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A PUBLIC GOOD/PRIVATE GOOD FRAMEWORK FOR IDENTIFYING POTS OBJECTIVES FOR THE PUBLIC SWITCHED NETWORK

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EXECUTIVE SUMMARY

This study has been motivated by the lack of a clear consensus on the meaning of "plain old telephone service" (POTS) and on the objectives that the telecommunications network of the future should meet. Absent a clear regulatory statement of POTS objectives, the future network may not meet the needs of the average residential and business customer. Indeed, too little work has been done in the area of revising important definitions such as what constitutes universal service and POTS or "basic" service in the 1990s and beyond. The lack of work in this area is particularly troubling in light of the rapid advances in telecommunications technologies which have brought about dramatic increases in the number and diversity of potential network capabilities, and the emergence of alternatives to the public switched network for certain network applications.

The universal service doctrine has dominated formal United States telecommunications policy both at the state and federal levels. While the foundation of the universal service doctrine is clear, that is, the idea that a basic communications capability is desirable or "essential," the doctrine does not provide any guidance to the specific problem addressed in this study--namely, identifying specific network features and functions which should be included as part of this essential or basic capability to be made available to all at reasonable charges.

This study develops an overarching analytical framework for the purpose of identifying objectives of the public switched network and defining POTS or basic services. The framework builds upon the two contrasting views of the nature of the telecommunications public switched network: the telecommunications network as a

"public good" versus the telecommunications network as a "private good." In actuality, the telecommunications network is an "intermediate good" possessing attributes of both "public" and "private" goods. The challenge of regulation is to achieve an efficient and desirable balance between the two views. The framework developed in this study is unadorned, yet analytically powerful in its ability to recognize and reconcile the two polar views of the network and to provide a paradigm consisting of a public-good and a private-good model that leads naturally to the development of fundamental principles for identifying objectives of the public switched network and for defining POTS or basic services.

The private-good model places emphasis on the direct benefits of network modernization, that is, those benefits internally or privately experienced by the consumer of the telecommunications service. In sharp contrast, the emphasis of the public good model is on the *total* societal benefits--both direct and indirect--associated with network modernization.

The contrasting views of the network have remarkably different, yet equally plausible, implications for identifying objectives of the public switched network and for defining POTS or basic services. If either model is *applied under proper conditions* and the limitations of the model are explicitly clear and well understood, then the public interest may be well served under either. A clear consensus on the definition of POTS therefore may not be possible or even desirable at a federal level, given potential (and indeed likely) differences across states and regions or both. What is important, however, is that a clear consensus exists with respect to fundamental principles. These principles include:

- Regulators should explicitly embrace a particular model or view of the network as an integral part of an open decision-making process;
- In adopting a particular model or view of the network, regulators should, as a precondition, ensure that the threshold conditions that determine whether that model can be properly applied are fully satisfied; and
- Once a particular model or view of the network is adopted, the identification of POTS objectives for the public switched network, and accordingly the definition of POTS service itself, must be fully consistent with that choice.

In choosing a model or view of the network, policymakers are not limited to the pure cases. Rather, they can adopt some combination of the two. In particular, the regulator could choose to adhere to the private-good approach generally, but overlay a public-good approach for specific (limited) kinds of investments deemed in the public interest but which the private sector would not be willing to support. The key point here is that the fundamental principles outlined above would be equally valid under such *hybrid* approaches.

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FOREWORD

The public switched telecommunications network has evolved in response to changes in technology, demand for services, and societal needs. Historically the public switched network has used a plain old telephone service (POTS) standard to set prices, establish quality of services, and guide network modernization. In the future, however, new technologies may lead to a blurring of the distinction between POTS and other services.

This report makes a contribution by providing regulators with a useful framework to analyze POTS objectives for the public switched network. This should be helpful in addressing pricing, quality of service, and modernization issues in the 1990s.

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CHAPTER 1

INTRODUCTION

The public telecommunications network's evolution in response to changing technology and public need traditionally has been a major regulatory concern. Perhaps now more than at any time in the past, this issue commands elevated importance as a result of the sheer magnitude of the investments that have been proposed, the unprecedented changes in the structure of the local exchange carrier (LEC) industry, and the changing nature of regulation itself. At the same time, regulators can, if they choose, exert significant influence over the direction that utilities under their jurisdiction pursue with respect to network infrastructure investments and the related question of how the public switched network is to evolve. In particular, the emergence of incentive regulation plans in the late 1980s, which *explicitly tie* policy decisions regarding investment in the network infrastructure to decisions concerning the utility's rates, rate structure, earnings levels, and competitive response, certainly has had this effect.

