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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable And Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant To Section 706 of the Telecommunications Act of 1996	)	CC Docket No. 98-146

NOTICE OF INQUIRY

Adopted: February 17, 2000 **Released: February 18, 2000**

Comment Date: March 20, 2000
Reply Comment Date: April 4, 2000

By the Commission:

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I. INTRODUCTION

1. This Notice of Inquiry (Notice) begins our second inquiry into "whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion."[1] Users with access to advanced telecommunications capability[2] are able to send and receive enormous amounts of information very quickly.

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[1] See § 706 of the 1996 Telecommunications Act (the 1996 Act) is § 706, Pub. L. 104-104, Title VII, Feb. 8, 1996, 110 Stat. 153, reproduced in the notes under 47 USC § 157. It provides:

SEC. 706. ADVANCED TELECOMMUNICATIONS INCENTIVES.

(a) In General.--The Commission and each State commission with regulatory jurisdiction over telecommunications services shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) by utilizing, in a manner consistent with the public interest, convenience, and necessity, price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment.

(b) Inquiry.--The Commission shall, within 30 months after the date of enactment of this Act, and regularly thereafter, initiate a notice of inquiry concerning the availability of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) and shall complete the inquiry within 180 days after its initiation. In the inquiry, the Commission shall determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion. If the Commission's determination is negative, it shall take immediate action to accelerate deployment of such capability by removing barriers to infrastructure investment and by promoting competition in the telecommunications market.

(c) Definitions.--For purposes of this subsection:

(1) Advanced telecommunications capability.--The term "advanced telecommunications capability" is defined, without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology.

. . . .

[2] Throughout this Notice, we use the term "advanced telecommunications capability" when addressing the specific requirements of section 706. In our First Report, we defined "advanced telecommunications capability" as upstream and downstream communications paths "capable of supporting a speed in excess of 200 Kbps in the last mile." In this Notice, we use other descriptive terms such as "high-speed services," "advanced services," and "broadband services" to refer to a larger subset of services that end users can access with asymmetric capabilities and speeds that are less than 200 Kbps, but are generally also considered high-speed (*i.e.,* greater than 128 Kpbs in a wireless environment or 144 Kbps in a wireline environment).

For example, a user can change web pages as fast as he or she can flip through the pages of a book, and can have services such as two-way teleconferencing.

2. Our first inquiry ended with the conclusion that the overall deployment of advanced telecommunications generally appeared reasonable and timely, given the early stage of deployment.[3] We were encouraged that the communications industry appeared to be making large investments in advanced technologies and that the deployment of high-speed long distance or "backbone" facilities, and of local or "last mile" facilities to business customers, appeared to be reasonable and timely.[4] We also concluded that deployment of last miles to residential customers at that time appeared on the whole to be reasonable and timely.[5] This was based in part on the fact that residential use of advanced telecommunications capability was surpassing or keeping up with use of consumer products such as cellular service and television.[6] We lacked adequate data, however, to find definitively whether high-speed services were reaching rural and inner city users and persons with disabilities in a reasonable and timely manner.[7] We were also hesitant to draw definitive conclusions regarding the deployment of advanced telecommunications capability given the early stages of deployment, and thus committed to monitoring the situation through annual reports. In addition, we stated our intention to improve and expand upon the data we receive and our tools of analysis.[8]

3. Since the First Report, deployment has increased substantially and now high-speed services are used by more than a million residential subscribers.[9] We continue to be encouraged by the information we have about the ongoing level of investment in high-speed services by many companies and we expect that this investment will lead, in the near future, to greater competition and more widespread deployment to all Americans. But, as encouraging as this trend is, today only a small percentage of

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[3] Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, *Notice of Inquiry*, 13 FCC Rcd 15280 (1998); Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, *Report*, 14 FCC Rcd 2398, 2402 (1999) (First Report).

[4] First Report, 14 FCC Rcd at 2408-09 (last miles to business customers), 2421 (backbone) (1999). We will use the terms "backbone" and "last mile" as shorthand for interoffice/long distance/international and local facilities and services, respectively. The "last mile," if seen from the customer's point of view, might be called the "first mile."

[5] First Report, 14 FCC Rcd at 2402, 2405, 2446-48.

[6] *Id.* at 2446-47.

[7] *Id.* at 2435-42.

[8] *Id.* at 2402.

[9] *Compare* Staff of Cable Services Bureau, *Broadband Today* (Oct. 1999) at 25 *and* Mass Media, COMMUN. DAILY, Aug. 3, 1999 (@Home and Road Runner have approximately 700,000 US customers, up 100% in the first six months of 1999) *with* John Borland, *Living Up to the Broadband Hype* (July 28, 1999) (visited Dec. 27, 1999) <http://news.cnet.com/news/0-1004-201-343780-0.html?tag=st.cn.1fd2.> ("barely a million"), New Media, COMMUN. DAILY, July 22, 1999 (@Home/Excite had 620,000 cable modem subscribers as of June 30, 1999), Brett Mendel, *Broadband Hits Home* (visited Dec. 27, 1999) <http://www.cnn.com/TECH/computing/9907/15/broadband-ent.idg/index.html> (cable modem users expected to top 1 million by end of July 1999, with xDSL users at 92,000 at end of 1Q 99), *and AT&T Plans Rapid Broadband Telephony & Data Service Growth*, COMMUN. DAILY, Mar. 17, 1999 ("digital cable customer base . . . grew to 939,000 by end of 1998").

Americans actually subscribe to high-speed services. Moreover, there is a growing concern that Americans living in rural areas and inner cities might not have access to advanced services that are comparable to services available to people living in other areas.[10] A lack of broadband infrastructure could limit the potential of these communities to attract and retain businesses and jobs, especially businesses that are dependent on electronic commerce. Lack of infrastructure could also restrict community access to education, health care, and recreational services. Although we are committed to advanced telecommunications capability being deployed to all Americans, we recognize that the market for high-speed services is still relatively nascent, a fact that might pose problems for assessing whether certain areas or groups will be left behind as the market matures. We also recognize that at this early stage, deployment may be proceeding quickly enough to be considered "reasonable and timely" even if we have not yet reached the ultimate goal that all Americans have meaningful access to advanced telecommunications services.

4. In order to make informed judgments about whether deployment of advanced telecommunications capability is reasonable and timely, we need objective, empirical data about the current state of deployment. In October 1999, in our *Data Gathering Proceeding*, we proposed new reporting requirements for all providers of broadband so that we can better assess deployment of broadband facilities.[11] We intend to adopt final rules in that proceeding shortly so that, if our proposals are adopted, the information we gather can be incorporated into our regular Reports. Also, we have convened a Joint Conference for state regulatory commissions and the FCC to facilitate the cooperative development of federal, state, and local policies to promote the widespread deployment of advanced services.[12]

5. In this *Notice,* we seek information in addition to the information that we intend to gather through the industry surveys proposed in the *Data Gathering Proceeding*, if the proposal is adopted, and the Joint Conference. We urge industry, trade associations, consumer groups, state and local governments, and others to respond to the specific questions we pose and to submit data for our consideration. Are advanced telecommunications capabilities being deployed to all Americans? If not, where has deployment not reached? One of our goals is to determine where advanced telecommunications capability has not yet been deployed and then to assess whether deployment is reasonable and timely. Where it has been deployed, how many subscribers are there? With the economic analysis that we ask for in this *Notice*, we also want to understand the basic economic conditions of the residential broadband market, such as how much competition we can expect to develop in different areas of the country (*e.g.*, areas with low population density). We ask for comment on these and other matters that

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[10] *See generally* National Telecommunications & Information Administration, *Falling Through the Net* (July 1999) (NTIA Report); statements made at the September 9, 1999, CEO Summit on Rural Telecommunications: Closing the Digital Divide, *available at* http://dpc.senate.gov/events/rural_telecom.html (CEO Summit).

[11] Local Competition & Broadband Reporting, *Notice of Proposed Rulemaking* FCC 99-283, CC Docket No. 99-301, released Oct. 22, 1999, *available at* 1999 WL 961574 (*Data Gathering Proceeding*).

[12] Federal-State Joint Conference on Advanced Telecommunications Services, CC Docket No. 99-294, *Order* FCC 99-293, released Oct. 8, 1999, available at 1999 WL 809499.

will help us determine "whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion."[13]

II. EXECUTIVE SUMMARY

6. In order to make the judgment required by section 706 we need first to understand the extent to which broadband infrastructure is being deployed, who has access to it and who does not. Only after we have the facts about the state of deployment can we then make a judgment if deployment is reasonable and timely, and determine if any action on our part is necessary.

7. To aid our analysis of this issue, we ask parties to follow the format laid out in this *Notice* in their comments. The *Notice* is structured as follows:

- What is "advanced telecommunications capability"? In this section we ask for comment on whether the definition of "advanced telecommunications capability" that we adopted in our first 706 inquiry -- *i.e.,* two-way bandwidth in excess of 200 kilobits per second (Kbps) in the last mile -- remains valid.

- Is advanced telecommunications capability being deployed to *all* Americans? In this section we ask for data on where broadband infrastructure currently exists or is being built, and who has access to it. We ask for national data that will illustrate any geographical differences in deployment, and data that will illustrate any differences in the customers who have access to advanced telecommunications capability. We also ask for analysis of the pace at which, and the extent to which, market forces will bring advanced telecommunications capability to those that do not currently have access to broadband services.

- Is overall deployment "reasonable and timely"? In this section we seek comment on the standard we should use to determine what is reasonable and timely. We also seek comment on the best way to measure deployment of advanced telecommunications capability.

- If deployment is not timely and reasonable, what actions will accelerate deployment? In this section we seek comment on the actions available to us if we determine that advanced telecommunications capability is not being deployed to all Americans in a reasonable and timely fashion.

III. WHAT IS "ADVANCED TELECOMMUNICATIONS CAPABILITY"?

8. Definition of "Advanced Telecommunications Capability." The First Report defined advanced telecommunications capability "as having the capability of

[13] See note 1 *supra*, Section 706 (b).

supporting, in both the provider-to-consumer (downstream) and the consumer-to-provider (upstream) directions, a speed (in technical terms, 'bandwidth') in excess of 200 kilobits per second (kbps) in the last mile."[14] We required a service to have bandwidth over 200 Kbps in both downstream and upstream directions, because section 706 requires that users be able to "originate and receive" high-quality services. Thus, we concluded that we must set a minimum speed in both upstream and downstream directions.[15] We chose 200 Kbps based on what we perceived as residential consumers' current demand for bandwidth.[16] We stated that we might change our definition as technology evolved and we learned more about marketplace demand.[17]

9. We invite comment on our existing definition, whether it should be changed and, if so, how. We also seek comment on which factors we should deem relevant in deciding whether to change our definition. Should we, for example, consider changes in technology performance, the characteristics of the medium, the cost of providing, or public demand for high-speed services? If we change the minimum bandwidth, what should the new minimum be? We also seek comment on whether both the originating and receiving paths must be of the same bandwidth.[18] In addition, we are under the impression that many residential consumers that subscribe to broadband services appear to demand less than 200 Kbps in the upstream path at the present time.[19] Should service with a return path of a standard telephone line, capable of supporting between 40 Kbps and 56 Kbps upstream, be considered "advanced telecommunications

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14 First Report, 14 FCC Rcd at 2406 (footnote omitted).

15 *Id.* at 2406-07.

16 *Id.* at 2406.

17 *Id.* at 2407-08.

