems that provide broadband in most U.S. communities use what is called HFC systems, or Hybrid Fiber Coaxial systems. Typically, fiber delivers television and broadband signals to equipment located in or near a neighborhood, and copper coaxial cable is used to connect the subscriber's home or business with the equipment fed by fiber. Cable systems have never

been widely deployed outside community boundaries (residential neighborhoods and business districts) because of the high cost of placing equipment near subscribers. In this regard, cable systems are limited in the same way that DSL systems are limited, and rural communities are at a distinct disadvantage because of the lower density of homes and businesses.

Unlike DSL, cable systems are not likely to be ever widely available in rural areas because of the cost and the limitations of the technology. Cable systems also cannot provide the future capacity that will be required by homes and businesses in the near future.

Satellite

Satellite broadband is a wireless technology, and to avoid confusion, systems like WiFi are often referred to as terrestrial wireless. Satellite broadband uses geostationary satellites located 22,500 miles above the earth, and data traversing a satellite system has a 45,000 mile loop (up and down). As fast as radio signals are, this distance still introduces latency (time delays) that can cause problems with real time transmission of telephone (VoIP) and videoconferencing. Bandwidth is generally less than what is available from DSL or cable systems, with a typical residential service offering 700 kilobits/second downstream and 128 kilobits upstream for between $55 and $65 per month. Higher speeds (e.g. 1 megabit/second downstream and 200 kilobits upstream) are also available for $10 or $20 per month additional.

If a home or business already has satellite television service, a second small dish antenna is needed for broadband service. Some companies have tried combining both services on a single dish, but this has usually had poor results because of signal and satellite position issues.

There are two primary providers of satellite broadband in the United States: Hughes Network Services and Wild Blue. Wild Blue has partnered with many rural electric coops, with the coops acting as sales agents and installers. Hughes uses independent small businesses as installers and resellers. Despite some limitations, satellite is an excellent broadband service option in underserved areas; no major infrastructure investments are required to obtain service, and speeds are much better than dial up, and in some cases may be equal to or better than entry level DSL service packages.

BPL

Broadband over Power Lines (BPL) has been available for several years and can be used in several different ways. Some BPL equipment is designed for in home use, where a broadband signal delivered by DSL or cable is delivered to different rooms in a home or business using the electric wiring. To provide service to a neighborhood, some electric companies use a system similar to cable systems, where fiber is used to get broadband near a cluster of homes, and then the signal is carried over electric lines for the last few hundred yards or last mile or two. In some other systems, the signal is carried via electric cables all the way from a broadband head end.

BPL has many of the same limitations as DSL and cable modem services. It is copper-based, and is limited in the amount of bandwidth that the technology can deliver. It requires technicians who have extensive training and experience working with high voltage systems, since special

bridges are installed at every neighborhood transformer (which also makes it a relatively expensive service). Some electric coops are considering BPL as a way to quickly provide some form of broadband to their rural customers. BPL's main advantage is that no new cable must be laid to deliver the service to a home or business. However, like DSL and cable systems, BPL is not a long term solution.

Fiber

Fiber is a future proof investment. The upper limit of fiber capacity has not yet been found, and off the shelf hardware can handle thousands of times the needs of an average home or business well into the future. Fiber has a life expectancy of thirty to forty years, and may last much longer than that; every year, the number goes up as fiber systems installed in the 1970s continue to perform adequately. A single fiber can carry all the traffic and services needed by a home or business, including voice telephone service, television programming, live videoconferencing, and HD television.

Fiber's primary drawback is its ***apparent*** high cost compared to other systems. Fiber is often unfairly compared to wireless, with the misleading conclusion that wireless is much cheaper. Regrettably, most fiber versus wireless studies compare the start up costs for wireless to the thirty year life cycle costs of fiber infrastructure. During a thirty year period, fiber is installed just once, while wireless systems will have to be replaced entirely several times. Properly costed over a thirty year period, fiber is actually less expensive than wireless, with many times the capacity.

Every home and business in Pennsylvania will eventually require fiber connections. Without ubiquitous fiber infrastructure, communities will not be economically competitive. Communities that already worry about losing too many young people to other areas have much more to worry about. In a recent college class, a professor asked 30 students how many would live in a community without broadband, and not a single student raised a hand. Fiber is the only transmission system that will be able to deliver all the services businesses and residents will expect and demand in just a few years. Communities that have not started fiber infrastructure investments by the end of 2008 will be at a severe disadvantage in the next decade when trying to attract and retain businesses and workers.