The universal service doctrine has dominated formal United States telecommunications policy both at the federal and state levels. Indeed, since the early 1900s when natural monopoly status was conferred on local telephone operating companies in most states, regulators in this country have not left decisions of network infrastructure development to the free market. Rather, regulators have carved a history of investment decisions *initiated by the utilities* but *approved (in some form) by regulators* on the basis of the collective interests of the industry, consumers, and society in general. This was entirely consistent with the focus on rate base regulation.

Rapid advances in telecommunications technologies have brought with them dramatic increases in the number and diversity of potential network capabilities, along with the emergence of alternatives to the public switched network for certain applications, and have made the collective decision-making process exceedingly complex. As a corollary, the consequences of this decision-making by regulators--whether indirectly through the approval of cost recovery of a utility's capital outlays or directly through the approval of a specific modernization program--are potentially much more significant both in nature and in effect. Yet very little has been written to guide regulators in this area; in particular, little work has been done in revising important definitions such as what constitutes universal service and basic or plain old telephone service (POTS) in the 1990s and beyond.

In the course of making investment decisions pertaining to the public switched network, policymakers explicitly have adopted objectives and programs that have guided or otherwise exerted influence upon development of the public switched network. Four historical examples are highlighted in Chapter 2 of this study. These are adoption of rural development objectives for the Rural Electrification Administration, the introduction of 9-1-1 emergency telephone systems, the expansion of local calling areas, and the approval of plant modernization/accelerated technology programs.

The manner in which the scope and definition of basic service has evolved historically in conjunction with the emergence of new technologies and in response to the changing needs of the population is discussed in Chapter 3 of this study. However, as technological advancement continues at an ever increasing rate, policymakers stand at an important crossroads with respect to determining whether

POTS customers are best served by a policy that allows for this evolution of the basic service definition to continue, or one that mandates a definition frozen at today's current level of service.

Chapter 4 presents a dynamic analytical framework in which these two polar views are evaluated and reconciled in the context of a "public-" and "private"-good model of the telecommunications network. The analytical framework is intended to provide regulators with the perspective and guidance needed to identify POTS objectives in their own jurisdictions to direct development of the public switched network in a fashion that best meets the needs of the public network users.

The implications of our analytical framework as applied to the touch-tone feature are considered in Chapter 5. We present a discussion of this particular service component as a useful analogy for assessing the evolution of the needs of POTS customers generally. Chapter 6 concludes the study by emphasizing the fundamental principles which are the outgrowth of our analytical framework and which provide guidance to regulators faced with the challenging task of directing the future development of the public switched network and the basic services to be incorporated within the definition of POTS.

CHAPTER 2

ADOPTION OF POLICY OBJECTIVES TO GUIDE DEVELOPMENT OF PUBLIC SWITCHED NETWORK

This chapter highlights four historical examples in which policymakers have explicitly adopted objectives and programs that have guided or otherwise exerted influence upon the development of the public switched network. These are: (1) the adoption of rural development objectives for the Rural Electrification Administration (REA), (2) the public safety objectives of 9-1-1 and E 9-1-1 emergency telephone systems, (3) the expansion of local calling areas, and (4) the approval of plant modernization-accelerated technology programs. These examples are instructive both in their similarities and in their differences.

In all four cases, changes in the public switched network have been justified on the basis of a "public-interest" standard in some material respect. In the case of the REA, the objective was promoting economic development of the rural areas of our country. For 9-1-1 and E-9-1-1 emergency telephone systems, the objective was enhanced public safety and well-being. The objective underlying expansion of local calling areas has been to stimulate basic communications within the customers' natural community of interests. Finally, and particularly in recent years, plant modernization and accelerated technology programs increasingly have been justified on economic development grounds both at the state and national levels.

In the context of the private-good-public-good framework developed in Chapter 4, the first two examples, REA and 9-1-1, provide clear-cut examples of the public good or collective nature of the telecommunications network. This is in contrast to the private-good view which emphasizes the direct benefits of a particular network

service as reflected by individual user's willingness to pay. Consistent with the public-good nature, the changes which have taken place in the public switched network related to implementation of REA or 9-1-1 objectives can be traced directly to legislative mandates. The role of the public utility commissioner, in these cases, generally has not been one of policy *initiation*, but rather policy *implementation*.