18 Some offerings of service that incumbent LECs, cable operators, and satellite-based companies call broadband depend on upstream speeds of less than 200 Kbps. For example, although DSL service offered by LECs can upgrade the average analog connection of about 40 Kbps to 1.5 Mbps and higher, DSL is also offered at lower-priced speeds of 384 Kbps downstream and only 144 Kbps upstream. *See* J. Atkin and D. Ernst, *Bring On the Bandwidth: An Investor's Guide to Competitive Broadband Services,* Ferris, Baker Watts, Inc. (July 1999) at 6. Cable operators also offer broadband with differing characteristics. A number of cable operators continue to offer only telephone return path (upstream) speed, which is about 40 Kbps. *See, e.g.,* <http://cabledatacomnews.com>. Satellite data services offer high speed downstream access of 400 Kbps but rely on about 40 Kbps telephone service for upstream transmission. *See, e.g.,* <http://www.direcpc.com>.

Commenters in the recent 700 MHz Commercial Service Rules proceeding, Service Rules for the 746-764 & 776-794 MHz Bands & Revisions to Part 27 of the Commission's Rules, *First Report & Order*, CC Docket No. 99-168, FCC 00-5 (rel. Jan. 7, 2000), have noted that broadband distribution networks might rely on a combination of technologies, reflecting limited amounts of spectrum and/or the asymmetric nature of data transmission. *See also* Microsoft Ex Parte Filing, CC Docket No. 99-168 (filed Nov. 15), 1999 (flexible allocation of up and downstream bandwidth).

19 *See supra* note 18. Also, in comments filed in *Data Gathering Proceeding*, *supra* note 11, several commenters opine that many residential consumers consider downstream bandwidth to be the critical broadband factor, and upstream bandwidth less important. Arkansas Public Service Commission Comments at 4 ("one-way broadband service could meet some of the needs of rural communities"); Bell Atlantic Comments at 6 ("Both one-way and full broadband services represent significant segments of the broadband market which the Commission must consider to get an accurate view of the competitive landscape"); MediaOne Comments at 11 ("For purposes of assessing the spread of broadband services, the relevant question is how many consumers subscribe to offerings that offer downstream speeds in excess of traditional dial-up modem capabilities."); Northpoint Comments at 3.

capability"? We also seek comment on any other definitional issues that have not yet been addressed. Is there an appropriate shorthand term for "advanced telecommunications capability?" Finally, what impact (if any) will the definition we select have on the deployment or market viability of other high-speed services that nonetheless fail to satisfy the definition?

IV. IS ADVANCED TELECOMMUNICATIONS CAPABILITY BEING DEPLOYED TO "ALL AMERICANS"?

A. Measuring Deployment

10. In the First Report, we described a broad-based investment boom in broadband, both backbone and last mile, amounting to tens of billions of dollars.[20] These investments are occurring in virtually every segment of the communications industry.

11. In our second inquiry, we seek additional information on actual deployment of both backbone and last mile facilities. Is significant investment being made in broadband infrastructure? If local facilities are upgraded in rural areas, are nearby backbone facilities readily accessible to carry the increase in data traffic? Are providers adequately meeting consumer demand for services? We request empirical data, both local and nationwide, about the extent of actual and committed deployment of broadband facilities, and about actual subscriptions by customers to each technology and service described in the following paragraphs and in Appendix A. We request data about both deployment (the number of homes that are reachable or "passed" by broadband last mile facilities and where customers are able to subscribe to broadband promptly if they order service)[21] and actual sales (paying subscribers). For example, how many consumers are now able to subscribe to broadband services from a cable television company and/or a local exchange carrier (LEC)? How many can obtain broadband services from a public utility-based venture or a satellite-based broadband system? How many can obtain broadband services from a fixed or mobile wireless service provider? For example, BellSouth has recently announced a trial of high-speed wireless Internet access in rural Louisiana, and we seek information on other such trials as well as established services.[22]

12. Appendix A states our preliminary understanding of the residential last mile market in detail. Initial estimates indicate that (a) as many as 50 million of the 105

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[20] First Report, 14 FCC Rcd at 2414.

[21] In measuring the availability of cable television, the Cable Services Bureau has used the concept of "homes passed," meaning "the number of homes a particular cable system has the technical ability to serve promptly if a potential customer orders service." Barden Cablevision, *Memorandum Opinion & Order*, 9 FCC Rcd 4805, 4806 n.17 (Cable Serv. Bur. 1994). *See also* Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, *Fifth Annual Report*, 13 FCC Rcd 24284, 24293 n.14 (Fifth Annual Cable TV Competition Report).

[22] *BellSouth to Launch Trial of High-Speed Wireless Internet Access in Rural Louisiana*, BUSINESS WIRE (Dec. 10, 1999), <http://workgroups.newsedge.com/cgi>.

million households[23] in this country now can purchase broadband services from at least one provider (in most cases a cable television company or incumbent LEC), (b) tens of millions of those households can purchase broadband services from two providers (in most cases a cable television company and an incumbent LEC), and (c) a few million households have access from more than two providers (a cable television company, an incumbent LEC, a data CLEC, and a utility-based firm and/or a fixed wireless firm).[24] We ask for detailed comment on this data. We also seek data that will enable us to develop nationwide numbers showing deployment overall. Commenters should state whether their data uses the definition of advanced telecommunications capability that we adopted in our First Report (having the capability of supporting, in both downstream and upstream directions, bandwidth in excess of 200 Kbps in the last mile). Commenters may examine the proposed Form 477 attached to the *Data Gathering Proceeding*.[25] The proposed Form shows the kind of information we are interested in receiving and one format for furnishing it.

13. We welcome comments about the best ways to measure the deployment of advanced telecommunications capability, and especially of last miles. Data about homes that are easily reachable by broadband last mile facilities and where customers could promptly subscribe to broadband services would be helpful. How should we measure the deployment of advanced telecommunications capability by wireline facilities such as LEC, cable, and fiber lines and central office or headend plant? How, also, should we measure the deployment of advanced telecommunications capability via radio spectrum? For wireless services, are there equivalents or counterparts to the predicted contours used to estimate broadcast licensees' service areas? To the extent that data about homes passed is unavailable, would data about paying subscribers be an acceptable reflection of deployment? We also ask whether there are other ways of measuring deployment. Could we measure deployment of last miles to residential customers by looking at the number of orders that manufacturers of fiber or high-bandwidth radio transceivers have received? We also seek comment on whether there are factors other than infrastructure deployment that are affecting the availability of broadband services.[26]

B. Market Segments

14. In the following paragraphs, we ask for information about the deployment of broadband backbone, and then about deployment of broadband last miles to various groups of customers. First, we ask about business and residential customers as a whole. Second, we focus on certain groups of customers that might be at risk of slower deployment.

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23 FCC Industry Analysis Division, TRENDS IN TELEPHONE SERVICE, Tbl. 17.1 (Sept. 1999) (as of March 1999, there were 104.8 million households in the United States).

24 *See generally* Appendix A, ¶¶ 2-9, 12-14, 16.

25 *Data Gathering Proceeding, supra* note 11.

26 Factors that affect the availability of broadband services might include the existence of content that requires broadband service for a consumer to receive it, the purchase of personal computers for the home, trends in the operation of the Internet, the ability of WebTV and other TV set-based forms of Internet access which require broadband speeds, and the development of technology that will enable a cost-effective fixed wireless last mile.

15. Backbone Facilities. In the First Report, we found that broadband backbone facilities were being deployed in a reasonable and timely manner.[27] We ask whether the same is true today. Are there communities that do not have access to a national backbone and, if so, is lack of access likely to persist for the foreseeable future? Where are they? Are there many such communities? Is reasonable and timely deployment of advanced telecommunications capability in rural areas hindered by a shortage of backbone capacity or access to it? If there is such a shortage, what is causing it? Is there a lack of fiber optic capacity reaching these areas? Or is the problem that there is no current means of connecting to nearby backbone facilities -- *i.e.,* there is no backbone hub or point-of-presence in the vicinity? If there are an insufficient number of "on ramps" to high-speed facilities, how can the problem be addressed? Additionally, is congestion a problem on backbone facilities? Is capacity keeping up with demand in all areas?

16. The Last Mile to Large and Medium-Sized Business Customers. In the First Report, we concluded in general terms that the deployment of advanced telecommunications capability to large and medium-sized business customers was reasonable and timely.[28] Has there been an increase in demand by such business customers, but not in supply of services to them? Of the business customers who did not have access to advanced telecommunications capability at the time of our First Report, do more now have access to it? If some business customers still lack access to advanced telecommunications capability, are they specific types of businesses, or are they located in specific places, such as rural areas or low-income, inner-city neighborhoods? Are there communities in which the lack of advanced telecommunications capability has made it difficult to attract and keep businesses?

17. The Last Mile to Small Business Customers. We seek comment about small business customers to the extent that deployment of advanced telecommunications capability to them differs from that to large and medium-sized business and residential customers. For example, do small businesses have as many choices of broadband suppliers as large and medium-sized businesses? Do rural small businesses have special demands for advanced telecommunications capability, such as for communicating with upstream or downstream businesses that insist on broadband connections? Are significant numbers of those small businesses located in areas that are not receiving residential broadband?

18. The Last Mile to Residential Customers. In the First Report, we concluded that the deployment of broadband last miles to residential customers appeared to be reasonable and timely, although we noted that our conclusions were based on a

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[27] First Report, 14 FCC Rcd at 2404, 2421 ("It appears to us that any shortages are relatively small in scope and duration and reflect not lack of capital, construction, or technologies, but the unforeseeable and enormous increases in demand for one of the most successful technologies in recent history.") (footnote omitted).

[28] First Report, 14 FCC Rcd at 2408-09.

limited snapshot at a very early stage in deployment.[29] Has deployment to residential areas increased? What is the likely path or trajectory of the deployment of advanced telecommunications capability to residential customers?[30] What types of companies besides incumbent cable companies and incumbent LECs are deploying or considering deploying broadband infrastructure to residential customers? Are incumbent LECs and cable companies spurring each other to deploy broadband infrastructure faster than they otherwise would? Is deploying "fiber to the home" (or close to the home) feasible from an economic perspective?[31] Are a significant number of competitive LECs committed to deploying advanced telecommunications capability to residential customers?[32] Are public utilities and wireless carriers likely to deploy advanced telecommunications capability to residential customers? Are broadband providers giving their customers a choice of information services and content?

19. There are some markets, such as Phoenix, Arizona and California's San Francisco Bay area, in which there now appear to be four or more broadband suppliers marketing to residential customers. Are there other such markets? If so, what factors create so many residential-oriented sellers in those areas -- geography, demographics, facilities already in place, policies of local governments, population density, the existence of certain content, the attitudes of investors and suppliers, or some combination of factors? What is the experience of foreign countries with respect to residential deployment? What can they teach us about how to accelerate deployment of advanced telecommunications capability in this country?[33]

20. Is there some extent to which deployment of advanced telecommunications capabilities to *business* customers is the catalyst to deployment to *residential* customers in an area? That is, if such services have already been deployed to business customers in a particular geographic area, is residential deployment in the area likely to follow soon thereafter? Are the facilities that are initially deployed to carry business traffic also used to carry data generated by residential customers? Are there specific hurdles for residential deployment? For example, do residential customers have a greater need for additional services, such as technical assistance and customer service?

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29 *Id.* at 2402, 2405, 2446-48.

30 Some parties allege that incumbent Local Exchange Carriers have been slow to deploy broadband to consumers in their territories. *See* Petition Requesting a Revision of the FCC's Advanced Network Report Findings, & a Request for an Investigation into the Bell Operating Companies' Advanced Network Deployment Failures, New Networks Institute (filed Dec. 9, 1999), *available at* <http://www.newnetworks.com/petitionfiled.html> (visited Jan. 10, 2000).

31 For one point-of-view of future competition in the residential broadband market, *see* Dana Blankenhorn, *Broadband Alternative – The Technology ISPs Will Use to Compete with the Big Dogs*, BOARDWATCH at 90 (Nov. 1999).