Wireless Broadband

We do not subscribe to the wireless vs. fiber debate. We believe both wireless and fiber systems are required in communities. Virtually everyone,within a few years, will have a very capable wireless device that supports phone service, email, Web browsing, gaming, TV, music and a host of other services. Residents and businesspeople will expect these devices to work everywhere; this means communities will need a well-designed wireless network of towers, antennas, and related systems, ***including fiber backhaul***. Wireless systems work best when supported by a fiber backbone to carry traffic to and from its destinations. Fiber and wireless systems are complementary, not competitive.

Wireless is often touted as a broadband panacea. Across the country, many communities are rushing to offer some kind of wireless system. These municipal wireless systems often lack sustainable business plans, and many well publicized projects are beginning to have problems. St. Cloud, Florida offers free wireless broadband throughout the city, but the quality of the service is so poor many residents have refused to give up paid cable and DSL service. Philadelphia's well known project has found that more access points are needed than originally anticipated, raising costs and threatening sustainability of the project.

Current wireless systems lack the capacity to handle high bandwidth services like video when more than a few people are using the same access point. Systems like WiMax are very expensive, and while prices will decline, when costed over a reasonable life cycle, wireless systems are relatively expensive. Wireless systems are inherently less secure than cable based systems, and we never recommend that a business uses a wireless connection for its primary access unless no other alternative exists. The primary future use of wireless will be for mobile access to services, rather than fixed point access. In underserved areas, properly designed wireless systems are an excellent first step, but are not a complete solution over the long term.

LDD Broadband Goals

Get some broadband service to every residence and business that wants it

❑ Encourage wider use of satellite broadband.

Action Steps

- Meet with Hughes and Wild Blue to discuss statewide service packages, discounts, and incentives.
- Use LDD broadband education initiatives to promote the use of satellite broadband in underserved areas.
- Work with local Chambers to enlist them as conduits to local businesses for information about satellite broadband.

❑ Encourage broader deployment of WiFi systems in underserved areas.

Action Steps

- Meet with existing wireless service providers to identify obstacles to service expansion.
- Work with townships and boroughs to adopt uniform policies and fees for mounting wireless antennas on public structures.
- Develop a model ordinance for communities to use for wireless policies and fees.
- See Goal Four in Last Mile Strategies (Part One) for additional opportunities.
- Provide a local investment fund to help capitalize wireless provider start-ups.

Each LDD has a regional entity with the charter to manage the broadband assets owned by local communities and governments.

❑ Identify two or three appropriate legal structures (e.g. regional authority, broadband coop, etc.) that can be used as templates for governance.

Action Steps

- Form a statewide LDD working group with assistance from appropriate legal and telecommunications experts to identify appropriate legal structures.
- Create template charter documents for each entity type that can be used by any of the LDDs interested in pursuing this approach.

❑ Identify two or three appropriate legal structures (e.g. regional authority, broadband coop, etc.) that can be used as templates for governance.

Action Steps

- Form a statewide LDD working group with assistance from appropriate legal and telecommunications experts to identify appropriate legal structures.

❑ Provide ongoing education and communication about the purpose and roles of a regional broadband management authority.

Action Steps

- Enumerate the roles and responsibilities of the organization and how it would work with both public and private organization and businesses to manage a digital road system.
- Design and distribute a short white paper on the roles, responsibilities, and beneficial economic impact of such an organization.
- Obtain endorsement of the organization from economic development organizations, Chambers of Commerce, and local governments.

Each LDD has a regional fiber overlay plan that maps fiber needs throughout the local counties, townships and boroughs.

❑ Each LDD can identify where fiber is needed for primary anchor tenants and inter-community broadband connectivity.

Action Steps

- Incorporate a fiber overlay layer in all LDD GIS mapping efforts.
- Use the regional Broadband Task Force/Management Team to identify critical business fiber needs.
- Meet with hospital administrators to identify health care fiber needs.
- Meet with all K12 schools and higher education representatives to add all educational facilities to the fiber GIS layer.

❑ LDD fiber overlay plans map fiber redundancy needs that meet business and economic development needs.

Action Steps

- Use the regional Broadband Task Force/Management Team to identify redundant fiber path needs.
- Meet with regional private sector fiber providers to identify existing fiber routes and facilities (when this information is available--not all companies will provide this).
- Meet with hospital administrators to identify health care fiber needs between facilities and urgent care treatment centers, with special attention to disaster relief, bio-terrorism health care responses, and disease epidemic needs.