In considering the expansion of local calling areas and the approval of plant modernization-accelerated technology programs, there exist neither a clear view of the nature of the telecommunications network nor a clear legislative mandate for future development of the network. While there has been some legislative involvement in these two areas to be sure, policies have tended both to be initiated and implemented at the state public utility commission level. There exists in this country a veritable patchwork of programs and plans relating to both local calling areas and plant modernization programs and plans that do not necessarily produce results consistent with the public interest standard underlying their development. The private-good-public-good framework developed in Chapter 4 produces a set of fundamental principles which will provide guidance to regulators for the express purpose of helping to ensure that such programs and plans in the future are implemented in a manner that serves the public interest.

Example 1: The Rural Electrification Administration (REA)

The Rural Electrification Administration (REA) was created in 1935 out of a desire by the United States Congress to end the isolation characteristic of rural America due in large part to the absence of electrical power in remote areas. Because privately owned electrical utilities were reluctant to extend their services

beyond the most easily accessible homesteads, a large percentage of the countryside was left without electric service. The lack of electric power throughout rural America gave rise to a substantial difference in living conditions between rural residents and city dwellers. In an effort to reduce this disparity and also out of a recognition of the importance of farming to the nation's economy generally, the REA was formed to make funds available to extend electric service to rural residents, providing capital to farm organizations and newly formed rural electric cooperatives for this purpose.

Some fourteen years later, these same REA objectives, which included the universal availability of service notwithstanding the rural or urban character of the community, were extended to the provision of telephone service. By 1949, much of the country had access to electric power, and REA funding was enlarged to incorporate telephone service. At this time, fewer than 40 percent of all farms had access to telephone service of varying quality. As with electric power prior to the establishment of REA funding, telephone service was limited to built-up town centers which excluded most farmsteads. Isolated unserved areas of the country were not confined to a single geographic area, but were as prevalent in the more densely populated east as they were in the western states.

Although perhaps not explicitly stated, the REA was one of the first federal agencies to adopt as its objective the *universal availability* of telephone and electric service. Indeed, the REA's electric and telephone lending programs recognized the importance of the rural community to the nation's prosperity and attempted to erase differences that would lead to disparities in service levels. More importantly, there was a realization that *without federal assistance, these goals were largely unattainable.*

The REA loan program was characterized by low rates of interest (initially 2 percent) and repayment periods up to 35 years. The majority of the funding was placed with telephone cooperatives, although some privately owned telephone companies did qualify for REA funds. The REA's low interest rates enabled borrowers to purchase state-of-the-art telecommunications equipment while maintaining local exchange rates that often were lower than those of neighboring telephone utilities. The newer central office equipment and distribution plant minimized exchange costs and afforded rural customers calling features whose rates would help offset some of the expenses associated with local exchange service.

An exchange upgrade using REA funds carried with it certain rate and service obligations for the borrowing telephone utility. Engineering studies performed only by REA-sanctioned engineers, including an area coverage design, had to be conducted. The area coverage design incorporated an (often generous) estimate of potential telephone customers and their locations throughout the local exchange. Upgrade plans describing the specifications of the central office, outside plant, and service pricing information had to be approved by the REA. Some state regulatory agencies required that the local exchange carrier also receive regulatory authorization before proceeding with the proposed upgrade. Gaining approval of both state and federal authorities often was difficult due to differing ratesetting philosophies. While state regulatory agencies may have preferred that customers be offered a choice between one-party and two-party telephone service (because the latter could be offered at a lower price), the REA's preference was for one-party service throughout the exchange with no alternative grades of service available. The REA response to this difference of opinion between state regulators and federal lenders varied. In some circumstances

funds were withheld until REA-approved ratemaking policies were adopted. The federal agency generally reasoned that alternative grades of telephone service were no less expensive to provide than one-party service and therefore concluded that one-party service should be available throughout the exchange. In other situations, state regulatory policies for service alternatives were accepted.

The REA philosophy of universality of service was exemplified by the agency's pricing policies. In addition to the virtual requirement that exchange upgrades incorporate one-party service, the REA also favored a pricing policy whereby all exchange customers paid the same monthly rate irrespective of their location within the exchange or of the specific cost involved in providing service to them.[1] Thus, all exchange customers were given the same opportunity to avail themselves of quality telephone service.

