17 July 2003

VERIZON DELAWARE: INFRASTRUCTURE DEVELOPMENT 1993-2002

By NERA Senior Vice President Dr. William Taylor
NERA Consultant Jaime D'Almeida

NERA
Economic Consulting

MMC Marsh & McLennan Companies

VERIZON DELAWARE:
INFRASTRUCTURE DEVELOPMENT 1993-2002

I. INTRODUCTION

In this study we evaluate the development of Verizon Delaware's network over the past ten years and we compare Verizon's network development in Delaware to other local telecommunications carriers in the United States. Using publicly-available data, we utilize nine indices to measure network modernization and broadband penetration for all the former Bell Operating Companies on a state level. We calculate Verizon Delaware's overall ranking among these companies with respect to the nine measurements.

II. METHODOLOGY

The Automated Reporting Management Information System ("ARMIS") was initiated by the Federal Communications Commission ("FCC") in 1987 for collecting financial and operational data from the largest regulated telecommunications carriers in the United States. Additional ARMIS reports were added in 1991 to collect service quality and network infrastructure information. Today there are ten ARMIS reports, one of which (ARMIS Report 43-07) provides a rich set of publicly available data on infrastructure and broadband measurements for Verizon Delaware and 47 other former Bell Operating Companies ("BOCs").

The data that are available in ARMIS Report 43-07 allow us to measure infrastructure development and broadband penetration across all former Bell Operating Companies, using nine separate indices.[1]

- The percent of switches that are digital;
- The percent of switches equipped with SS7;

[1] In November 2002, NERA performed a similar ranking for Verizon Pennsylvania using ARMIS data from 1992-2001. That analysis did not, however, include any indices to measure broadband penetration. Additionally, the ranking for Verizon Pennsylvania included measurements for carrier links and circuit links, for which the FCC stopped collecting technology-specific data in 2001. In that study, Delaware's rankings remained essentially the same as in this study.

- The percent of switches equipped with ISDN;
- The ratio of fiber strands to copper pairs terminated at the Central Office or Main Frame respectively;
- The ratio of fiber digital carrier working channels to copper working channels;
- The ratio of fiber digital carrier equipped channels to copper equipped channels;
- The ratio of fiber sheath kilometers to copper sheath kilometers;
- The number of fibers terminated at customers' premises at the DS1 rate as a percentage of total access lines; and
- The number of fibers terminated at customers' premises at the DS3 rate (or higher) as a percentage of total access lines.

The first seven indices all measure technologies that indicate an advanced network infrastructure—the use of digital switches, the deployment of SS7 and ISDN technologies, and the use of fiber over copper. In addition, they are, for the most part, necessary for deployment of broadband services. The use of fiber over copper is particularly important for broadband services because the deployment of fiber provides the bandwidth support that broadband services demand. Therefore, a network with an increased use of fiber over copper reflects a network that is better prepared for broadband services.[2] The final two measurements capture broadband *penetration* in a network as well as measure the deployment of fiber in a network. The number of fibers terminated at customers' premises directly reflects active broadband services in a particular network, with transmission at a DS1 level translating to 1.544 Mbps, and transmission at a DS3 level translating to 44.736 Mbps.

