

# Infrastructure in Rural Areas: Telecommunications

**Moderator – Peter L. Stenberg, Ph.D., Senior Economist at the Economic Research Service (ERS), U.S. Department of Agriculture, Washington, D.C.<sup>27 28</sup>**

The Future of Economic Development in Rural America

## Modern Telecommunications in Rural America

Stenberg provided a broad overview of the increasingly significant economic role that the Internet plays in the rural marketplace. “The rural and farm communication and information issues presented by the Internet present the biggest economic challenges to rural America,” stated Stenberg. “The concept of economies-of-scale is the key to understanding the economic challenge.”

According to Stenberg, local exchange carriers (telephone companies) incur higher costs for providing rural households with telecommunication services than they do for urban households. As population density decreases, the price for delivering traditional or wireless phone service increases exponentially because there are fewer people to share in the costs, he explained. In addition, rural telephone service providers must spend more per customer for maintenance and repair than do urban providers. Because equipment manufacturers focus on the needs of more profitable large-scale telecommunication companies, Stenberg continued, small telecommunication companies often face challenges in purchasing equipment scaled for their operations.

The diversity of providers also provides another challenge for rural areas. Most of the more than 1,000 telecommunications service providers are small and concentrated in rural areas, and many are organized as cooperatives. “The spectrum of providers ranges from ‘mom-and-pop’ operations serving as few as 10 households to the Baby Bells with millions of customers,” he said. “Quality of service varies considerably across these providers and even within the service areas of the largest providers.”

## Federal Policy Facilitates Diffusion

“Federal policy has been developed to facilitate the diffusion of new communication and information services, and to address equity issues associated with cost barriers

to providing equivalent telecommunication services to rural areas,” stated Stenberg. “The cornerstone of our current policy is the Telecommunications Act of 1996, which deregulated the communication and information sectors and updated universal service provisions that had led to a near universal availability of a minimum level of service at affordable rates.”

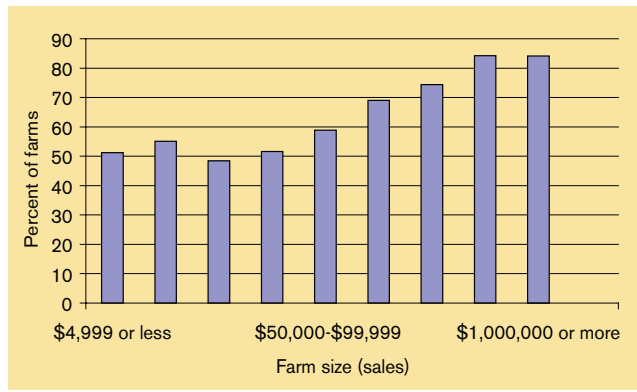
The new universal service provisions build on previous policies that resulted in fairly uniform prices for local telephone service across the country. The uniformity in price, however, does not guarantee uniformity in quality of service, nor does universal service address the cost of toll calls, which can be a significant expense for some rural households.

Stenberg explained that the 1996 universal service provisions also provided \$2.25 billion dollars in new funds annually to help pay for modern communication infrastructure for schools and medical facilities in high-cost (i.e., rural) and low-income communities. The 1996 act also mandated, at some point in the future, a broadening of the definition of telephony to include Internet service provision.

The most recent changes to federal policy are incorporated in the Farm Security and Rural Investment Act of 2002. This legislation focuses on rural development and authorizes \$100 million for grants, loans, and loan guarantees for the purpose of improving access to broadband telecommunication services in rural areas. The funds are earmarked for construction, improvement, and purchase of equipment and facilities for rural broadband service in eligible communities. Further, the definition of “broadband service” would be reviewed regularly to take into account changes in technology.

“In rural areas, farms have been in the vanguard of Internet use in the workplace,” Stenberg said. As illustrated in Figure S1, 56 percent of farms reported having computers with Internet access in 2004. According to Stenberg,

**Figure S1: Farm Internet Access 2004**



Source: Stenberg using the 2004 USDA Agricultural Resource Management Survey

20 percent of those respondents used the Internet to purchase farm-related items and 29 percent used it to purchase household items. Internet use varied somewhat by geographic location of the farm household, with farms in small towns having the lowest share of Internet access. "Differences in Internet use among farm households by farm sales, however, were striking," Stenberg noted. He explained that Internet use ranged from 49 percent for farms with sales of \$10,000 to \$19,999 to 84 percent for the largest farms (gross sales of \$500,000 or more). "The largest farms also had the highest share of individuals using the Internet to make both farm and household purchases, mirroring the pattern of all U.S. households," he said.

### Trends in Rural Communication and Information Services

"Two major developments, wireless and satellite telephony, have often been cited by their promoters as overcoming the economic disadvantages rural areas have in the use of traditional telephone service," stated Stenberg. "However, both technologies still face constraints that keep their costs high relative to the quality of the service they provide." Wireless services have some cost advantages in covering the "last mile" from a phone company's switch to the household, but limitations in the technology and the terrain keep costs high – overcoming dead zones (i.e., areas either too far from a communications tower or where physical barriers impede the signal) in areas with low population density quickly reduces any cost advantages. Although satellites hold some promise in providing broadband Internet service to rural households, the transmission quality has not reached the level of hardwired systems, noted Stenberg. Service speed may never match broadband services obtained through telephone or cable systems because of technical limitations.