The objectives of the Rural Electrification Administration largely have been met. However, without this dedication of federal funding for the extension of electric and telephone service, it is unlikely that the disparities between rural and urban services, insofar as they relate to electric and telephone service, would be eliminated. The ability to borrow funds at a minimal rate of interest has enabled rural residents to enjoy state-of-the-art telephone services and lower rates than otherwise would exist. Moreover, REA cooperatives frequently offer one-party telephone service and monthly rates that are uniform throughout the exchange. This can be contrasted with

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[1] It is a common ratemaking practice, in *nonREA* areas, for local telephone companies to impose mileage or "locality" charges where service is furnished to points located outside of the "Base Rate Area" of the exchange. The Base Rate Area is typically the built-up region immediately adjacent to the central office. In exchanges covering large geographical areas, the Base Rate Area may constitute only a small fraction of the total area included within the exchange.

neighboring telephone utilities that often are characterized by older central office equipment, party-line service, and higher local exchange rates. Without REA funding it is possible and highly probable that geographical areas with characteristics such as low population density and high costs of service either would remain entirely unserved, receive distinctly inferior service, or be subject to prohibitively high monthly local exchange service rates.[2]

Many of the concerns addressed by the REA continue to be pursued in other federal forums. The universal service fund (USF) has its funding source in the access charge Carrier Common Line component. These USF funds are channeled to telephone companies with greater than average local loop costs. Although not targeted below the company level, it is assumed that by providing "high cost

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[2] A comparison of the circumstances under which urban and rural telephone companies operate illustrates this point:

> Costs are higher in rural areas because, with low-density populations and low-volume traffic dispersed over large areas, costs are harder to share. The Bell companies, which serve primarily urban areas, have about 10,000 lines per central office, whereas REA borrowers--generally the smallest of the independents--average only 2,500 lines per central office.
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> Moreover, whereas the Bell companies have, on average, almost 130 subscribers per route mile of outside plant, REA companies average only six. In addition, the average length of a large company's subscriber loop (the wire between the central office and the user's premises) is about half that of REA companies (10,787 versus 20,330 feet). The Bell companies also have many more higher paying business access lines than rural companies. Not surprisingly, revenue per line for small companies is $682 per year or $56 per month, as compared to $757 per year, or $63 per month for large companies. If rural telephone companies did not have access to low-cost financing through REA, the gap between urban and rural telephone revenues would likely be higher. (U.S. Congress, Office of Technology Assessment, *Rural America at the Crossroads: Networking for the Future*, OTA-TCT-471 (Washington, DC: U.S. Government Printing Office, April 1991) 69; footnotes omitted.)

companies" with offsetting funds, these LECs will be able to maintain lower basic exchange rates than would otherwise be possible.[3] While rural companies are not the sole recipients of USF funds, telephone utilities with service characteristics such as fewer subscribers and with greater distances between customers often serve rural areas. The higher costs associated with these attributes will frequently qualify a rural telephone utility for USF support.[4]

Notwithstanding the REA loan program or the Federal Communications Commission's (FCC) universal service fund, there continue to be disparities between the telephone services delivered to more populated urban areas vis-a-vis less populous rural areas in particular in the provision of equal access. In a central office equipped to provide equal access, customers are able to avail themselves of a potentially greater number of services offered by competing interexchange carriers at comparable prices. The FCC does not require that a central office be equipped to provide equal access if the costs of doing so would be prohibitively expensive or if the office serves fewer than 50,000 lines. Another important factor in explaining the continued existence of disparities and policies that discriminate between rural and urban subscribers is the emergence of competitive entry in the post-divestiture period, which

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[3] Company-level targeting does not, per se assure that only the high cost *customers* served by the high cost *company* receive support from the USF. A more specifically directed rate design policy would be required to guarantee that outcome.

[4] Large operating telephone companies, such as BOCs, typically *average* the relatively high costs of their rural exchanges with the lower-cost exchanges that serve more densely populated areas. The subsidization of high-cost communities is thus *implicit* in the case of larger operating companies. To a significant degree, the use of devices such as a high-cost fund has the effect of placing exchanges served by *different* operating companies in a somewhat similar position as they would be if served by one utility.

has occurred primarily in urban areas and which has thus reduced the ability (or inclination) of the telephone company to extract subsidies from its urban customers to improve service or to make service cheaper in the rural areas.[5]

Currently, REA loans may be used to upgrade telephone service to all one-party service, or they may instead be used to replace older central office facilities with more modern digital switching vehicles. Although REA cooperatives may infrequently be establishing service for new customers due to low or negative growth in the rural areas, the lower-cost loans continue to enable telephone cooperatives to provide telephone service to rural residents that is fully comparable to that supplied in urban areas. The continued availability of REA funding is particularly critical in light of the increased focus on plant modernization and accelerated technology deployment as discussed later in this Chapter.[6] In the context of the public-good-private-good

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[5] According to the U.S. Congress, Office of Technology Assessment:

> Few, if any, of the larger or more specialized providers are trying to enter or develop rural markets. Given a highly competitive, post-divestiture environment, these providers naturally focus their efforts on the more lucrative business market, generally to be found in urban areas.... This urban focus means that even when rural businesses are large enough to economically justify the delivery of advanced services, they are often among the last to be served. This can have a spiraling effect, with businesses since businesses sometimes will not locate in rural areas because of an inadequate communications infrastructure. (U.S. Congress, Office of Technology Assessment, *Rural America at the Crossroads*, pp.68-69

[6] New York State Public Service Commission Deputy Chairman Gail Garfield Schwartz makes this point, although in the more limited context of establishing trials of technologically advanced services consistent with her view that accelerated deployment of the latest telecommunications technologies should be limited to "communities of interest" for which demand can be demonstrated. According to Dr. Schwartz, "existing Rural Economic Development Agency loans for communications intrastructure might be incorporated into the interest-targeted plans to ensure that

framework developed in this study, the REA program provides a classic application of the public-good model of the telecommunications network in its purest form. Infrastructure investment is made on the basis of a federal *social* policy to serve rural areas, independent of (or despite of) *economic* market demand conditions, and funded by federal *tax* dollars.

Example 2: Emergency Telephone Number Systems

The evolution of emergency telephone number systems began internationally during the period from 1937 to 1959, when several European countries began implementing various emergency number systems. Britain set aside "999" in 1937, Belgium chose "900," Denmark implemented "000," and Sweden introduced "9000," as emergency response telephone numbers.[7]

In the United States, the movement toward a nationwide emergency telephone number was initiated in 1957, when the National Association of Fire Chiefs first proposed this method for reporting fires.[8] Ten years later, the President's Commission on Law Enforcement and the Administration of Justice issued the following statement: "Wherever practical, a single number should be established [for

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some small rural areas get hooked into trials. This would be an efficient means of meeting social needs, and ensuring that federal funds - which at best will be minimal - are not wasted in 'last resort' palliatives." ("Telecommunications and Economic Development Policy", by Gail Garfield Schwartz, Ph.D., Deputy Chairman, New York Public Service Commission, presented at NARUC 101st Annual Convention, Boston, November 13, 1989 p.17.)

[7] The Associated Public Safety Communications Officers, Inc., *Instructor's Manual, The APCO Institute - Unit Seven: 9-1-1 Systems and Operating Procedures, Evolution of Emergency Telephone Number Systems* (Daytona Beach, FL, 1987) 137.

[8] *Ibid.*

emergency services], at least within a metropolitan area and preferably over the entire United States."[9] In response to this statement and the appeals of United States citizens for a "standard, dedicated emergency telephone number," AT&T announced on January 12, 1968, that the digits "9-1-1" would be designated for emergency service in its serving areas.[10] The independent telephone companies, including GTE, shortly joined AT&T in setting aside 9-1-1.[11] Between 1968 and 1973, the 9-1-1 emergency telephone number system was adopted in over 200 communities benefitting approximately 20 million people.[12]

The next major event in the history of the development of 9-1-1 occurred on March 21, 1973, when the Executive Office of the President--Office of Telecommunications Policy issued a national policy statement (Bulletin No. 73-1, hereinafter the Bulletin)[13] which stated the following:

> For several years, numerous governmental commissions, legislative bodies, private organizations, and citizen groups have recommended the establishment of a single, nationwide emergency telephone number to meet [the] need for improved emergency communications.... The United States Independent Telephone Association and the Bell System have supported this concept and have taken steps to implement it.... The lack of a clear focal point in the Federal Government, and the absence of an overall national policy in this area, however, has slowed implementation

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[9] David C. Yandell, *Weaving the Safety Net...911*, paper presented to the United States Telephone Association, E-911 Seminar, New Orleans, Louisiana, April 12, 1989, 1.

[10] *State of California: 911 Operations Manual*, Fifth Edition, July, 1988, iii.

[11] APCO, *The APCO Institute - Unit Seven:* ... p. 137.

[12] Clay T. Whitehead, *Bulletin No. 73-1*, (Washington, D.C.: Executive Office of the President, Office of Telecommunications Policy, March 21, 1973).

[13] APCO, *The APCO Institute - Unit Seven:* ..., p. 138.

> of the 9-1-1 concept in many other communities. This Bulletin is issued to clarify the Executive Branch's position supporting the 9-1-1 concept as the means to achieve a single nationwide emergency telephone number.[14]

Among the policy and planning guidelines enumerated in the Bulletin were the following: First, it established that the policy of the Federal Government should be to encourage local authorities to adopt and establish 9-1-1 emergency telephone service in both urban and rural areas.[15] This was consistent with the REA objective of establishing rural service which closely mirrors the capabilities available in urban networks.[16] Second, the bulletin encouraged states to offer assistance to individual localities in their planning and implementation procedures regarding 9-1-1.[17] Third, the Bulletin made clear that responsibility for the institution of 9-1-1 service belongs with the local government.[18] Fourth, it further suggested that planning and implementation of basic 9-1-1 service should not be deferred pending evaluation of proposed

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[14] Whitehead, *Bulletin*.