Long Term Infrastructure Strategies

Pennsylvania Intelligent Communities

Broadband is not a silver bullet for communities in economic distress. Broadband investments need to be tied to a wider set of community and economic development strategies that help make communities engaging and interesting places to locate and run a business, and to make communities a vibrant and safe place to live. Communities that have made broadband investments without taking the time to identify a broader set of goals and expected outcomes have usually been disappointed when broadband investments have not had much impact.

LDDs that are interested (a minimum of two) should embark on a branded strategy to leverage necessary broadband infrastructure investments with other key community and economic development projects. We suggest calling this the ***Pennsylvania Intelligent Community*** initiative. Pennsylvania Intelligent Communities would have the following set of characteristics.

- ***Abundant, inexpensive bandwidth*** locally available from an integrated fiber and wireless open service provider system.
- Massive and ***redundant fiber*** and wireless connections to the rest of the world.
- An effective and well-designed cluster of Web sites that market the community to the world, including a ***community Web portal***, economic development sites, excellent local government sites, and many local community and civic sites.
- A ***knowledgeable and engaged citizenry*** that is comfortable using technology for business and personal use.
- ***Businesses that are expert in using broadband-enabled services*** to manage current customers and to market goods and services to markets throughout the world.
- ***Rich local content*** generated by citizens, organizations, government, and local organizations.
- ***Entrepreneurial Main Street*** revitalization projects that reposition downtown areas as entrepreneurial hubs. This would include converting buildings to downtown incubators, rehabbing other buildings for business and professional office space, attracting appropriate business to business services (copy stores, shipping stores, business lawyers, accounting services, etc.) to downtown areas. It would also include providing appropriate dining venues for business meetings, including "Starbucks quality" coffee shops, diner style restaurants for breakfast meetings, and upscale restaurants for business lunches and dinners. Finally, every Main Street building would have fiber to the building and a fully cabled "Internet ready" infrastructure in the building and some free WiFi Internet access in downtown for business travelers.

- ***Energy and green investments*** that ensure the community has reliable and resilient electric power for business needs, as well as appropriate "green" recycling and reuse programs that appeal to socially conscious businesses and younger people.

The Intelligent Community program would have a well-designed branding effort that would be marketed locally, regionally, and statewide. The LDDs could work with state legislators to develop a special source of funds for communities that make matching investments aligned with the attributes of the program. The LDDs should also create a certification program that controls how the PIC brand is used and under what circumstances. No other state or area of the country has a similar program, and we believe this represents a significant opportunity for the communities of the LDDs to achieve national attention.

Economic Development Strategies

As we indicated in the previous section, broadband is not a silver bullet for solving a community's economic development challenges. Broadband is a means to an end. Investments in a high performance, community owned and managed digital road system are necessary but not sufficient. While traditional industrial recruitment will continue to be an important element of local and regional economic development strategies in Pennsylvania, most new jobs are not being created by attracting companies from other regions. Between 75% and 90% of all new jobs are being created by small businesses (under 25 employees) that rarely move from one area to another, and so most new jobs are being created by businesses already located in a community.

- Industrial Recruitment – Continue to recruit businesses from other regions and countries, with wide availability of affordable broadband and redundant cable routes key marketing advantages compared to other regions. In the short term, having a broadband strategy for making community/regional investments in affordable broadband and for provision of redundant cable routes can be used strategically for recruitment.

- Entrepreneurial Recruitment – Recruit entrepreneurs, microbusiness owners, and "lone eagle" consultants by focusing on amenities of interest to this market segment: broadband in neighborhoods, entrepreneurial downtowns, and quality of life.

- Existing Business Development – Help existing businesses grow with targeted business planning and financial assistance.

- New Business Start Up and Entrepreneur Strategies – Develop regional angel investment networks for early stage funding and develop venture capital funding via local investors. Encourage high schools and two year colleges to offer more business training oriented toward entrepreneurial business and management skills.

- Workforce Retraining Strategies – Use state and federal funds to help workers who are interested develop Knowledge Economy skills.

- Decentralized Workforce Strategies – Look for opportunities to leverage broadband investments in fiber to the home to make Pennsylvania attractive to fully decentralized call center operations like the Jet Blue reservation center (all reservation agents work from their own home, using a broadband connection to the Jet Blue reservation and phone system).