32 *See, e.g.*, Roger O. Crockett & Catherine Yang, *Faster, Faster, Faster*, BUSINESS WEEK at 191 (Oct. 18, 1999) (Covad has plans "to reach 100 of the top U.S. cities by 2001, bringing split-second Net access to 40% of the homes and businesses in the country.").

33 *See* Michael Sedge, *Italy Explores Internet via Electrical Circuits*, INTERNETNEWS (Feb. 19, 1999) (visited Dec. 27, 1999) <http://www.internetnews.com/intl-news/print/0,1089,6_70431,00.html>; Wylie Wong, *Powerline Firms Charge Networking Push*, C|NET (May 14, 1999) (visited Dec. 27, 1999) <http://news.cnet.com/news/0-1004-200-342522.html>.

Are the differences between broadband services for business customers and broadband services for residential customers so great that they are two unrelated consumer products?

21. We also request comment on what providers have learned in the past year about residential consumers and their demand for advanced telecommunications capability. For example, have the characteristics of subscribers, such as income or education, changed in the past year? Do current subscribers exhibit similar demand characteristics with respect to desired bandwidth or applications, or does demand vary? Are residential broadband services a market distinct from the market for residential narrowband communications (*e.g.*, Internet access)?

22. Longer Term Analysis of the Residential Broadband Market. We also seek comment and analyses concerning the current market for broadband infrastructure to residential customers and how this market is likely to develop over the next three to five years. We welcome analyses that are nationwide in scope as well as those that focus on broadband deployment in particular communities. More specifically, we seek comment on such issues as the number of firms that are likely to compete in specific geographic markets, the barriers to entry that may exist for new entrants into the market for residential services, the degree that competitors are likely to differentiate their products, and the likely importance of vertical integration among suppliers of broadband infrastructure. We also seek comment on any other factors that may affect the structure, conduct or performance of the market for such services to residential customers.

23. Commenters are asked to distinguish and discuss separately demand-side and supply-side factors that are likely to affect the structure, conduct or performance of this market over the next three to five years. For example, we seek comment on demand-side factors, such as the percentage change in the quantity demanded of a good in response to a percentage change in the price of that good (*i.e.,* the own-price elasticity of demand)[34] for service by residential customers. We also seek comment on the cross-price elasticity of demand -- which is the percentage change in the quantity demanded of a good in response to a percentage change in the price of a second good -- between broadband service and other services, such as narrowband data services. In addition, we seek comment on the nature and extent of the costs that must be incurred to switch broadband providers and the likely rate of growth in demand for broadband services by residential customers. We also request comment on how network externalities associated with broadband services may affect the growth of demand over the next three to five years.[35] For example, what types of residential applications that require broadband bandwidths are most likely to stimulate the growth in demand for broadband services in the next few years?

24. In addition, we seek comment on any supply-side factors that may affect the market for residential broadband services. For example, we seek comment on such

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[34] *See generally* William J. Baumol, ECONOMIC THEORY & OPERATIONS ANALYSIS 184 (4th ed. 1977).

[35] A network externality arises when a good becomes more valuable to a user if the more users adopt the same good or compatible ones. Jean Tirole, THE THEORY OF INDUSTRIAL ORGANIZATION 405 (1992).

factors as the nature and extent of the investment required to deploy advanced telecommunications capability to residential customers, including the extent to which such investment is sunk.[36] We also seek comment on the nature and extent of any economies of scale and scope with respect to such investment.[37] Do the economics of deploying advanced telecommunications capability differ from one technology (for example, wireline) to another (for example, wireless)? Finally, we seek comment on how technological developments are likely to affect the market for residential broadband services over the next three to five years.[38]

25. We also seek comment on the future nature of competition in this market for residential broadband services. For example, what is the likely nature and extent of price competition over the next three to five years? Similarly, how important are other forms of competition likely to be, such as advertising and promotional expenditures, price discrimination, and product design, including the design of new applications? How will mergers among broadband providers likely affect the structure and conduct of the market for residential broadband services? To what extent, and how, could incentives be created to induce additional entry into this market? Finally, how are developments in the structure and conduct of this market likely to affect the need for regulation?

C. Geographic Areas and Demographic Groups

26. Although nationwide data is important, it may mask geographic or other differences in deployment. We have heard considerable concern expressed that rural areas and poor communities, among others, have significantly less access to broadband than other communities.[39] In its recent report, *Falling Through the Net* (NTIA Report), the National Telecommunications and Information Administration discusses what it calls a "Digital Divide."[40] The NTIA Report chronicles unequal growth in Internet access between certain demographic groups and regions of the United States and asserts that the "Digital Divide" is widening significantly.[41]

27. The NTIA Report concludes that all Americans are more connected to the Internet than ever before and that connections for all groups are increasing substantially. But the NTIA Report finds that a divide exists between the "information rich" -- whites, Asians/Pacific Islanders, those with higher incomes, those more educated, and dual-parent households -- and the "information poor" -- younger Americans, those with lower

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36 The importance of large sunk costs is suggested in Oliver E. Williamson, THE ECONOMIC INSTITUTIONS OF CAPITALISM (1985). *See also* William J. Baumol, John C. Panzar, & Robert D. Willig, CONTESTABLE MARKETS & THE THEORY OF INDUSTRY STRUCTURE 279-309 (1982).

37 A detailed analysis of economies of scale and scope and their interaction in shaping market structure is provided by Baumol, Panzar & Willig, *supra* note 36.

38 The nature and importance of increasing returns phenomena are clearly presented in the collection of papers in Brian Arthur, INCREASING RETURNS & PATH DEPARTURE IN THE ECONOMY (1994).

39 *See, e.g.,* CEO Summit, *supra* note 10; letter from Thomas Daschle, Senator from South Dakota, *et al.*, to William E. Kennard, Commission Chairman, May 20, 1999.

40 National Telecommunications & Information Administration, *Falling Through the Net* (July 1999) (NTIA Report).

41 NTIA Report at xiii.

income and education levels, certain minorities, and those in rural areas and inner cities. According to NTIA, more of the former are connected to the Internet than are the latter.[42] Further, the NTIA Report asserts that these differences are significant and growing.[43] In particular, "Americans living in rural areas are less likely to be connected to PCs or the Internet – even when holding income constant."[44] We ask for comments on NTIA's conclusions. Moreover, we ask for comment on the degree to which NTIA's conclusions apply to advanced telecommunications capability. What groups are not receiving high-speed services? If deployment of service to one group or area is lagging behind deployment to most Americans, is service to that group or area nevertheless catching up to the majority?

28. We are aware that the Massachusetts Institute of Technology's Internet & Telecom Convergence Consortium is attempting to create a comprehensive database and analysis of residential broadband deployment and subscription in the Commonwealth of Massachusetts.[45] We understand that this effort is funded by a variety of companies in the communications industry. We are also aware of a study by the State of Wisconsin of broadband deployment in that State.[46] We welcome any studies of the actual deployment of advanced telecommunications capability. We encourage all actual and potential providers of advanced services to cooperate in furnishing data.

29. Rural Areas, Underserved Areas, and Tribal Communities. In section 706(a) of the 1996 Act, Congress directs the Commission and the states to promote the deployment of advanced telecommunications capability on a reasonable and timely basis to "all Americans."[47] In the First Report, we expressed particular concern about deployment of advanced telecommunications capability in rural areas. We indicated at that time that we lacked adequate data to conclude definitively that deployment of advanced telecommunications capability in rural areas was proceeding in a reasonable and timely fashion.[48]

30. In this *Notice*, one year later, we seek comment on whether advanced telecommunications capabilities are being deployed to rural areas in a reasonable and timely manner. In the previous section, we seek comment on the deployment of backbone facilities in rural areas. Here we seek comment on whether facilities serving the last mile to rural customers are being deployed in a reasonable and timely fashion. Are such facilities being deployed in certain rural areas, but not others? The National

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42 *Id.*

43 *Id.*

44 *Id.* at 5.

45 The Consortium may be contacted through Dr. William Lehr, Executive Director, E40-231, 1 Amherst Street, Cambridge MA 02139, 617-258-0630, <wlehr@rpcp.mit.edu>, <http://itel.mit.edu>.

46 Public Service Commission of Wisconsin, *Annual Report on Universal Service to the Joint Committee on Information Policy* at 3, 10-12, 17-18 (July 1999), *available at* http://www.psc.state.wi.us:8080/writings/usf99rpt.pdf. *See also* Public Util. Comm'n of Texas, *Project #21166, Report to the 77th Legislature on Availability of Advanced Services in Rural & High Cost Areas,* <http://www.puc.state.tx.us/telecomm/projects/21166/21166.cfm>.

47 47 U.S.C. §157 nt., *see supra* note 1.

48 First Report, 14 FCC Rcd at 2432-35.

Telephone Cooperative Association asserts that a significant number of its members is studying and/or deploying broadband in rural America.[49] Is there a difference between the broadband deployment strategies of the rural incumbent LECs and the non-rural ones? To what extent are these strategies influenced by the LEC's choice of technology, and the relative advantages or disadvantages of wireline and wireless approaches, including the extension of wireless local loop technologies to underserved areas? Are other kinds of companies (perhaps using different technologies, such as satellite) deploying advanced telecommunications capability to residences and businesses in rural America? Are rural consumers subscribing to it? Is advanced telecommunications capability particularly necessary for rural areas to attract and retain businesses? We also request comment on the deployment of advanced telecommunications capability in areas populated by Native Americans.[50] Is the rate of growth faster or slower than deployment to rural areas generally? We ask for empirical data to support commenters' views.

31. Persons with Disabilities. We seek comment on whether persons with disabilities have the same access to advanced telecommunications capability as other persons. Do the broadband technologies being deployed pose any special access barriers to persons with disabilities?[51] What needs to be done to ensure that new broadband technologies have accessibility features built into their *initial* designs in order for people with disabilities to have the reasonable and timely access contemplated by section 706? We seek data on this issue, and on the extent to which universal and inclusive design practices are being incorporated into emerging broadband networks, equipment, and services. What are trends in deployment of both built-in accessibility and compatibility features affecting access by consumers with visual, hearing, speech, mobility, cognitive, or other disabilities?

32. We recently released rules implementing section 255 of the 1996 Act that require manufacturers of customer premises equipment and telecommunications equipment and providers of telecommunications services to design, develop and fabricate products that are accessible to, and usable by, persons with disabilities if readily achievable.[52] How can we ensure that broadband services and equipment are designed, developed and fabricated to be accessible to and compatible with assistive technology?[53]

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[49] National Tel. Coop. Ass'n, *Internet/Broadband Availability Survey – Report* (Sept. 15, 1999); *Dial-Tone Is Not Enough: Serving Tribal Lands – The Role That Small Rural Telecommunications Companies Play in Bringing Both Basic and Advanced Services to Reservations* (Nov. 1999).

[50] Parties who addressed this issue in their filings in Federal-State Joint Board on Universal Service: Promoting Deployment and Subscribership in Unserved and Underserved Areas, Including Tribal and Insular Areas, CC Docket No. 96-45, *Further Notice of Proposed Rulemaking* FCC 99-204 (rel. Sept. 3, 1999), *available at* 1999 WL 684121, may attach copies of those filings to their Comments herein.

[51] We note that digital wireless networks have not been compatible with TTYs, though considerable progress is being made in developing solutions. We also note that the Cellular Telecommunications Industry Association has established a voluntary certification program encouraging cellular telephone manufacturers to provide a standardized jack for adjunct technologies.

[52] 47 USC § 255. Access to Telecommunications Services, Telecommunications Equipment & Customer Premises Equipment by Persons with Disabilities, WT Docket No. 96-198, *Report & Order & Further Notice of Inquiry* FCC 99-181 (rel. Sept. 29, 1999), *available at* 1999 WL 770958.