[15] *Ibid.*

[16] See also, Kenneth P. Jameson, *Technical Change in Rural Telecommunications: A Case Study of the Michigan E 9-1-1 Law*, paper presented at the 1988 Conference on Communications and Society of the Aspen Institute for Humanistic Studies, June 1988. A number of states--including Michigan, California, Connecticut, Maryland, Minnesota, and Oregon--have put mechanisms in place to allow the extension of Enhanced 9-1-1 service to rural areas. One of the earliest was Maryland's mandated system in 1985. All of these systems differ in their organizational and financial elements.

[17] Whitehead, *Bulletin*.

[18] *Ibid.* Despite this statement, the APCO materials note that "the Federal Emergency Medical Service Act of 1973 contained a provision that required 9-1-1 or definitive plans for 9-1-1 implementation prior to release of grant funds for improvement of emergency medical services." (APCO, *The APCO Institute - Unit Seven:* ..., p. 138.)

additions or service enhancements (such as automatic call routing to particular jurisdictions and agencies, automatic number identification, and so on) to basic 9-1-1 service.[19] These service enhancements are discussed in more detail later in connection with Enhanced 9-1-1 (E 9-1-1). Finally, the Bulletin encouraged state governments to offer assistance to cities and towns in the process of establishing 9-1-1 service.[20]

Perhaps more than any other single event in the history of the development of 9-1-1 service, Bulletin No. 73-1 galvanized regulators into action with respect to the implementation of a uniform emergency number system in the United States. It essentially set the stage for 9-1-1 implementation nationwide by establishing a clear agenda with well-stated policy goals. The Bulletin summarily declared that one of the fundamental uses of the telecommunications system should be to facilitate the universal provision of an enhanced emergency response system to United States citizens. Endorsement of the 9-1-1 concept by several agencies in the law enforcement and related fields followed in the wake of this Bulletin.[21]

The objectives of a 9-1-1 Emergency Service Communications System are to make it as easy as possible for a citizen to contact the proper emergency service agency and to minimize the response time required to receive emergency service. The 9-1-1 Operations Manual of the State of California succinctly summarizes the advantages of 9-1-1:

> 9-1-1 replaces seven-digit emergency numbers which are

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[19] *Ibid.*

[20] *Ibid.*

[21] See APCO, *The APCO Institute - Unit Seven:* ..., 138.

> more difficult to remember and that vary between needed services. Being shorter and easier to remember, the 9-1-1 number reduces the total response cycle between the detection of an event and the dispatch of assistance to that event. In some cases, 9-1-1 reduces public agency costs by consolidating support services.

> When a citizen seeks aid, 9-1-1 provides three major advantages: (1) it relieves doubt about the proper emergency response agency. One call can bring multiple agency response when needed; (2) it is easier to remember and remains the same from one community to another; (3) it is easier and faster to call, especially under adverse conditions.[22]

In addition, a 9-1-1 Public Safety Answering Point (PSAP) operator, unlike a regular operator, is typically a specialist trained to handle emergency requests, thus offering an additional improvement in the facilitation of emergency communications.[23]

Currently, many communities have simple or "basic" 9-1-1 systems in place. Under such a basic system, "[d]ialing 911 connects the caller to a special emergency services operator, who determines the nature and location of the problem and passes the information to the appropriate agency or agencies."[24] However, experts identify major problems with the basic system:

> Two problems with this simple system are the presence of a middleman between the emergency and the assistance and the frequent difficulty in getting an excited, frightened caller to give a precise location. While

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[22] *California 9-1-1 Operations Manual, iii.*

[23] *Ibid.*

[24] Anthony G. Oettinger, Paul J. Berman, and William H. Read, *High and Low Politics: Information Resources for the 80s*, Cambridge, Massachusetts: Ballinger Publishing Co., 166.

> these difficulties are not insuperable, they place a practical limit on the area and population each 911 system can serve, and they put heavy burdens on the ingenuity and capability of the emergency services operator.[25]

Perhaps as a result, the implementation of more advanced technologies in various states is becoming increasingly common. Any 9-1-1 service that takes advantage of such technology is known as Enhanced 9-1-1 or E 9-1-1.[26] The advanced technologies associated with E 9-1-1 allow for the automatic identification of the geographic location from which the 9-1-1 call is placed, and automatically route the call to a dispatcher covering that area.[27] At this time, at least a dozen states have legislation in place which calls for the establishment of Enhanced 9-1-1 service.[28] These include states that have enacted provisions for statewide E 9-1-1 systems.