- Quality of Life Strategies – Microbusiness owners and entrepreneurs are making relocation decisions based primarily on family needs, rather than business needs. Ensure that local communities have appropriate housing stock, attractive downtown areas, and a marketing plan that includes a lively and dynamic community Web portal that makes it easy for spouses to learn more about the community (e.g. extensive links to churches, sports groups, civic groups; online community calendar; up to date neighborhood and local government links and information; and a local online business directory).

Northwest Commission Region Analysis and Strategies

The household expenditures analysis is based primarily on data from the 2000 Census. In a few cases, more recent Census Bureau data from 2005 was available.

Assumptions

We assume that broadband will eventually be in a minimum of 90% of all homes and 100% of businesses. We feel this is very conservative, given that the adoption rate of Internet access (any kind, including dial up) and the adoption rate of broadband is much faster than any previous wireline technology (electricity, telephone, cable TV).

We assume that a community broadband project makes a commitment to build (over a period of several years) to 100% of customers (homes, businesses, institutions) that request service. This is calculated as an actual build-to percentage of about 90% (that is, fiber service will eventually be provided to 90% of all homes and businesses).

The expenditure and income estimates are based on an assumption that the amount of telecom services purchased by the average household will not increase in real dollars over the next thirty years. In our model, we estimate the average middle income household spends about $150/month for telecom services. As more and more kinds of services become available via IP-based broadband systems, this figure is widely expected to increase to about $300/month (adjusted for inflation). This means our model ***under-predicts*** the amount of revenue and income flowing through the system.

Accurate data is not available from the Census Bureau on micro-businesses, work from home businesses, and teleworkers (employees who work from home for a business in another district or state). This analysis, therefore, underestimates the amount of broadband services purchased by businesses and home workers.

We assume that the broadband networks build would be Open Service Provider Networks (OSPNs) that support full Layer 3 end to end automated service provisioning, with multiple service providers in each category of service, and with a wide variety of service categories that go well beyond traditional “triple play” offerings.

Population and household data is taken from the 2000 Census. Establishment (number of businesses) data is generally from 2003 data.

Build out costs are calculated on the average estimated cost ($2,750) of running fiber to the premises (FTTP) with a 50%/50% mix of residential (average FTTP cost of $2,000) and rural (average FTTP cost of $3,500) homes.

Northwest Commission Opportunities

The Northwest region has an active Technology Advisory Group in place, with a clear and direct vision for the communities of the region:

"***We want everything a city has [with respect to broadband]***"

In fact, the LDD regions could have more and better broadband than most larger urban areas. Urban areas tend to be less concerned about broadband because there appears to be more choice among service providers and most residents already have a choice of DSL or cable modem or even both. But those copper-based services will be inadequate in just a few years, and strategic investments in integrated fiber/wireless systems by the more rural areas of the state will pay off handsomely as the copper infrastructure falls behind and as more and more services become available on LDD-facilitated open access digital roadways.

This region is also asking a very appropriate question:

"What do we need to support industry ten or fifteen years from now?"

In much less than fifteen years, businesses will expect fiber to every building in every business and industrial park in the region, and will expect every employee to have a very high performance connection at home so that all corporate businesses services can be accessed at the same speed and performance from the home as in the office. Some attendees at the broadband meeting reported that they are already being told by people moving into the area that these new residents won't even consider looking at homes without broadband. The region's good mix of industry clusters suggests that adequate housing stocks may play a key role in maintaining and expanding business opportunities in the area.

Action Steps

- Work with existing business parks to upgrade existing telecom duct and colocation facilities or to add such facilities to the parks.
- Work with the business parks and local electric utilities to bring redundant electric service into the parks that have fiber/colo facilities to make them highly attractive to server farms and other server/data storage businesses.
- Develop a program to work with local builders and developers to ensure that every new home is equipped with structured wiring (Internet ready), using a regional standard vetted by a qualified telecommunications consultant.
- After identifying business parks willing to upgrade or install telecom duct and colo facilities, work with existing regional fiber backbone providers to develop a regional network of "connected" business parks. For gaps in service, begin planning for community/regional backbone investments.
- Use the existing Technology Advisory Group to begin a regular and repetitive outreach initiative to local officials who need help understanding the economic benefits of community investments in broadband.