[53] The Assistive Technology Act of 1998, Pub. L. 105-394, at § 3(a)(3), defines an "assistive technology device" as "any item, piece of equipment, or product system, whether acquired commercially,

In particular, what is needed to assure that video telephony standards will support simultaneous video, text, and voice for applications such as video relay interpreting with captions? What different or additional factors distinguish delivery of such broadband applications by wireline and wireless technologies?

33. Elementary and Secondary Schools and Classrooms. Section 706 specifically directs our attention to the deployment of advanced telecommunications capability to elementary and secondary schools and classrooms.[54] In the First Report, we cited our programs to make advanced telecommunications capability available to elementary and secondary schools and classrooms.[55] As of late November 1999, our E-Rate Programs had committed $3.58 billion for payment to carriers and other providers supplying schools and libraries with telecommunications services, Internet access, and internal connections at a discount.[56] We ask for comment on the degree to which elementary and secondary schools and classrooms have access to advanced telecommunications capability.

34. Low Quality POTS as a Barrier to Broadband Deployment. We ask for comment on whether shortcomings in the quality, reliability, and other technical characteristics of an area's narrowband Plain Old Telephone Service ("POTS") network will affect the availability of broadband services. Does poor quality POTS represent plant that is unsuitable for the deployment of advanced telecommunications capability? Or would interconnection of poor quality POTS plant with other technologies (*e.g.*, wireless) allow use of such plant for advanced telecommunications capability? Does the answer vary depending on the other technology? Will there be enough broadband last miles that do not use POTS plant at all, so that the quality of the POTS network will not have significant bearing on the availability of advanced telecommunications capability?

35. We are particularly concerned about the relationship between the quality of the POTS network and the deployment of advanced telecommunications capability because of indications that the wire centers with the worst service quality for POTS are frequently in low income and minority neighborhoods.[57] If low quality POTS presents a barrier to deployment of advanced telecommunications capability, and if low quality POTS occurs most often in low income and minority neighborhoods and is a barrier to broadband, then those neighborhoods could be at particular risk for unreasonable and untimely deployment of advanced telecommunications capability. If we determine that

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modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities." 29 USC § 3002 (a)(3).

[54] 47 U.S.C. § 157 nt., *see supra* note 1.

[55] First Report, 14 FCC Rcd at 2439-42.

[56] *See* http://www.sl.universalservice.org/apply/fcyear1/national.asp; http://www.sl.universalservice.org/apply/fcyear2/national.asp.

[57] *See* New England Tel. & Tel. Co., 115 PUR 4th 44 (Mass. DPU 1990); Petition of Twenty Customers of New England Tel. & Tel. Co., Mass. DPU 96-30 (July 18, 1997) at 28; Madeleine Plasencia, *The Politics On The Electronic Highway: An Analysis of the Video Dialtone Redlining Cases, & The NYNEX Consent Decree In Roxbury*, 15 TOURO L. REV. 518 (1999); William Sherman, *How Your Phone Service Rates Clear Talk? Or Dead Lines & Static? It All Depends on Where You Live*, N.Y. DAILY NEWS, 1999 WL 3427200 (March 7, 1999).

the quality of POTS service has an impact on deployment of advanced telecommunications capability, how can we determine where service quality is poor and identify any patterns to service quality differences? What remedies at our disposal would ensure the reasonable and timely deployment of advanced telecommunications capability in affected neighborhoods?

36. More broadly, we ask whether advanced telecommunications capability is being deployed in low income and minority neighborhoods -- particularly in urban, inner-city areas -- in a reasonable and timely manner. Do the residents in such neighborhoods appear to have an unusually small or large demand for advanced telecommunications capability? Do residential customers there have a particular need for advanced telecommunications capability in order to have access to education, employment, health care, and commercial services that are otherwise in short supply? Are more or fewer suppliers interested in serving such neighborhoods than are interested in serving other urban areas? We ask for empirical data to support commenters' views.

37. Other Groups. We also welcome comment showing the degree to which groups other than those we have named have access to advanced telecommunications capability. We emphasize our need for detailed data rather than generalizations. We also seek comment on the extent to which we can promote deployment to specific groups consistent with the Act and other applicable legal authority.

V. IS OVERALL DEPLOYMENT "REASONABLE AND TIMELY"?

38. Once we have gathered data on the deployment of advanced telecommunications capability, section 706 requires that we determine whether such capability is being deployed to all Americans "in a reasonable and timely fashion."[58] We seek comment on whether we need to develop a standard against which to measure what constitutes "reasonable and timely."

39. In the First Report, we judged whether the deployment of last miles to residential customers was "reasonable and timely" by comparing current data about advanced telecommunications capability with data about four other consumer electronic technologies at similarly early stages in their commercial lives.[59] The four technologies are the telephone starting in 1876, black-and-white television starting in 1946, color television starting in 1954, and cellular service starting in 1983. We ask for comment about whether these comparisons are still useful. Our best information at this time is that the first regular commercial offering of broadband to residential consumers was in late 1996.[60] This would mean that on December 31, 1999, residential broadband completed its third calendar year as a consumer product. According to our data, the penetration of the four technologies we used in the First Report at the end of their third calendar year of offering was as follows:

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58 47 USC § 157 nt, *see supra* note 1.

59 First Report, 14 FCC Rcd at 2410-13.

60 *Id.* at 2411 n.36.

telephone (mainly business)	.22%
black-and-white television (mainly residential)	2.23%
color television (mainly residential)	.20%
cellular service (mainly business)	1.38%

40. Appendix B shows data about use of electricity, radios, cable television, video cassette tape players (VCRs), compact disc players (CDs), and direct broadcast satellite service (DBS) (as well as the four technologies we used in the First Report). Radios, VCRs, CDs, and DBS became widespread much faster than the four technologies we used in our First Report. Market penetration at the end of their third calendar year of offering was, according to our data:

video cassette tape players	3.10%
compact disc players	4.00%
direct broadcast satellite service	8.32%
radios	9.99%[61]

We seek comment on whether these other consumer products and services are more appropriate benchmarks than the ones we used in our First Report for measuring reasonable and timely deployment.

41. We also invite suggestions of other benchmarks for measuring reasonable and timely deployment of advanced telecommunications capability. Is a comparison to consumer electronic technologies misleading because advanced telecommunications capability is fundamentally different? If we do not compare current deployment to other consumer products or services, how else can we determine whether current deployment is reasonable and timely?

VI. WHAT ACTIONS WILL "ACCELERATE DEPLOYMENT"?

42. If we find that advanced telecommunications capability is not being deployed in a reasonable and timely manner, we must "take immediate action to accelerate deployment."[62] Section 706 (a) mentions "price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment" and section 706 (b) speaks of "removing barriers to infrastructure investment and . . . promoting competition in the telecommunications market."[63] In addition, there may be methods by which the influx of market participants and investment capital can accelerate deployment.

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61 *See* Appendix B. We have not located data about the deployment of electricity in its first 20 years. The sources for the penetration rates are derived from and include: HISTORICAL STATISTICS FOR THE UNITED STATED, COLONIAL TIMES TO 1970, Bureau of the Census, U.S. Dept. of Commerce (1975); STATISTICAL ABSTRACT OF THE UNITED STATES, Bureau of the Census, U.S. Dept. of Commerce (various years 1970-1998). See Appendix B for detailed source information.

62 47 U.S.C. § 157 nt., *see supra* note 1.

63 *Id.*.

43. We ask for comment on how we might best use the tools specified in section 706 to accelerate deployment of advanced telecommunications capability to areas where it is not being deployed in a reasonable and timely manner. We welcome comment from the states on how we can coordinate our efforts pursuant to section 706. Are there ways, in addition to the Joint Conference, that we can work with the states to promote the deployment of advanced telecommunications capability to all Americans?[64]

44. We also seek comment on how to target action to specific groups, such as those we have mentioned in paragraphs 26-37 above, and whether such targeting would be consistent with our statutory mandate and applicable legal authority. The NTIA Report asserts that community access centers, such as schools, libraries, and other public access points, will play an important role in extending the provision of information services across what it characterizes as the "Digital Divide."[65] Do NTIA's conclusions apply to advanced telecommunications capability? Or, are there practical issues or other factors, such as time limits on use, that limit the ability of such public access points to provide meaningful access?

45. Is it the case that no one technology (telephone-based, cable-based, terrestrial wireless, satellite, *etc.*) can bridge any "Digital Divide" that exists? Might it be that the solution will be cable television in one underserved area, xDSL in another, fixed wireless in a third, satellite in a fourth, unlicensed spectrum in a fifth, a municipal-built or user-owned system in a sixth, a cable overbuild[66] in a seventh, and so on?[67] Business executives' statements at the recent CEO Summit indicate that there may be many ways to cross any rural "Digital Divide," no one of which fits all rural areas.[68] In our recent 700 MHz Commercial Service Rules proceeding, parties asserted that varied wireless technologies can provide broadband services, both as stand-alone services and in conjunction with other technologies, and in both rural and urban environments.[69] If

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[64] Section 706 requires both the Commission and the states to promote the deployment of broadband to all Americans in a reasonable and timely fashion. *Id. See also supra* note 12.

[65] NTIA Report, *supra* note 40, at xiv.

[66] Cable overbuilding is defined as occurring when two or more wireline cable systems directly compete for subscribers in a local delivery market. Fifth Annual Cable TV Competition Report, *supra* note 21, 13 FCC Rcd at 24293 n.11.

[67] *See* Branko J. Gerovac & David C. Carver, *Delivering on the Promise: Scenarios for Deploying Local Access* in DEBORAH HURLEY & JAMES H. KELLER (EDS.), THE FIRST HUNDRED FEET: OPTIONS FOR INTERNET & BROADBAND ACCESS (1999) at 24, 37 ("a collage of technologies will be deployed in different settings, depending on local circumstances.") & Andrea L. Johnson, *A City Guide: Developing, Using & Regulating Regional Telecommunications Networks under the Telecommunications Act of 1996,* in *id.* at 119 ("American cities are pursuing a variety of initiatives to ensure the provision of advanced communications services to their citizenry.").

[68] CEO Summit, *supra* note 10, Statements Charles Brewer, CEO of Mindspring (ISP wants to provide broadband to rural residences via incumbents' plant); Joe Floyd, CEO of MidContinent Media, Inc., (cable television company now providing broadband in rural areas with as few as fifty customers); Statement of Jim Gleason, CEO of Galaxy Cablevision (cable television company now deploying broadband in rural areas); Statement of Dan Landguth of Black Hills Corp. (energy company now deploying broadband to customers in western South Dakota).

[69] *See supra* note 18, FreeSpace Oct. 5, 1999 & Oct. 13, 1999 Ex Parte Filings (network architecture and spectrum licensing); FreeSpace Nov. 24, 1999 Ex Parte Filing (methodology for evaluating potential

crossing any rural "Digital Divide" requires a variety of approaches, should we be using the tools provided in section 706 (*e.g.*, regulatory forbearance) to encourage the deployment of advanced telecommunications capability through many different kinds of technologies?

46. In the First Report, we noted the Alliance for Public Technology's idea of "demand pull," which involves community leaders pooling the demands of underserved areas and consumers and thus attracting profit-driven suppliers.[70] Demand pull attempts to interest profit-driven suppliers in developing and testing services tailored to the particular needs of underserved consumers -- applications that are community-driven and address the needs and cultures of those living in marginalized communities. These might be debt management and financial skills, health care, and finding and performing jobs instead of leisure- and entertainment-oriented broadband. We request comment about any experiments or experiences with demand pull. Have they brought broadband to areas and consumers that would otherwise not have it? With what applications? Does the demand pull concept appear to be a promising way to encourage the deployment of broadband in underserved areas? If so, how could the Commission promote demand pull?

47. Universal Service. In our First Report, we mentioned our universal service mechanisms.[71] In our Universal Service First Report & Order,[72] we stated that on or before January 1, 2001, the Federal-State Joint Board would convene to consider the definition of services supported by the high cost universal service fund. We seek comment on the relationship between the universal service provisions of section 254 of the 1996 Telecommunications Act[73] and section 706's mandate that we encourage the deployment of advanced services to all Americans.