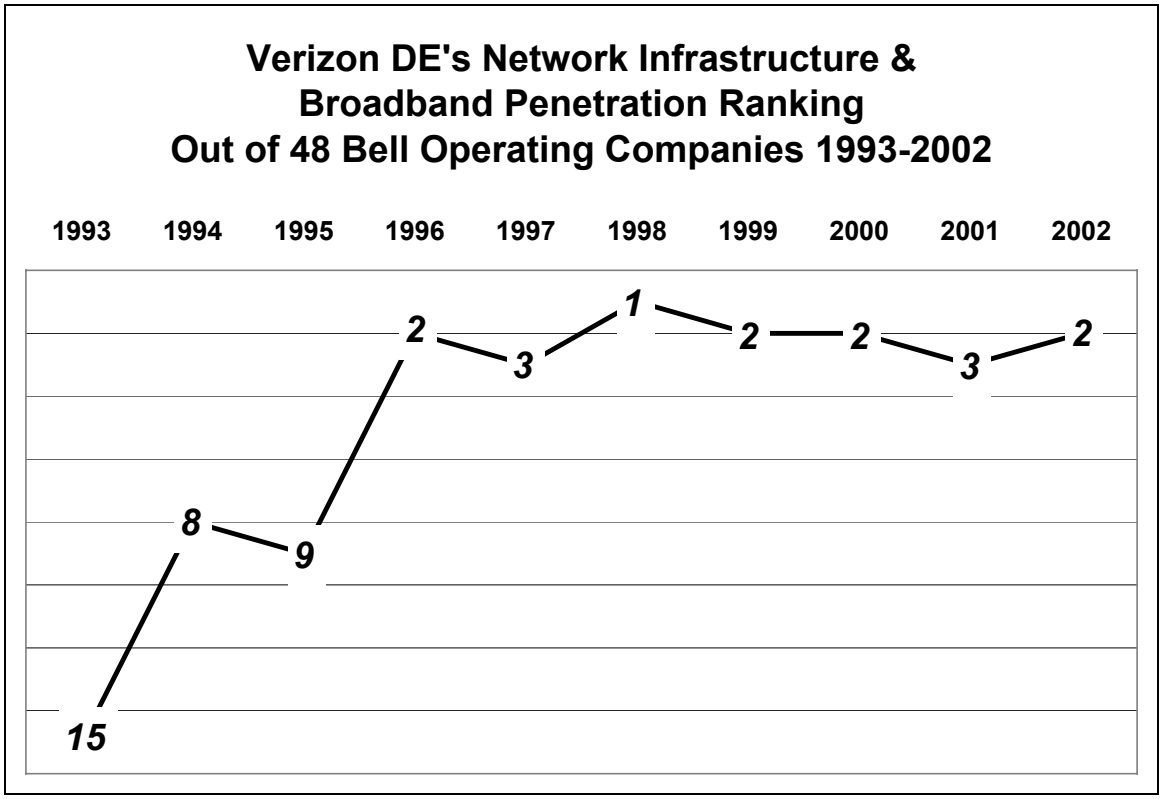
III. RESULTS

Ranking the Bell Operating Companies in each state on each of the nine indices and applying the same weight to each measurement yields an annual ranking for each BOC on a state-specific level. Comparing the annual rankings between 1993 and 2002 indicates a

[2] Other benefits of using fiber include lower error rates and fewer problems with attenuation. Unlike copper, which transmits electricity, fiber transmits light, providing a "natural" insulation against electromagnetic interference which plagues copper wire networks. See Johnson, Dick, "Seeing the light: Fiber optics illuminate process control and instrumentation," Control Engineering Magazine, Barrington, December 2000; Yager, Tom and Connolly, PJ, "Will fiber optics overtake the copper in the backbone?" InfoWorld, Framingham, March 26, 2001.

measure of infrastructure development and broadband penetration over that period in that state by that BOC.

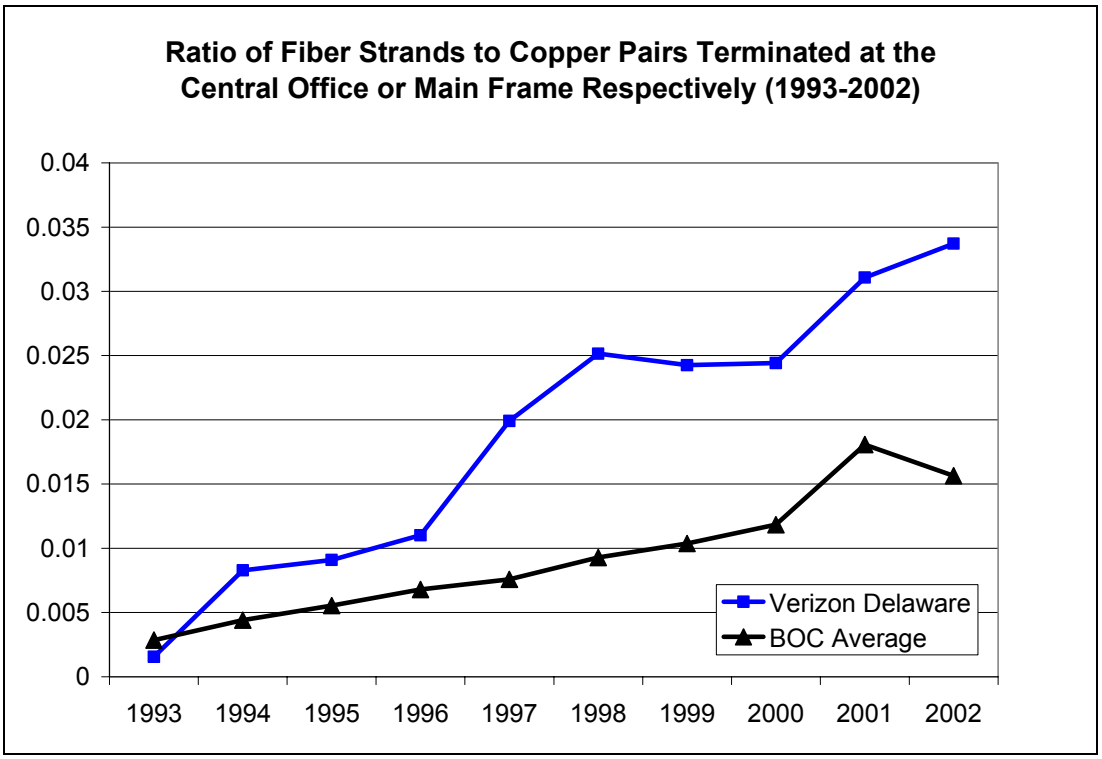
The results reveal that Verizon's infrastructure and broadband development in Delaware has dramatically improved since 1993, and currently ranks in the top three among all BOC activity with respect to modern infrastructure development. The following chart shows Verizon Delaware's ranking from 1993-2002:

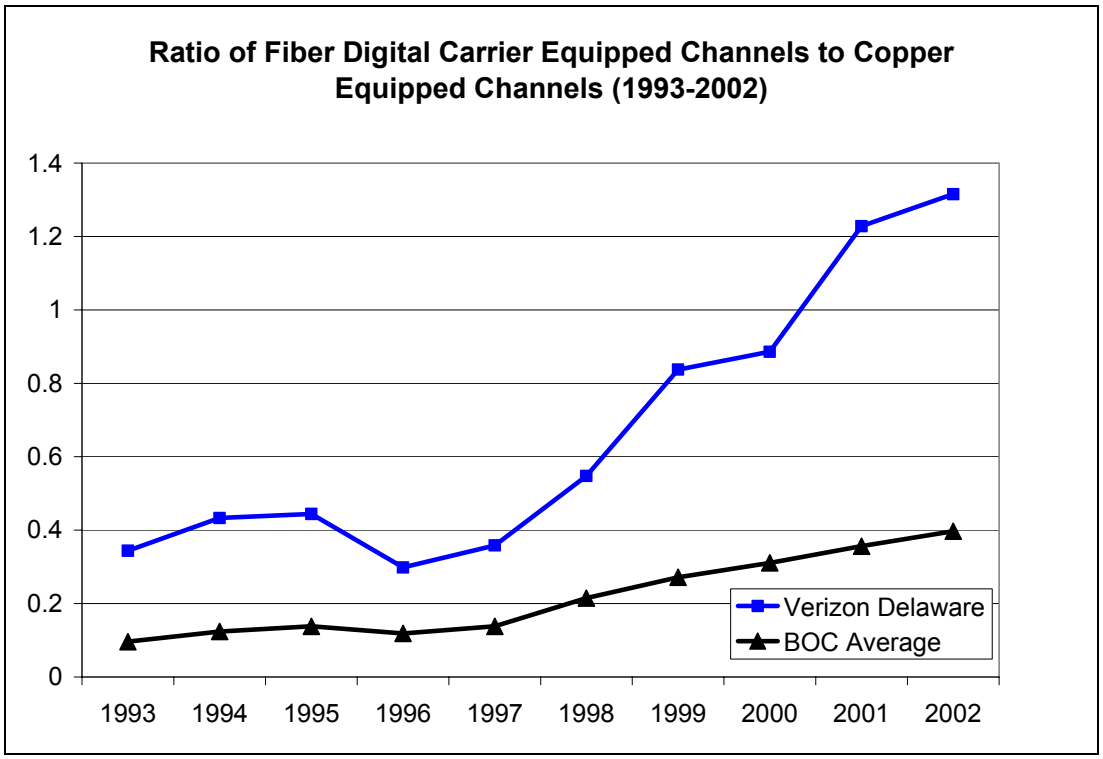


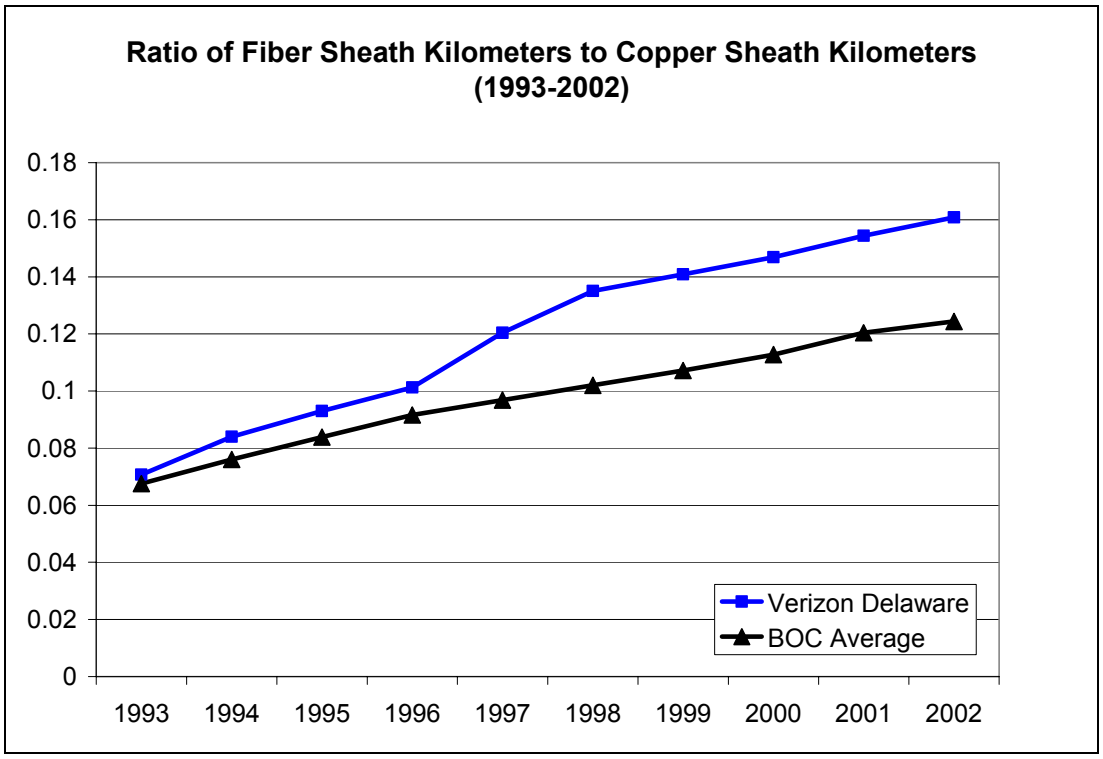
In 1993 Verizon Delaware ranked 15th in the country (out of 48). However, by 1998 Verizon Delaware had topped the ranking at number one. After attaining the top ranking, the company maintained its commitment to an advanced network, and in fact, by 2002 Verizon Delaware had maintained seven straight years of top three ranking among all of the nation's BOCs in infrastructure and broadband development. While Verizon Delaware has not yet duplicated its top ranking from 1998, maintaining a top-ten ranking for the past seven years is a significant result. The variance of results among BOCs is such that the top ten defines a select group of BOCs. Consider that the top ten BOCs in 2002 accounted for over 75% of the annual

top ten lists from 1992 to 2002. Clearly, Verizon Delaware's commitment to infrastructure and broadband development has put them in a exclusive group of BOCs.

Verizon Delaware's improvement in its ranking from 1993-2002 can be more easily understood by viewing a number of the individual indices. For example, from 1993-2002 Verizon Delaware improved its network infrastructure faster than the average Bell Operating Company in (1) the ratio of fiber strands to copper pairs terminated at the Central Office or Main Frame respectively, (2) the ratio of fiber digital carrier equipped channels to copper equipped channels, and (3) the ratio of fiber sheath kilometers to copper sheath kilometers. The charts below compare Verizon Delaware with the Bell Operating Company average for each of these measurements.




Ratio of Fiber Digital Carrier Equipped Channels to Copper Equipped Channels (1993-2002)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Verizon Delaware
BOC Average


Ratio of Fiber Sheath Kilometers to Copper Sheath Kilometers (1993-2002)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Verizon Delaware
BOC Average

IV. SUMMARY

Over the last seven years, Verizon Delaware has consistently ranked among the top ten former BOCs in demonstrating its commitment to infrastructure deployment and network modernization. In 1993, Delaware ranked 15th in the country. From there, Verizon Delaware's standing climbed steadily to number one in 1998 and has remained as one of the top three states since then. Verizon Delaware's current top-ten ranking also places them in an exclusive group of BOCs that have all demonstrated a commitment to network modernization. The State is clearly poised to take advantage of the current and future advances in telecommunications due to Verizon's investment in its network.