The marked decline in investment in telecommunications at the time of the dot-com bust did initially slow the diffusion of Internet and other new services, but the demand for these services has continued to grow. Stenberg summed up his remarks by stating that the

availability of new services and their affordability will be determined by three main mechanisms: governmental policy, market incentives, and the economic feasibility and technical limits of new technologies.

### Mahaska Communications Group – Starting from Scratch

**JOE P. CROOKHAM - President and Principal Owner of Musco Corporation and Mahaska Communications Group (MCG), Oskaloosa, Iowa<sup>29</sup>**

Musco Corporation's primary business is athletic field lighting for community parks, recreation facilities, and schools. Because he was dissatisfied with the telecommunications services provided by his local provider, Crookham established MCG to meet the telecommunication needs of Musco. Crookham discussed how he started and built a rural telecommunications company from scratch and the implications that bringing reliable and high quality communications services has for the economic development and future viability of his rural community.

The lack of locally available sophisticated telecommunications services constrained Musco's operation and growth. Crookham started MCG only after pursuing every other option aimed at not getting into the telecommunications business. "Musco Corporation operates seven international offices, and communications is absolutely critical to us," explained Crookham. "And so when we started running into telecommunications problems; we started looking around for how to solve it. We discovered that, since we were dealing with things that are on the leading edge, our best solution wound up being doing it for ourselves." Crookham noted that MCG was started without any government programs or grants. "We got a conventional bank loan and went into business," he said.

As MCG began to build its communications network, it soon discovered that its own employees had similar needs – only at home. Further, the employees were reflective of the entire local community. "So we looked at what it would cost to build a complete 'fiber to the home/fiber to the world' system. It's about a \$12 million investment for a town of 11,000 people," he said. "We determined what our investment break even point was and then jumped in to build the network." Construction started in July 2003 and was completed in October 2005.

"Modern communications networks are no longer about sending electronic pulses over copper wire," explained Crookham. "They're now about sending eight-bit packets of information over glass (transparent glass fibers transmitting light)." He compared a modern fiber optic network to a parcel shipping company – an envelope with

the proper label can contain just about anything and be shipped anywhere in the world. Similarly, anything, such as pictures, movies, voice, and data, that can be broken down into eight-bit digital packets, can be sent via the Internet to anywhere in the world. "How big are the things that can be disassembled and put back together?" asked Crookham. "We're just beginning to find out."

"The issue for everyone who wants to use the Internet and be successful in competing in the future is *network capacity*," Crookham emphasized. Crookham stated that robust Internet network capacity facilitates commerce in the same way that the interstate highway system does. However, where the interstate highway system moves physical goods, the Internet moves information. "The key is to have a robust communication network – i.e., a big pipe – because people are going to find bigger and bigger ways to make things happen that confer competitive and economic advantages, and if you don't have the ability to ship information through the network you will not stay competitive."

### **Wisconsin State Telecommunications Association – Providing Rural Service**

**BILL ESBECK - Executive Director of the Wisconsin State Telecommunications Association<sup>30</sup>**

Bill Esbeck provided a broad overview of current telecommunications technology and its application in Wisconsin's rural areas and a glimpse of what the very near future will hold for telecommunication consumers.

Esbeck began with a brief overview of the technology applicable to rural telecommunications. He explained that broadband Internet access, or "broadband," is a high data-transmission rate Internet connection. Current broadband speeds are about five times faster than traditional dial-up connections. The four existing technologies that are capable of delivering broadband are: digital subscriber line (DSL), Wi-Fi (wireless), satellite, and cable modem (which includes both fiber optics and copper wires). Esbeck then discussed the current state of telecommunications in rural Wisconsin including such areas as: investment and broadband availability, compression technology, increasing bandwidth, and products and services.

Esbeck said approximately 90 percent of telephone exchanges in Wisconsin have broadband capabilities, and 85 percent of all residents can order broadband products from their telephone companies. "More than 15,000 sheath miles of fiber optic cable and more than 1 million strand miles of fiber optic cable have been buried in Wisconsin," stated Esbeck. "This allows us to get to 85 percent penetration of broadband to all residents." He cited a recent study by the University of Wisconsin-Stout concluding that the nine counties in northwestern

Wisconsin (a very rural area) have 100 percent broadband availability.