The costs for 9-1-1 service can be roughly broken into four categories: (1) network, (2) Public Safety Answering Point (PSAP) equipment, (3) administrative

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[25] *Ibid.*

[26] E-9-1-1 is distinguished from Basic 9-1-1 by the use of such advanced technologies as Automatic Location Identification (ALI) and Automatic Number Identification (ANI) as well as other related features--including a geo-data base or master street address guide (MSAG) to accomplish selectively routing the call--which are capable of enhancing the performance of the 9-1-1 emergency telephone network system. Additional features could include computer aided dispatch interface, call detail recording, some provision of management information, and limited interaction with the database created to support the system. (Yandell, *Weaving the Safety Net...911*, 6.)

[27] F.R. Stroud, *A Systems Analysis of the Single Emergency Telephone Number and Automatic Location Identification*, GTE, June 7, 1972.

[28] *State by State Comparison of 9-1-1 Legislation and Policy*, compiled by the Texas Advisory Committee on State Emergency Communications (January 1991).

(usually at the state level), and (4) local planning and implementation costs.[29] The funding of these costs has been treated in a number of different ways. Approximately thirty states fund their emergency telephone number systems by a surcharge on telephone services. Typically, the telephone surcharge revenue is pooled at the state level and then distributed to the various cities and towns. In California, for instance, all of the costs of 9-1-1 are covered by a surcharge on noncompetitive intrastate telephone service except for any direct costs associated with PSAP equipment.[30] The surcharge imposed on telephone subscribers in California as well as in a number of other states is subject to a cap; it may not exceed .075 percent of California ratepayers' monthly usage charges.[31]

In Connecticut, which does not have a surcharge funding mechanism, network costs are included in the telephone company's rate base, local planning costs are absorbed by the local jurisdiction, and equipment costs for primary PSAPs are funded by state bonds.[32] Minnesota appropriates local planning *and* PSAP costs to the local jurisdiction, but funds network and administrative costs through a surcharge of $0.18 per access line.[33] Some states recover the costs of 9-1-1 service entirely from taxes, as opposed to surcharges applied only to telephone company subscribers. In New

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[29] Patricia A. Cuza et al, State of Michigan, Department of Management and Budget, Office of Criminal Justice, *Report and Recommendations of the Emergency Telephone Service Committee*, April 1988, 90-91.

[30] *Ibid.*

[31] The California surcharge is currently set at .063%, revised upward from 0.05% in 1990.

[32] Cuza et al, *Report and Recommendations.*

[33] *Ibid.*, and *State by State Comparison of 9-1-1 Legislation and Policy.*

Jersey, costs are recovered through a sales tax on telephone equipment, Nevada recovers costs through property taxes, and in Delaware funding is appropriated from the state's general fund.[34] Other states have taken or are planning to take some rather unique approaches to the allocation of costs among ratepayers. In Massachusetts, for example, an Enhanced 9-1-1 system will be funded by a surcharge on those ratepayers who exceed a monthly free ten-call allowance to directory assistance.[35]

There is an interesting distinction to be drawn between Massachusetts where the funds for E 9-1-1 are collected from the additional revenues of a specific and unrelated service (Directory Assistance) and the tax-like surcharges of a number of other states which treat emergency telephone number systems as an essential public good and accordingly appropriate the surcharge among the general body of ratepayers. California, another unusual example, collects its surcharge from each customer based upon total monthly intrastate charges (noncompetitive services only), thereby charging customers an amount proportionate to their use of the public switched network. Those who use the network the most make the largest contributions toward of the E 9-1-1 System, although use of network services is not necessarily correlated to income and thus ability to pay.[36]

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[34] Survey of 9-1-1 legislation completed by Jim Beutelspacher (Minnesota Public Utilities Commission) for the APCO 9-1-1 Committee, June 6, 1991.

[35] A telephone relay service available to speech-impaired and hard-of-hearing individuals will also be funded in the same way. (Established by Chapter 393 of the Acts of 1990, Massachusetts Legislature, and signed into law by the Governor on December 26, 1990.)