48. Regulatory Factors. Many proceedings are underway before this Commission and elsewhere that may accelerate the deployment of advanced telecommunications capability. These proceedings include the "UNE Remand,"[74] "Line Sharing,"[75] "Unserved Areas,"[76] "Competitive Networks,"[77] "LATA Relief"[78] and

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interference with adjacent spectrum blocks); Motorola Nov. 22, 1999 Ex Parte Filing (methods for managing interference; problems of urban interference environment).

[70] First Report, 14 FCC Rcd at 2438-39; Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable & Timely Fashion, *Notice of Inquiry*, 13 FCC Rcd 15280, 15305-06 (1998).

[71] First Report, 14 FCC Rcd at 2436-37.

[72] Federal-State Joint Board on Universal Service, Report & Order, 12 FCC Rcd 8776, 8834-35 (1997), *as corrected by Errata*, CC Docket No. 96-45, FCC 97-157 (released June 4, 1997), *aff'd in part, rev'd in part, remanded in part sub nom.* Texas Office of Pub. Util. Counsel v. FCC, 183 F.3d 393 (5th Cir. 1999).

[73] 47 U.S.C. § 254.

[74] Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98, *Third Report & Order & Fourth Notice of Proposed Rulemaking* FCC 99-238 at ¶¶ 162-229 (rel. Nov. 5, 1999), *available at* 1999 WL 1008985 (loop and subloop unbundling).

[75] Deployment of Wireline Services Offering Advanced Telecommunications Capability, *Third Report & Order in CC Docket 98-147 & Fourth Report & Order in CC Docket No. 96-98*, FCC 99-355 (rel. Dec. 9, 1999), *available at* 1999 WL 1124073.

"Inside Wiring"[79] proceedings. We have also considered deployment issues in our Spectrum Reallocation Policy Statement.[80] If the Commission were to decide that deployment is not reasonable and timely, will the action taken in these proceedings accelerate the deployment of advanced telecommunications services in a reasonable and timely manner? We welcome suggestions of other ways to accelerate the reasonable and timely deployment of broadband service and terminal equipment, if the Commission were to decide that deployment is not reasonable and timely. Should we encourage investment in fiber to the home?[81] Are there ways we can streamline technical registration of xDSL terminal equipment? If the Commission were to decide that deployment is not reasonable and timely, will improved licensing of new kinds of satellite dishes accelerate the reasonable and timely deployment of satellite-based broadband?[82] Should the Commission decide that deployment is not reasonable and timely, are there ways for the Commission to expedite changes to its technical rules that will accelerate the reasonable and timely deployment of advanced telecommunications capability?

49. At present, we use several different systems of regulation for different industries. Title II applies to common carriers, Title III applies to wireless broadcasters and carriers, and Title VI applies to cable companies. Utilities are regulated largely under state laws and information service providers are unregulated. As discrete industries and services begin to compete in a "broadband market," the application of different regulatory systems to competing services may well have varying effects on the rate and manner of growth of deployment. We ask for comment whether any of the models described above is likely to lead to more rapid deployment of advanced telecommunications capability to all Americans in a reasonable and timely manner. Would some other regulatory model, or a de-regulatory or non-regulatory one, speed deployment?

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[76] *See supra* note 50.

[77] Promotion of Competitive Networks in Local Telecommunications Markets, *Notice of Proposed Rulemaking & Notice of Inquiry in WT Docket No. 99-217 & Third Further Notice of Proposed Rulemaking in CC Docket No. 96-98*, FCC 99-141 (rel. July 7, 1999), *available at* 1999 WL 459319.

[78] Deployment of Wireline Services Offering Advanced Telecommunications Capability, Request by Bell Atlantic–West Virginia for Interim Relief Under Section 706, or, in the Alternative, a LATA Boundary Modification, CC Docket No. 98-147, *Fourth Report & Order & Memorandum Opinion & Order*, FCC 00-26 (rel. February 11, 2000).

[79] Review of Sections 68.104 and 68.213 of the Commission's Rules Concerning Connection of Simple Inside Wiring to the Telephone Network, CC Docket No. 88-57, *Third Report & Order*, FCC 99-405 (rel. Jan. 10, 2000).

[80] Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, *Policy Statement*, FCC 99-354, (rel. Nov. 22, 1999), *available at* 1999 WL 1054886.

[81] *See* letter of Matthew J. Flannigan, President of the Telecommunications Industry Association, to William E. Kennard, Chairman of the Commission, dated Aug. 2, 1999, re Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98, *available at* https://gullfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6009148625.

[82] *See, e.g.*, *Clinton Promises Focus on 'Digital Divide' Next Year*, COMMUNICATIONS DAILY, Dec. 10, 1999 ("OnSat Network Communications said FCC should demonstrate commitment by granting company's request for blanket licenses of 3.7 m dishes in C-band, move company said would clear way for it to provide high-speed access in remote areas.").

VII. PROCEDURAL MATTERS

50. Pursuant to sections 1.415, 1.419, and 1.430 of the Commission's rules, 47 C.F.R. § 1.415, 1.419, 1.430, interested parties may file comments on or before March 20, 2000, and reply comments on or before April 4, 2000. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. See *Electronic Filing of Documents in Rulemaking Proceedings*, 63 Fed. Reg. 24,121 (1998).

51. Comments filed through the ECFS can be sent as an electronic file via the Internet to <http://www.fcc.gov/e-file/ecfs.html>. Generally, only one copy of an electronic submission must be filed. If multiple docket or rulemaking numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rulemaking number referenced in the caption. In completing the transmittal screen, commenters should include their full name, Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to ecfs@fcc.gov, and should include the following words in the body of the message, "get form <your e-mail address." A sample form and directions will be sent in reply.

52. Parties who choose to file by paper must file an original and four copies of each filing. If more than one docket or rulemaking number appear in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rulemaking number. All filings must be sent to the Commission's Secretary, Magalie Roman Salas, Office of the Secretary, Federal Communications Commission, 445 12th St., S.W., Room TW B-204, Washington, D.C. 20554. Filings will be available for public inspection and copying during normal business hours in the FCC Reference Information Center, 445 12th Street, S.W., Suite CY-A257, Washington, D.C. 20554.

53. We note that there are many other proceedings now underway at the Commission that include issues that could affect a company's, or class of companies', incentive and ability to deploy advanced telecommunications capability. If commenters wish to refer to their filing in another proceeding, they must provide in their comments in this proceeding a complete recitation of the pertinent information and also attach a copy of the filing to which they refer.

54. Subject to the provisions of 47 C.F.R. § 1.1203 concerning "Sunshine Period" prohibitions, this proceeding is exempt from ex parte restraints and disclosure requirements, pursuant to 47 C.F.R. § 1.1204(b)(1). Because many of the matters on which we request comment in this Notice may call on parties to disclose proprietary information such as market research and business plans, we suggest that parties consult 47 C.F.R. § 0.459 about the submission of confidential information.

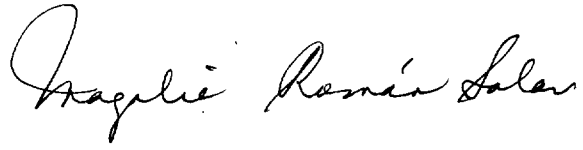
55. For additional information regarding this proceeding, contact John W. Berresford, Senior Antitrust Attorney, Industry Analysis Division, Common Carrier Bureau, at 202-418-1886 voice, 202-418-0484 TTY, or jberresf@fcc.gov. It would be appreciated if parties filing comments or reply comments would deliver to John W. Berresford, Room 6 A-165, 445 12th Street, S.W., Washington, D.C. 20554, two hard copies and one diskette copy in Word, suitable for word-searching.

56. Alternate formats (computer diskette, large print, audio recording, and Braille) are available to persons with disabilities by contacting Martha Contee at (202) 418-0260 voice, (202) 418-2555 TTY, or at mcontee@fcc.gov. This Notice of Inquiry can also be downloaded in MSWord97 and in ASCII formats at: http://www.fcc.gov/dtf.

VIII. ORDERING CLAUSE

57. Accordingly, IT IS ORDERED that, pursuant to section 706 of the Telecommunications Act of 1996, this Notice of Inquiry IS ADOPTED.

FEDERAL COMMUNICATIONS COMMISSION



Magalie Roman Salas
Secretary

APPENDIX A

THE LAST MILE TO THE RESIDENTIAL CUSTOMER

1. In the following paragraphs, we state our preliminary understanding, based on public sources, of current and committed deployment of broadband services to residential customers.[1]

2. Cable-Based Broadband Service. Cable operators are in the midst of upgrading their cable network architecture from coaxial distribution systems that feature one-way delivery of analog television to two-way interactive systems involving a hybrid of traditional coaxial and modern fiber optic technologies.[2] These new hybrid fiber-coaxial (HFC) networks enable the cable operators to deliver a wide range of services, including high-speed Internet access, telephony, and digital television. By the end of 1999, the larger cable operators (AT&T, Cablevision, Comcast, Cox, and Time Warner) should have upgraded their systems that serve 65% of the 72 million homes passed by cable.[3] Some small cable operators are also upgrading.[4] One of the primary drivers behind this rapid upgrade schedule is the offering of high-speed (or broadband) Internet access that offers significant advantages over the traditional telephone dial-up modem service. With a cable modem, a subscriber can access data at speeds approximately 100 times faster than conventional dial-up service. In addition, the cable modem service offers an always-on connection and does not have delays associated with log-on procedures.[5]

3. According to one source, at the end of October 1999, cable modem service was available to 37 million homes in the United States and Canada.[6] This is a substantial increase over the end of 1998, when cable modem service was estimated to be available to 21 million such homes.[7] At the end of 1998, there were an estimated 373,000 cable

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[1] For clarity's sake, our discussion is organized by commonly used terms (e.g., cable TV company, fixed wireless). We realize, however, that some of these terms overlap to some extent (e.g., a cable TV company may provide broadband outside its cable territory by fixed wireless spectrum).

[2] Barbara Esbin, *Internet Over Cable: Defining the Future in Terms of the Past*, OPP Working Paper Series 30 at 75 (Aug. 1998).

Technically, the term "cable-based broadband service" includes traditional cable television because even the one-way transmission of many analog channels of video programming requires high bandwidth. In this proceeding, we mean to exclude traditional cable television from "cable-based broadband service."

[3] Lehman Brothers, *ADSL v. Cable Modems: And the Winner is . . .* , at 6 (June 1999).

[4] In our Local Competition & Broadband Reporting NPRM, CC Docket No. 99-301, *Notice of Proposed Rulemaking* FCC 99-283, (rel. Oct. 22, 1999), *available at* 1999 WL 961574, the Comments of American Cable Association state (at 4) that many "smaller cable businesses...provide or are about to launch new digital services, often including high-speed digital, data and Internet services in rural America.").

[5] Some cable operators are offering high-speed Internet service using a telephone return path. This type of service is not always on and offers significantly lower upstream speeds than does two-way cable service.

[6] *Cable Modem Market Stats & Projections*, CABLE DATACOM NEWS (Nov. 9, 1999) (visited Jan. 5, 2000) < http://www.cabledatacomnews.com/cmic/cmic16.html>.