Advances in technology over the past 15 years have focused on the ability to compress data and deliver it over great distances. To illustrate the advances, Esbeck described how BadgerNet, Wisconsin's video distance learning network, has steadily improved its compression technology. In 1991, BadgerNet was capable of delivering only a single 1x1 video signal using a 45 Megabits per second (Mbps) "pipe," which was the best available technology. In 1997, BadgerNet was able to triple the product it was delivering through the same "pipe" by migrating to a 1x3 video signal. By 2005, BadgerNet was still delivering three video streams; however, instead of using a DS3 (45Mbps) "pipe," it can deliver the same video channels (1x3) and the same video quality with only 4 Mbps. "Imagine," Esbeck offered as an analogy, "that you had a bus load of people. In 1991 you would have needed a 45-lane highway to drive that bus anywhere. In 1997, the bus became a triple-decker and carried three times the number of passengers driving down the 45-lane highway. In 2005, you still have a triple-decker bus, but now you only need a 4-lane highway. This is more than a 30-fold increase in carrying capacity over the past 15 years."

Esbeck concluded by stating that products and services in rural Wisconsin include competitive broadband options with increasingly higher bandwidth (ADSL 2 Plus). Digital video is available from about 12 rural telephone companies, and IP voice (voice over the Internet protocol) is just beginning to emerge, allowing for the movement toward "total convergence." "As we look to communications, what we are going to see in the very near future is the total convergence of voice, video, and data applications – any product or service – on any device at anytime, anywhere," envisioned Esbeck, who quoted well known industry sources. "This isn't like the 'flying car' or 'paperless office' predictions we were all promised a while back. Rather, these are very real, very user-friendly applications that are going to increase productivity and make the entire communications process much more enjoyable – all in a very cost-effective manner."

### **Michigan Broadband Development Authority – Attracting Internet Investment to Underserved Communities**

**ROBERT L. FILKA - Chief Operating Officer for the Michigan Broadband Development Authority (MBDA)<sup>31</sup>**

Robert Filka was also a member of the executive leadership team for the Michigan Economic Development Corporation (MEDC), where he authored the LinkMichigan telecommunications infrastructure report and developed the MEDC's benchmarking analysis to gauge the state's economic competitiveness.<sup>32</sup>

"In 2002, the goal used to be to get broadband access out to everywhere we could and have it be affordable," Filka said. "Today, when you're talking about world class communities, you're really talking about a community that has multiple residential types of services available: cable, DSL, fiber access for higher bandwidth commercial applications, and mobile wireless access." Filka stated that global business leaders want these types of broadband access options when they are looking to conduct business in various towns. He pointed out that although many businesses can afford to bring state-of-the-art access to their own corporate headquarters, they want to locate in areas where the workforce also has 24/7 broadband access at home. According to Filka, the United States ranks only 14th best in the world in terms of use and availability of broadband.

The MBDA was formed as a result of the findings of a state economic development benchmarking analysis conducted in 2002, which found that access to high-speed telecommunication services is the most important state infrastructure issue for the new century.<sup>33</sup> The MBDA's mission is to attract high-speed Internet investment to underserved communities, and encourage competition and more affordable broadband services across the state. Using a \$50 million bond sale and limited CDBG dollars, the MBDA makes loans and grants to broadband providers.

### **MBDA Financing**

"We operate much like a bank in terms of lending criteria," described Filka. "However, unlike a banker, the MBDA is really a banker, venture capitalist, and economic developer all rolled into one to try to bring service to different parts of the state." The MBDA charter permits lending to a range of organizations: telecommunications companies, private businesses, nonprofits, and government entities. The MBDA can finance a broad range of projects such as network expansion (fiber, DSL, cable, wireless), hardware, software, training, and installation. The MBDA will consider loan requests up to \$100 million.

When evaluating loan requests, the MBDA asks three primary questions:

1. Does the proposed use of funds serve the public interest?
2. Is the project technically and financially feasible?
3. Are the applicants a reasonable credit risk?

Key lending criteria includes adequate cash flow, a solid business plan, sufficient borrower equity, and guarantees.

Typical loan terms and conditions are:

- **Maturities** – ranging from five to seven years and 12- to 24-month interest-only draw periods if necessary

- **Interest Rate** – 8 percent fixed rate

- **Equity** – 100 percent project financing available, but net equity on company balance-sheet should equal 20 percent (at a minimum) of loan request

- **Guarantees** – typically required, but usually not collateralized; operating deficit reserves and other alternatives to personal guarantees utilized on occasion

### **Low Interest Loans to Expand Services to Underserved Areas**

The MBDA has a charge to expand affordable broadband access throughout Michigan by 2007. To accomplish this, the MBDA aggressively seeks financing applications to expand their services into the state's most rural and underserved regions. In eligible regions, qualifying broadband providers may receive loans with 4 percent interest and interest-only draw periods of up to 24 months. Providers will work with local government and economic development organizations to qualify their proposals. "Michigan is encouraging regional leaders to creatively utilize this solicitation to attract more broadband investment into their regions," stated Filka. "Schools, government offices, and other large users of high-speed Internet services in underserved regions are being encouraged to leverage community-wide access by serving as anchor tenants for providers willing to expand services throughout their area. It is hoped these entities will partner with providers to lower the cost of such infrastructure, by providing access to towers and other structures to support community-wide deployment."