Northwest Commission Financial Analysis

County Level Demographics

County	Population	Households	Businesses
Clarion	41,765	16,011	1,036
Crawford	90,366	34,695	2,217
Erie	280,843	106,488	6,766
Forest	4,946	1,996	134
Lawrence	94,643	37,136	2,142
Mercer	120,293	46,755	3,026
Venango	57,565	22,788	1,285
Warren	43,863	17,700	976
Totals	**734,284**	**283,569**	**17,582**

LDD Region-wide Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	283,569		
Percentage of households	45%	45%	10%
Number of households [1]	127,606	127,606	28,357
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$5,282,890,470	$6,890,726,700	$969,805,980
Total 30 year residential telecom expenditures	$12,173,617,170		
Total residential, business, government, and institutional telecom expenditures [1]	$13,390,978,887		

LDD Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$13,390,978,887
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$2,008,646,833
What the community spend on telecom with an OSPN system	$11,382,332,054
Average 25% revenue share paid by service providers to network owner/operator	$2,845,583,013
Total build out cost to 100% of homes, businesses, institutions requesting service [2]	$745,348,725
Cost of financing build out (10%)	$74,534,872
Total cost to build integrated fiber/wireless system to all premises	$819,883,598
Thirty year revenue after initial system is paid for	$2,025,699,416
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$1,012,849,708
Total monies available[4] for economic development, business expansion	$3,021,496,541

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Clarion

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	16,011		
Total businesses	1,036		
Percentage of households	45%	45%	10%
Number of households	7,205	7,205	1,601
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$298,284,930	$389,067,300	$54,757,620
Total residential expenditures	$687,352,230		
Total community expenditures [1]	**$756,087,453**		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$756,087,453
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$113,413,118
What the community will spend on telecom with an OSPN system	$642,674,335
Average 25% revenue share paid by service providers to the network	$160,668,584
Build cost [2]: 100% of homes, businesses, institutions requesting service	$42,191,325
Cost of financing build out (10%)	$4,219,132
Total cost to build integrated fiber/wireless system to all premises	$46,410,458
Thirty year revenue after initial system is paid for	$114,258,126
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$57,129,063
Total monies available[4] for economic development, business expansion	**$170,542,181**

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Crawford

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	34,695		
Total businesses	2,217		
Percentage of households	45%	45%	10%
Number of households	15,613	15,613	3,470
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$646,367,850	$843,088,500	$118,656,900
Total residential expenditures	$1,489,456,350		
Total community expenditures [1]	**$1,638,401,985**		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$1,638,401,985
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$245,760,298
What the community will spend on telecom with an OSPN system	$1,392,641,687
Average 25% revenue share paid by service providers to the network	$348,160,422
Build cost [2]: 100% of homes, businesses, institutions requesting service	$91,357,200
Cost of financing build out (10%)	$9,135,720
Total cost to build integrated fiber/wireless system to all premises	$100,492,920
Thirty year revenue after initial system is paid for	$247,667,502
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$123,833,751
Total monies available[4] for economic development, business expansion	**$369,594,049**

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Erie

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	106,488		
Total businesses	6,766		
Percentage of households	45%	45%	10%
Number of households	47,920	47,920	10,649
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$1,983,871,440	$2,587,658,400	$364,188,960
Total residential expenditures	$4,571,529,840		
Total community expenditures [1]	**$5,028,682,824**		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$5,028,682,824
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$754,302,424
What the community will spend on telecom with an OSPN system	$4,274,380,400
Average 25% revenue share paid by service providers to the network	$1,068,595,100
Build cost [2]: 100% of homes, businesses, institutions requesting service	$280,303,650
Cost of financing build out (10%)	$28,030,365
Total cost to build integrated fiber/wireless system to all premises	$308,334,015
Thirty year revenue after initial system is paid for	$760,261,085
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$380,130,543
Total monies available[4] for economic development, business expansion	**$1,134,432,966**

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Forest

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	1,996		
Total businesses	134		
Percentage of households	45%	45%	10%
Number of households	898	898	200
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$37,185,480	$48,502,800	$6,826,320
Total residential expenditures	$85,688,280		
Total community expenditures [1]	**$94,257,108**		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$94,257,108
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$14,138,566
What the community will spend on telecom with an OSPN system	$80,118,542
Average 25% revenue share paid by service providers to the network	$20,029,635
Build cost [2]: 100% of homes, businesses, institutions requesting service	$5,271,750
Cost of financing build out (10%)	$527,175
Total cost to build integrated fiber/wireless system to all premises	$5,798,925
Thirty year revenue after initial system is paid for	$14,230,710
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$7,115,355
Total monies available[4] for economic development, business expansion	**$21,253,921**