[7] *Cable Modem Customer Count To Top 500,000 At Year's End*, CABLE DATACOM NEWS (Dec. 1998) (visited Sept. 29, 1999) < http://www.cabledatacomnews.com/dec98/dec98-1.html >.

modem subscribers in the United States.[8] By the beginning of October 1999, less than a year later, this number had grown to an estimated 1.1 million subscribers.[9]

4. Despite the promise of two-way cable broadband service, the cable HFC network presents some technical limitations that affect the performance and security of the service. Unlike other technologies such as dial-up and digital subscriber line (DSL) that offer a dedicated connection to each subscriber, the cable network is a shared medium wherein transmission channels are shared at the local loop level between subscribers in a given area. Depending upon how many subscribers are using the connection at any one time, Internet access speeds vary and can slow appreciably during peak usage periods.[10] The shared medium also presents security risks, as data could be intercepted or "hacked" by unauthorized users. However, the cable operators are currently employing various techniques to address the performance and security issues.[11]

5. Incumbent LECs' Broadband Services. Incumbent LECs use DSL technology and existing copper telephone plant to provide broadband service to residential customers. At this time, it appears that about 80 percent of total DSL lines in service are provided by incumbent LECs, and most of the remainder are provided by competitive LECs.[12] Various estimates suggest that the total number of residential subscribers to DSL service is growing rapidly but is still small. For example, the consulting firm TeleChoice estimates that about 275,000 total DSL lines were in service in the United States at the end of the third quarter of 1999, of which about 190,000 served residential customers.[13] By way of contrast, TeleChoice also estimates that there were 39,000 such lines at the end of 1998 and projects that there will be 575,000 such lines at the end of 1999.[14] Pioneer Consulting offered a somewhat higher forecast of 760,000 total DSL lines in service in the United States as of the end of 1999.[15]

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8 *Id.* (Canadian cable modem subscribers were estimated to number 140,000).

9 *Cable Modem Market Stats & Projections*, CABLE DATACOM NEWS (Nov. 9, 1999) (visited Jan. 5, 2000) < http://www.cabledatacomnews.com/cmic/cmic16.html>. (Canadian cable modem subscribers were estimated to number 325,000). *See also* Notice, note 8.

10 J. Atkin & D. Ernst, *Bring On the Bandwidth: An Investor's Guide to Competitive Broadband Services,* Ferris, Baker Watts, Inc. (July 1999) at 82 (Ferris Baker Report).

11 To maintain performance of the cable modem service as usage increases, the cable operator can segment the node and, thereby, reduce the traffic load at key points of the network. To maintain network reliability and prevent security breaches, the cable operator can employ various techniques, including encryption technology and network management solutions.

12 TeleChoice, Inc., *Deployment – UPDATED 11/5/99* (visited Nov. 15, 1999) <http://www.xdsl.com/content/resources/deployment_info.asp> (estimates 274,755 total DSL lines in service at the end of 3Q99, provided as follows: 220,000 by incumbent LECs; 52,159 by competitive LECs; 1,700 by competitive LECs that are also Internet Service Providers; and 896 by interexchange carriers).

13 *Id.* (estimates, by type of provider, the percentage of total DSL lines that serve residential customers: 81% of such incumbent LEC lines; 21% of such competitive LEC lines; 43% of such lines provided by competitive LECs that are also Internet Service Providers; and 83% of such lines provided by interexchange carriers; also notes that the estimated residential percentage for the entire market, which is 69%, may be misleading because, *inter alia,* many home office (*i.e.*, business) customers purchase service from "residential" product categories).

14 *Id.* (also projects about 9.6 million DSL lines in service in the United States at the end of 2003).

15 *U.S. DSL Subscribers Will Grow From 760,000 in 1999 to Over 12 Million in the Year 2003, According to Pioneer Consulting* (Nov. 4, 1999) (visited Nov. 15, 1999)

6. Since the First Report, a number of incumbent LECs have announced plans to accelerate deployment of broadband service. For example, in October 1999 SBC announced expanded plans to offer DSL services to an estimated 77 million Americans in nearly 35 million customer locations – representing about 80 percent of SBC customers – by the end of 2002.[16] Earlier in 1999, SBC had announced plans to make 9.8 million households and businesses "serve-able," and a goal of 200,000 DSL service subscribers, by the end of 1999.[17] In September 1999, U S WEST announced the addition of an occasional-use broadband service, targeted at recreational Internet users whose telephone lines meet certain technical specifications, which the company is making available in the nearly 250 telephone central offices from which it serves almost 7 million households.[18] Other large incumbent LECs highlighted plans for residential DSL in July 1999 announcements. Bell Atlantic said it was doubling its deployment of DSL-capable lines, making them available to 17 million qualified residential and business lines served from 700 central offices by the end of 1999 and to 21 million qualified lines by the end of the first quarter of 2000.[19] Ameritech (whose plans have since been subsumed in those of SBC) announced that it would accelerate deployment in switching centers that serve 7 million homes by the end of 2000 and 8 million homes by the end of 2001.[20] GTE earlier announced plans to offer DSL service in parts of 16 states by the end of 1999.[21] Among its local service areas, Sprint began offering DSL service in Charlottesville, VA in May

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<http://www.pioneerconsulting.com/press/99press09.html> (also projecting that small and medium-sized businesses will represent an important share of the forecasted growth).

[16] *SBC Launches $6 Billion Broadband Initiative* (Oct. 18, 1999) (visited Nov. 2, 1999) <http://www.sbc.com/News_Center/Article.html?query_type=article&query=19991018-01> (DSL technology will be placed in about 1,400 central offices in 13 states; additionally, the plans call for laying more than 12,000 miles of fiber sheath, and installing or upgrading 25,000 neighborhood broadband gateways, to eliminate distance constraints that currently limit the reach of DSL service) (SBC News Release).

[17] *Southwestern Bell Launches High-Speed DSL Service in St. Louis* (July 1, 1999) (visited Sept. 16, 1999) <http://www.swbell.com/News/Article.html?query_type=article&query=19990701-03>. Of the SBC total, 3.8 million of the households and businesses were in the Southwestern Bell states of Texas, Missouri, Kansas, Oklahoma, and Arkansas. SBC earlier announced that Pacific Bell will offer DSL service to about 6 million business and residential customers in California by the end of 1999. *Pacific Bell and PeopleSoft Create First DSL-Powered Telecommuting Program* (May 18, 1999) (visited Sept. 16, 1999) <http://www.sbc.com/PB/News/Article.html?query_type=article&query=19990518-02>.

[18] *U S WEST Catapults High-Speed Internet Access to Mass Market with Nation's First 'DSL-on-Demand' at $19.95/mo. for Casual Internet Users* (Sept. 15, 1999) (visited Sept. 16, 1999) <http://www.uswest.com/news/091599.html>.

[19] *Bell Atlantic Doubles Infospeed DSL Deployment, Company to Make 17 Million Lines DSL-Capable This Year* (July 28, 1999) (visited Sept. 16, 1999) <http://www.ba.com/nr/1999/Jul/19990824002.html>. Recent estimates are that DSL was available to about 10 million Bell Atlantic lines at the end of 1999. *US DSL Deployment & Subscribers – Updated January 5, 2000* (visited Jan. 12, 2000) http://www.dslprime.com/News_Articles/Availability/availability.html.

[20] *Ameritech Accelerates ADSL Deployment* (July 21, 1999) (visited Dec. 16, 1999) http://www.ameritech.com/news/release/view/1,1753,3090,381_384_390,00.html.

[21] *GTE to Offer Ultra-Fast Internet Access; Nation's Largest Deployment of Asymmetric Digital Subscriber Line (ADSL) Service to Roll Out in Two Phases Starting this June in Current Market Trial Locations; Fujitsu Network Communications Selected as Supplier of High-Speed Internet Access Equipment* (Apr. 27, 1999) (visited Sept. 16, 1999). <http://www.gte.com/AboutGTE/NewsCenter/News/Releases/980427.html>.

and in Las Vegas, Nevada in September, and announced plans to introduce service in the Orlando, FL area later in 1999.[22]

7. Smaller incumbent LECs are also offering DSL service. For example, in a survey in which over 400 of the more than 500 small and rural incumbent LEC members participated, the National Telephone Cooperative Association found that more than 30 percent of members offer DSL or plan to offer DSL.[23] By the end of 1999, therefore, incumbent LECs as a group expected to be able to offer broadband service based on DSL technology to between 40 and 50 million households and businesses that receive telephone service over existing copper plant,[24] and to even larger numbers of households in future years. DSL does, at this time, face some technical limits to deployment in (or by means of) incumbent LEC networks. It generally requires a continuous copper loop to the customer (*i.e.*, an absence of Digital Loop Carrier systems), has been limited by signal fade to a roughly 3-mile distance from the central office, is incompatible with the load coils and bridged taps that may be installed on customer lines, and may contribute to signal interference problems.[25] Some observers claim, however, that the prospects for widespread DSL deployment are improving because of the recent adoption of a uniform transmission standard and the recent introduction, by several equipment manufacturers, of a range of products designed to overcome the distance limitations of DSL.[26] We observe that many incumbent LECs' retail DSL offerings include up-front nonrecurring charges of between $60 and $100 and a wide variety of monthly charges, with the average around $50.

8. Competitive LECs.[27] Announcements about incumbent LEC deployments of DSL services often note that Internet Service Providers (ISPs), competitive LECs, and other communications carriers will resell these services. For example, Bell Atlantic has announced agreements under which more than forty ISPs can sign up nearly 3 million customers for its DSL service.[28] Certain competitive LECs, moreover, have focused on

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22 *Sprint Brings High Speed DSL Service and EarthLink Sprint Internet Access to Las Vegas* (Aug. 16, 1999) (visited Sept. 16, 1999) <http://www.sprint.com/Stemp/press/releases/9908/9908160847.html>.

23 *Rural Telcos Actively Deploy Broadband NTCA Surveys Independent Telcos on Status of Internet Deployment* (Sept. 15, 1999) (visited Sept. 20, 1999) <http://www.ntca.org/press/releases/pr_091699.html> (noting also that 1 percent of potential customers subscribe to offered broadband service).

24 *See also,* L.L. Selwyn, S.C. Lundquist, and S.A. Coleman, *Bringing Broadband to Rural America: Investment and Innovation in the Wake of the Telecommunications Act*, Economics & Technology, Inc. (Sept. 1999), Tbl. 2 (E&T Report). By contrast, there are about 105 million U.S. households. FCC Industry Analysis Division, TRENDS IN TELEPHONE SERVICE, Tbl. 17.1 (Sept. 1999).

25 *See, e.g.*, Ferris Baker Report at 54-55; E&T Report at 6-7, 10.

26 *See* E&T Report at 7-13 (noting, in particular, that the "G.lite" standard for DSL service adopted by the International Telecommunications Union in early 1999 is interoperable with Digital Loop Carrier systems, and providing examples of product releases or installations of improved Digital Loop Carrier systems to better accommodate DSL services, repeaters that boost digital signal strength, and better and smaller DSL electronics). *See also* SBC News Release (discussing plans to eliminate distance constraints on DSL service by placing fiber deeper into neighborhoods and installing new or upgraded digital electronics there).

27 The following paragraphs describe broadband deployment by competitive LECs that use wireline technology. Wireless competitive LECs are described in ¶¶-13-17 below.

28 *Bell Atlantic Doubles Infospeed DSL Deployment, Company to Make 17 Million Lines DSL-Capable This Year* (July 28, 1999) (visited Sept. 16, 1999)

providing DSL services by leasing local loops and central office space from incumbent LECs and themselves providing the necessary DSL electronics (*e.g.*, Digital Subscriber Line Access Multiplexers, or DSLAMs,[29] in incumbent LEC central offices). Such "facilities-based data CLECs" include, among others, the publicly traded firms Covad Communications, Network Access Solutions, NorthPoint Communications, and Rhythms NetConnections.[30] Some of these firms, such as Covad, market primarily to home and business customers and others, such as Rhythms NetConnections, focus on businesses and their telecommuting workers.[31] Interest in DSL service also is growing among competitive LECs more generally, particularly among competitive LECs that have established collocation arrangements in incumbent LEC central offices. Allegiance Telecom, for example, has begun offering DSL service to its target customer base of medium-sized and small businesses.[32]

9. As is the case for incumbent LECs, the DSL services of competitive LECs may be incorporated in ISP service offerings. Covad, for example, offers DSL services to small and medium-sized businesses and home users through ISPs, and offers such services directly to large businesses.[33] Rhythms NetConnections recently announced that it would become a supplier of DSL services to AT&T for use in that firm's Internet service offerings.[34] Furthermore, AT&T is but one example of a primarily interexchange carrier that is interested in providing DSL services. Qwest Communications International has announced agreements under which Covad and Rhythms NetConnections will supply DSL services that Qwest will market, and has made strategic investment in these data

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<http://www.ba.com/nr/1999/Jul/19990824002.html>. *See also, America Online and SBC Communications to Offer High-Speed Upgrade to AOL Members* (Mar. 11, 1999) (visited Sept. 21, 1999) <http://www.sbc.com/News_Center/Article.html?query_type=article&query=19990311-01> (SBC's DSL service to be incorporated into service options for America Online customers).

29 A DSLAM is a device that can divide voice and data signals carried over a copper twisted pair (*i.e.*, a single "customer line"). This "splitting" function can be performed in a DSLAM or elsewhere. Once splitting occurs, the voice signal carried on the customer line may be transmitted toward a circuit switch, which is now the typical switching mechanism in a telecommunications network designed to carry voice traffic, and the data signal carried on the customer line may be combined with data signals from other customer lines (another function of the DSLAM) and transmitted to a packet switch, which is the typical switching mechanism in telecommunications networks designed to carry data traffic.

30 *See, e.g.*, J.H. Henry, *In the Loop*, Bear, Stearns & Co. Inc. (Sept. 20, 1999).

31 *See supra* note 13 (at this time it appears that incumbent LECs, as a group, provide DSL service primarily to residential customers and that competitive LECs, as a group, provide DSL service primarily to business customers).

32 *Allegiance Telecom Launches DSL Service* (Apr. 21, 1999) (visited Sept. 22, 1999) <http://www.allegiancetelecom.com/body_DSLservice.html>.

33 *Covad Expanding Network to 40 Percent of U.S. Homes and Businesses* (Sept. 2, 1999) (visited Sept. 22, 1999) <http://www.covad.com/about/press_releases/press_090299b.html>.

34 *Rhythms Netconnections Signs Agreement to Provide High-Performance DSL Service to AT&T* (Sept. 21, 1999) (visited Sept. 22, 1999) <http://www.rhythms.net/about/pr/att.html>; *see also, AT&T Launches Broadband Business Services Portfolio* (Sept. 15, 1999) (visited Sept. 16, 1999) <http://www.att.com/press/item/0,1193,665,00.html> (announcing availability of DSL-based AT&T Internet service for large businesses with remote office locations as well as telecommuters and small businesses, and market trials of AT&T Internet services over HFC cable system plant).

CLECs.[35] Frontier Communications has announced a similar supply agreement with NorthPoint.[36]

10. Satellite-Based Broadband Services. The only satellite-based provider that could be said to now offer broadband service to residential customers is DirecPC, owned by Hughes Electronics and AOL. DirecPC currently offers satellite-based Internet access with a downstream speed of approximately 400 Kbps and a standard dial-up telephone line (about 40 Kbps) for the upstream path.[37] It has approximately 40,000 subscribers in the United States.[38] There are some estimates that its subscribership could expand to 1.5 million in the next three years.[39] The service is currently offered in the "lower 48" of the United States using a single Ku-Band satellite transponder. If the service does expand to 1.5 million subscribers, approximately 40 transponders would be required,[40] or roughly the full capacity of two Ku-Band satellites.[41]

11. Another satellite company, Gilat Satellite Networks, has announced plans to provide what may be broadband to the residential market, with service to begin next year.[42] We are unaware of any other satellite-based broadband providers that are focused on the residential market or likely will be in the next two years.

12. Utility-Based Broadband. With progressive deregulation in utility businesses, a growing number of utilities have begun to provide broadband services to their residential customers. This includes both investor-owned utilities and government-owned utilities.[43] We understand that they usually do so in a joint venture with an ISP or multimedia firm or other company and that their favored means of distribution is initially resale of incumbent LEC loops and then the venture's own fiber. Utility-based

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35 *Qwest Launches Digital Subscriber Line Service* (Aug. 4, 1999) (visited Sept. 22, 1999) <http://www.qwest.com/press/story.asp?id=140> (noting that Qwest plans to expand into additional markets through its own construction and additional strategic alliances); *see also, Qwest Communications and Investor Group Commit $251 Million to Advanced Radio Telecom to Expand its High-speed Local Wireless Network* (June 1, 1999) (visited Sept. 22, 1999) <http://www.qwest.com/press/story.asp?id=121> (announcing Qwest investment in Advanced Radio Telecom, which plans to provide broadband Internet service using fixed wireless technology).

36 *Frontier Communications Closes the Loop with DSL Technology* (Apr. 7, 1999) (visited Sept. 22, 1999) <http://www.frontiercorp.com/about/news/199947-923506933.html>.

37 With an about-40 Kbps telephone return path, DirecPC would not meet the First Report's definition of broadband. First Report, 14 FCC Rcd at 2407 n.17.

38 *See, e.g., DirecPC Experiencing Slow Consumer Growth, But Is Optimistic*, COMMUNICATIONS DAILY (Apr. 8, 1999) (quoting consultant's estimate that DirecPC has considerably fewer than 50,000 subscribers); Merrill Lynch Analyst Report Concerning Hughes Electronics Corp. (June 23, 1999)("about 40,000" subscribers).

39 Merrill Lynch Analyst Report Concerning Hughes Electronics Corp. (June 23, 1999)("about 40,000" subscribers).

40 *Id.*

41 A typical Ku-Band satellite has 24 transponders.

42 *Microsoft & Gilat Begin 2-Way Satellite Internet Service: New Telephone-Free Operation Scheduled to Reach 20,000 U.S. Sites*, COMMUN. DAILY (Feb. 17. 2000).

43 The development of broadband services by public utilities is also being promoted by the American Public Power Association subsidiary, Hometown Connections, which has partnered with Qwest Communications to provide communications services to community-owned utilities and other municipal agencies. ENERGY DAILY, Jan. 12, 1999.

broadband is offered in major urban areas,[44] medium-sized cities,[45] and scattered rural areas. One utility-based company recently claimed to pass 550,000 homes.[46] In most utility-based offerings, broadband is one element of a bundle that includes the utility's core service, ordinary telephone service, multi-channel video programming, and perhaps other elements.[47]

13. Terrestrial Wireless Carriers. A number of land-based ("terrestrial") wireless carriers have shown interest in providing residential broadband services using fixed (point to point or point to multipoint) technologies. These carriers plan to use different bands of spectrum, including PCS and wireless cable and various upper bands. As a result, they face different technical obstacles and have distinct business strategies. In addition, several commenters in the 700 MHz Commercial Service Rules proceeding have expressed interest in using that band to provide broadband wireless service, with both existing and newly developed technologies.[48]

14. AT&T has resumed its Project Angel, which provides communications services such as four voice-grade lines and one data line supporting up to 1 Mbps, using PCS spectrum.[49] AT&T began market tests of this service, which is targeted towards residential customers, in Dallas in May 1999[50] and plans to introduce local commercial

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[44] Among these are Boston, Massachusetts, Chicago, Illinois, Los Angeles, California, and Washington, D.C., and surrounding suburbs. Joe Bartolotta, *Boston Strikes Deal with RCN*, BOSTON HERALD, Finance (June 29, 1999), *available at* 1999 WL 3404367; Reuters, *RCN Seeks to Enter Midwest*, LOS ANGELES TIMES at C-3 (Dec. 14, 1999), *available at* 1999 WL 26205535; Jeff Leeds, *RCN Says It Will Use Edison Lines for Net Broadband: Deal Speeds Up Company's Plan to Challenge Southland Cable Providers*, LOS ANGELES TIMES at C-1 (Jan. 6, 2000), *available at* 2000 WL 2198165; *Starpower Moving into D.C. Suburbs with Phone, Cable, Internet Service,* ELECTRIC UTIL. WK. DEMAND SIDE REP. (Aug. 12, 1999), *available at* 1999 WL 12809455.

[45] For example, Sigcorp, parent of Southern Indiana Gas & Electric, offers high-speed Internet service to Evansville, Indiana, and surrounding communities. McGraw-Hill, ENERGY SERVICES & TELECOM REP. (May 6, 1999). Northern States Power Co. offers cable, local, long-distance and Internet-access service in St. Cloud, Minn., and is planning expansions into Colorado. *Overbuilder Seren Could Stir Things in Denver*, MULTICHANNEL NEWS, *available at* 1999 WL 10009229 (June 7, 1999).

[46] *RCN Subscribers, Market Reach and Losses Rise*, (visited Oct. 29, 1999) <http://www.broadband-daily.com>.

[47] Regional power utilities have become increasingly active in providing broadband infrastructure in addition to last miles. For example, Tri-State Generation & Transmission, with several local Colorado power companies, is creating a 400-mile fiber network in the Four-Corners region that will allow more remote communities along the network to plug in. New Century Energies, a state power holding company, and Touch America, a subsidiary of Montana Power, are building an 18,000-mile fiber-optic network to deliver mixed voice and data services at speeds from T1 to 155-megabit in the west and northwest. The network is deployed in power-line rights-of-way and networks already used for internal communications.

[48] Service Rules for the 746-764 & 776-794 MHz Bands & Revisions to Part 27 of the Commission's Rules, *First Report & Order* FCC 00-5, released Jan. 7, 2000.

[49] Fred Dawson, *AT&T's Angel Spreads Wings*, MULTICHANNEL NEWS (Oct. 25, 1999), *available at* 1999 WL 30092438. This service, as planned, provides subscriber households with two phone lines and the capability for Internet access at 128 Kbps. *See AT&T's Breakthrough Wireless Technology New Alternative for Local Service*, News Release, AT&T Corp., Feb. 25, 1997.

[50] *Dallas Tapped for Project Angel Fixed Wireless Trial*, WIRELESSNOW, May 20, 1999.

voice and data services in three cities by the end of the third quarter of 2000.[51] There is at least one other trial of broadband service on PCS spectrum.[52] With these limited exceptions, we are unaware of any specific activity by CMRS licensees that will lead to a broadband offering targeted at residential consumers in the next two years. There appears to be substantial technical potential for broadband services on the 700 MHz commercial bands, based on the record our recently concluded proceeding concerning that band.[53] The extent and timing of actual offerings on that spectrum, however, will depend on the outcome of the auction for it and, to some degree, on the compatibility of such services with incumbent television broadcasters.

15. The Commission recently relaxed its CMRS spectrum cap in rural areas to facilitate the offering of broadband service on that spectrum in those areas, and has announced that it expects, in a rulemaking in the near future, to consider making available additional spectrum for the provision of third generation wireless and other advanced mobile wireless services.[54] In addition, spectrum in other frequency bands may provide an additional resource for these services.[55]

16. The Commission's authorization for so-called "wireless cable" licensees to offer two-way communication services has provoked major telecommunications firms such as MCI and Sprint to acquire struggling licensees and commit to re-deploy their spectrum as broadband telecommunications services.[56] Wireless cable spectrum gives a new broadband last mile, and one allegedly cheaper to use than a cable-TV-based last mile,[57] to companies that already possess most of the other necessary inputs for broadband (*e.g.*, brand names and good reputations, aptitude at new technology, back office systems, existing customers). Sprint claims that its acquisitions will allow it to reach about 30 million households with high-speed Internet services during the first quarter of 2000.[58] Sprint plans to target small to medium-size businesses and the home-office market with a combination of data, voice and video services. It appears to us that

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[51] *See* Telephony, COMMUNICATIONS DAILY (Oct. 12, 1999); *Cell Phones, PDAs Merge*, PCS WEEK (Feb. 15, 1999). *See also* Pioneer Holdings LLC (visited Sept. 17, 1999) <http://www.pioneerholding.com>.