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Lawrence

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	37,136		
Total businesses	2,142		
Percentage of households	45%	45%	10%
Number of households	16,711	16,711	3,714
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$691,843,680	$902,404,800	$127,005,120
Total residential expenditures	$1,594,248,480		
Total community expenditures [1]	**$1,753,673,328**		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$1,753,673,328
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$263,050,999
What the community will spend on telecom with an OSPN system	$1,490,622,329
Average 25% revenue share paid by service providers to the network	$372,655,582
Build cost [2]: 100% of homes, businesses, institutions requesting service	$97,213,050
Cost of financing build out (10%)	$9,721,305
Total cost to build integrated fiber/wireless system to all premises	$106,934,355
Thirty year revenue after initial system is paid for	$265,721,227
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$132,860,614
Total monies available[4] for economic development, business expansion	**$395,911,613**

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Mercer

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	46,755		
Total businesses	3,026		
Percentage of households	45%	45%	10%
Number of households	21,040	21,040	4,676
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$871,045,650	$1,136,146,500	$159,902,100
Total residential expenditures	$2,007,192,150		
Total community expenditures [1]	**$2,207,911,365**		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$2,207,911,365
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$331,186,705
What the community will spend on telecom with an OSPN system	$1,876,724,660
Average 25% revenue share paid by service providers to the network	$469,181,165
Build cost [2]: 100% of homes, businesses, institutions requesting service	$123,207,975
Cost of financing build out (10%)	$12,320,798
Total cost to build integrated fiber/wireless system to all premises	$135,528,772
Thirty year revenue after initial system is paid for	$333,652,393
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$166,826,196
Total monies available[4] for economic development, business expansion	**$498,012,901**

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Venango

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	22,788		
Total businesses	1,285		
Percentage of households	45%	45%	10%
Number of households	10,255	10,255	2,279
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$424,540,440	$553,748,400	$77,934,960
Total residential expenditures	$978,288,840		
Total community expenditures [1]	$1,076,117,724		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$1,076,117,724
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$161,417,659
What the community will spend on telecom with an OSPN system	$914,700,065
Average 25% revenue share paid by service providers to the network	$228,675,016
Build cost [2]: 100% of homes, businesses, institutions requesting service	$59,580,675
Cost of financing build out (10%)	$5,958,068
Total cost to build integrated fiber/wireless system to all premises	$65,538,742
Thirty year revenue after initial system is paid for	$163,136,274
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$81,568,137
Total monies available[4] for economic development, business expansion	$242,985,796

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue

Warren

Telecom Expenditure Analysis			
	Low to Middle Income Households	Middle to Upper Income Households	Households with no Broadband
Total households	17,700		
Total businesses	976		
Percentage of households	45%	45%	10%
Number of households	7,965	7,965	1,770
Average monthly telecom expenditures	Local phone: $25 Long distance: $25 Cable/satellite TV: $45 Dial up Internet: $20	Local phone: $25 Long distance: $25 Cable/satellite TV: $60 Broadband Internet: $40	Local phone: $25 Long distance: $25 Cable/satellite TV: $45
Annual telecom cost/household	$1,380	$1,800	$1,140
30 year telecom expenditure	$329,751,000	$430,110,000	$60,534,000
Total residential expenditures	$759,861,000		
Total community expenditures [1]	**$835,847,100**		

Community Broadband System Cost/Revenue Analysis	
Community telecom expenditures over 30 years	$835,847,100
Savings on telecom fees from using an OSPN system (conservatively 15%) that goes back into the local economy immediately	$125,377,065
What the community will spend on telecom with an OSPN system	$710,470,035
Average 25% revenue share paid by service providers to the network	$177,617,509
Build cost [2]: 100% of homes, businesses, institutions requesting service	$46,223,100
Cost of financing build out (10%)	$4,622,310
Total cost to build integrated fiber/wireless system to all premises	$50,845,410
Thirty year revenue after initial system is paid for	$126,772,099
Net 30 year revenue[3] after annual expenses, maintenance, repairs (about 50% of gross revenue)	$63,386,049
Total monies available[4] for economic development, business expansion	**$188,763,114**

[1] Business, schools, institutions, and government costs estimated conservatively at 10% of residential expenditures
[2] Conservatively estimated at an average cost of $2,750 per premise connected.
[3] Funds available to participating local governments and regional authorities for other projects
[4] The sum of 15% savings on telecom costs, and net revenue