[52] For example, in October 1998 Pioneer Holdings, LLC, owned by Long Line Limited, MCI, and Northwest Iowa Power Cooperative (NIPCO), joined two other companies in launching a fixed wireless access trial to 25 customers outside Hawarden, Iowa. Karissa Todd, *The Road to Local Competition*, WIRELESS REVIEW (Nov. 30, 1998).

[53] *See* note 48 *supra*.

[54] 1998 Biennial Regulatory Review - Spectrum Aggregation Limits for Wireless Telecommunications Carriers, WT Docket 98-205, *Report & Order*, FCC 99-244 at ¶ 82 (rel. Sept. 22, 1999). *See also* Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, *Policy Statement* FCC 99-354, released Nov. 22, 1999.

[55] *See, e.g.*, Service Rules for the 746-764 & 776-794 MHz Bands & Revisions to Part 27 of the Commission's Rules, *First Report & Order* FCC 00-5, released Jan. 7, 2000.

[56] Sprint has acquired People's Choice TV, American Telecasting Inc. and Videotron USA. MCI WorldCom is acquiring the equity of CAI Wireless and Wireless One and the debt of several other fixed wireless service providers. *MCI, Sprint Continue Mad Grab for Access*, BROADBAND NETWORKING NEWS (Aug. 3, 1999); *Sprint Plans Attack on Broadband*, COMMUNICATIONS TODAY (Aug. 10, 1999).

[57] Nancy Gohring, *Special Report: The Miracle Cure*, TELEPHONY (July 5, 1999).

[58] *Id.*

the combination of wireless cable spectrum with existing switched telecommunications know-how opens the possibility of a significant, additional last mile to the residential customer. We are unsure, however, of the number of residential broadband consumers that companies using wireless cable spectrum now serve and how much attention such companies will give to the residential market (other than small business and home office customers) in the next year or two.[59]

17. Many ventures are underway to use upper band spectrum, such as 24, 28, and 39 GHz, for fixed broadband services, but their principal thrust has been to serve business customers. Some of these ventures, however, have indicated that they intend to market to residential consumers in the future.[60] For example, based on recent requests for clarification of our rules, we are aware of current trials in the 28 GHz spectrum to test new technologies that may be capable of delivering economical, two-way, high-speed broadband connections.[61]

18. Over-the-Air Television Broadcasters. We are not aware of any interest among over-the-air television broadcasters in broadband services for residential customers. We understand that even with Digital Television (DTV) spectrum, the one-way nature of their spectrum allocation and bandwidth and interference limitations will prevent broadcasters from offering broadband to residential consumers. It appears that broadcasters are concentrating instead on high-end, one-way transmissions to certain residential consumers.[62] Finally, as described in paragraph 14 above, the recently re-allocated 700 Mhz spectrum, which was television channels 60-69, may be used for broadband.[63]

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[59] *See, e.g.,* "Wireless/Private Cable Investor," Paul Kagan Associates, Inc., "Wireless Cable Sub Count & Revenue Projections, 1998-2009" at 4 (July 13, 1999).

[60] *See, e.g., WinStar Reports Strong On-Net Line Installations For 1999 Second Quarter* (Aug. 3, 1999) (visited Sept. 17, 1999), Milestone Press Release, WinStar Homepage, <http://www.winstar.com>; *Teligent Reports Third Quarter Revenue of $10.3m; Tops 1999 Target of 75,000 Installed* (Nov. 9, 1999) (visited Nov. 12, 1999), Press Release, <http://www.teligent.com>); Advanced Radio Telecom Corp. Home Page (visited Sept. 17, 1999) <http://www.artelecom.com>; Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 -- Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, *Fourth Report*, 14 FCC Rcd 10145, 10262 & n.55 (1999); *NEXTLINK Field Tests Broadband Wireless; On Track For Extensive Deployment In 2000* (visited Sept. 17, 1999) <http://www.nextlink.net/ra/news/archive/press/xpr_corp_091499_broadband.html>.

[61] *See* Letter to D'Wana Terry, Chief, Public Safety and Private Wireless Division, from Robert L. Pettit, Counsel to Raytheon Systems Company (dated Dec. 22, 1999).

[62] DTV broadcasting will allow some datacasting applications to develop, which involve the broadcasting of program content to personal computers. An alternative strategy increasingly pursued by the major broadcast networks is to acquire and enhance portal websites that serve to complement the programming content of the network's traditional broadcast business. Eventually, the development of streaming video applications may allow these content providers to deliver audio and video content directly through their Internet sites.

[63] Service Rules for the 746-764 & 776-794 MHz Bands & Revisions to Part 27 of the Commission's Rules, First Report & Order FCC 00-5, released Jan. 7, 2000.

19. Unlicensed Spectrum. We have made spectrum, such as Unlicensed National Information Infrastructure (UNII) spectrum,[64] available for unlicensed operations. Such spectrum might be used on a large scale for last miles or "last hundred feet"[65] of residential broadband. It is also possible, however, that the lack of privacy and exclusivity inherent in unlicensed spectrum and the lack of active marketing by experienced sellers will limit the use of unlicensed spectrum.

20. Internet Service Providers. The ventures mentioned above include what could be referred to as facilities-based broadband ISPs (i.e., one company offering both Internet service and the broadband facility over which that service is accessed). There is a significant number of other ISPs who are pursuing non-facility based business plans, gaining access to their users over the facilities of third parties. These ISPs, in the view of some, are a driving force in the deployment of broadband.[66]

21. Summary. Other than those mentioned above, we are unaware of any offerings of broadband service to residential customers on a significant scale that are being made now or are planned to be made in the next two years.[67]

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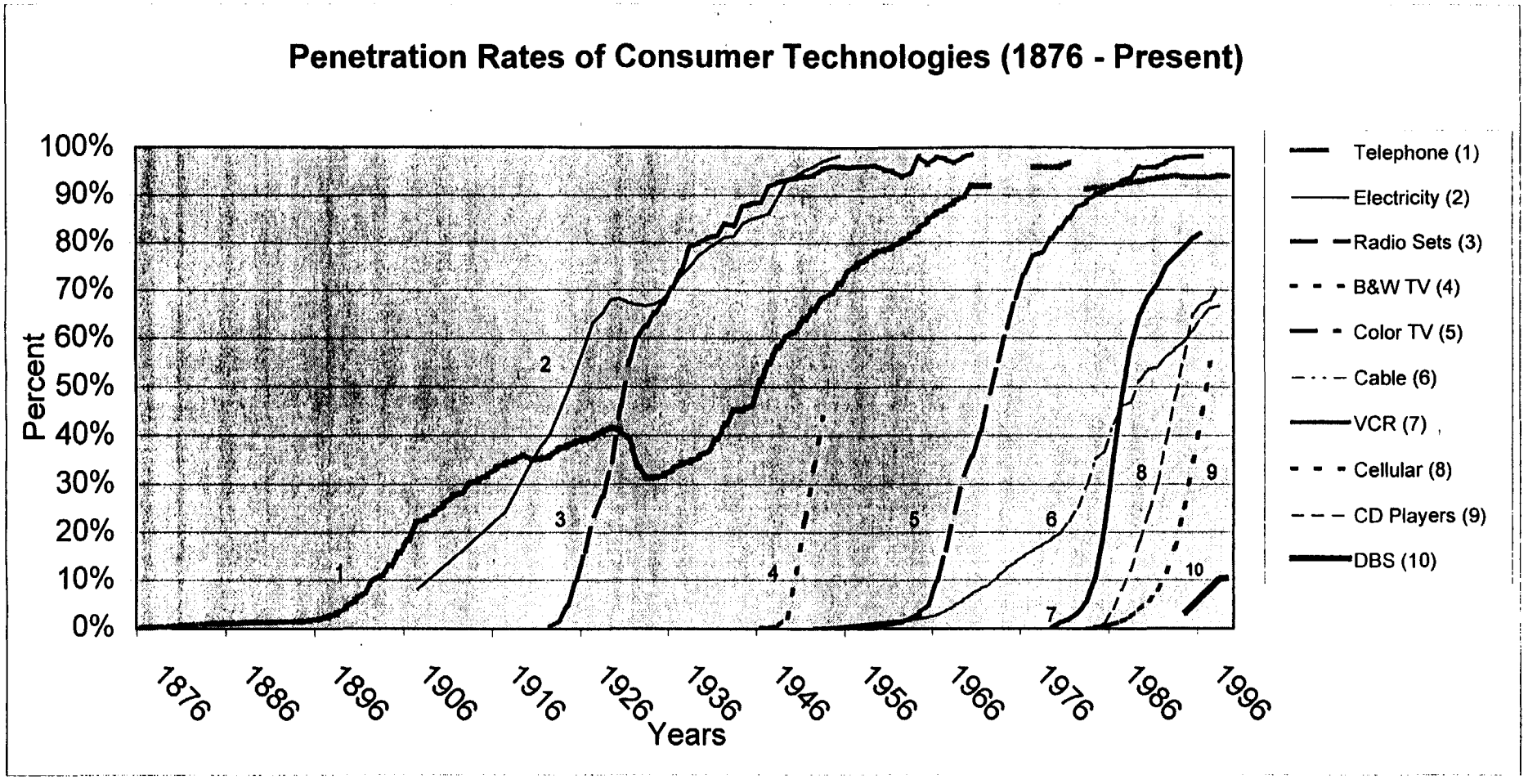
[64] *See, e.g.*, Metricom's wireless UNII service (visited Nov. 23, 1999), <www.metricom.com>; *MCI Worldcom Plans Nationwide Wireless Net*, TECHWEB (June 23, 1999) (visited Sept. 16, 1999) <http://www.techweb.com/wire/story/TWB19990623S0002> (MCI Worldcom announcing it will work with Metricom to deploy a nationwide UNII network).

[65] First Report, 14 FCC Rcd at 2450.

[66] A recent Cahners In-Stat Group Report reportedly indicates that ISPs are rushing to provide DSL service, that one-third of ISPs are providing high-speed service based on DSL, and that ISPs are largely partnering with Regional BOCs in order to provide this service. ISP Rush To DSL "A Stampede," Report Says, CNNfn (Dec. 2, 1999) (visited Dec. 7, 1999) <http://www.cnnfn.com/news/technology/newsbytes/140201.html>.

[67] Self-provision of broadband may also be possible by individual homeowners, neighborhoods ("rooftop community networks"), local governments, "microcellular wireless," virtual private networks, and regional telecommunications networks. *See* DEBORAH HURLEY & JAMES H. KELLER (EDS.), THE FIRST HUNDRED FEET: OPTIONS FOR INTERNET & BROADBAND ACCESS *passim* (1999); <http://www.cpau.com/fiberservices/bg.html>, City of Palo Alto Utilities, *The Palo Alto Fiber Backbone* (visited Nov. 11, 1999).

APPENDIX B



Sources of data: for "households" (1876-1900) and "homes with electricity" (1908-11, 1913-16, 1918-20), staff estimates based on Census Bureau information; for CD players, Consumer Electronics Manufacturers Association data (June 1999), for Direct Broadcast Satellite, THE SATELLITE REPORT 1999, by Global Satellite Research, C.E. Unterberg, Twobin (1999); for all other data, STATISTICAL ABSTRACTS OF THE UNITED STATES, by US Dep't of Commerce, Bureau of the Census (1972, 1974, 1976, 1978, 1979, 1982-83, 1987, 1989, 1990, 1992, 1995, 1997, 1998) and HISTORICAL ABSTRACT OF THE UNITED STATES: FROM COLONIAL TIMES TO 1970, by US Dep't of Commerce, Bureau of the Census (1975).