[36] It is true, however, that customers of Lifeline service, by definition, should on average have lower basic monthly bills than other customer classes, and therefore, the funding policy adopted in California would help assure that low income subscribers--to the extent they subscribe to Lifeline service--will pay less toward the recovery of E

California was the first state to pass a law with mandated deadlines for establishment and funding of a statewide E 9-1-1 system.[37] In 1985, California arrived at 100% implementation of 9-1-1,[38] and its E 9-1-1 system is expected to be 100% complete by the end of 1992.[39] As a recent paper on the subject of 9-1-1 notes, "The California program, initiated in 1972, one year prior to the Federal Policy Bulletin, dramatically illustrated the cooperation and coordination necessary to make 9-1-1 possible,"[40] not to mention the length of time involved in a comprehensive statewide implementation program.

Several obstacles have stood in the way of the potential success of 9-1-1 or E 9-1-1 systems. The fact that the areas served by the telephone company central offices generally do not coincide with local political and jurisdictional boundaries has often presented unusual difficulties for local planners who have tried to implement a 9-1-1 system.[41] Another difficulty in implementing 9-1-1 and E 9-1-1 services relates to telephone company control over the costs of the systems. While there is the

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9-1-1. Of course, this could also have been achieved by waiving the surcharge on lifeline customers. Indeed, exactly such a policy was implemented in New York State in New York Assembly Bill 6841, March 28, 1991.

[37] Yandell, *Weaving the Safety Net*, 4.

[38] *Ibid.*

[39] The 9-1-1 law required that all systems be in service statewide by December 31, 1985. Statewide implementation was accomplished prior to the deadline. Of the 58 counties in the state, approximately 40 are currently E 9-1-1 capable. Thus, in terms of population, between 90-95% of California's citizens are now covered by E 9-1-1 (including 100% of the southern half of the state). (Larry Kuhn, State of California, Department of General Services, Telecommunications Division.)

[40] Yandell, *Weaving the Safety Net*, 4.

[41] *Ibid.*

potential for competition with respect to the customer premises equipment components of the service, the telephone company is in a position to exercise monopoly power in this market segment as well due to its control over bottleneck network facilities.[42]

A related problem deals with the cost allocation aspects of E 9-1-1 service. Network investments ostensibly *required* to provide E 9-1-1 service may have many other uses in connection with providing other "enhanced" services.[43] In this context, it is important that monopoly provided E 9-1-1 capabilities not automatically bear all related network upgrade costs.[44] Some of these costs may be properly allocated to the other "enhanced" services, as would be required under a correct application of the private-good model for these services discussed in later chapters of this study. Another option, discussed in this study, is to allocate all 9-1-1-related network upgrade costs to the general body of ratepayers, but then assure that all ratepayers are able to benefit from of the other service capabilities made possible by that investment. In

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[42] Jameson, *Technical Change* 2. As an illustration of this point, in December 1989, Pro-Tel, Inc. (a customer premises equipment or CPE vendor), asked the FCC to order Michigan Bell to provide certain information necessary to interconnect CPE with the telephone company's E 9-1-1 trunks and data circuits. Pro-Tel had apparently "underbid Michigan Bell to win a contract to provide CPE for the E 9-1-1 service being installed in the city of East Lansing." According to Pro-Tel, Michigan Bell would not provide "information regarding the interface with a node in the Michigan Bell network." (*Telecommunications Reports*, "Pro-Tel Complaint Asks Michigan Bell to Provide Information for 'E911' Interconnection", September 4, 1989, 28.)

[43] William Page Montgomery, et al, *Incentive Regulation for the 1990s: Making the Case for Sound Reform*, ICA Third White Paper (Dallas, TX, 1991) 22.

[44] *Ibid.*

other words, the entire network modernization investment would be treated as a public good and not just the obvious 9-1-1 component.

Example 3: Expansion of Local Exchange Calling Areas

The "local exchange" is the geographical area *within which* a local exchange carrier has been granted the exclusive franchise to provide basic telephone service. One or more "exchanges" may be combined into common and/or overlapping "local calling areas" within which calls may be placed without a toll charge.[45] As fundamental as the nature and extent of local calling is to the notion of basic telephone service, there probably is no other attribute of basic service that exhibits as much diversity not only across different jurisdictions but within the same jurisdiction as well.[46] Local calling may embrace an area as small as a single exchange, not uncommon in low-density rural areas, to extensive coverage of an metropolitan area,

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[45] The distinction between "local" and "toll" calling embraces a broad range of regulatory, accounting, separations, jurisdictional, and other issues. "Local" calls may be provided on a flat-rate basis, or be subject to measured-use charges sometimes structured in a manner that is similar to the rate treatment typically afforded toll calling, i.e., based upon distance, duration and time-of-day. In at least one situation (the "Regional Call Plan" in use within the New York Metropolitan LATA), the technical distinctions between "local" and "toll" calls within the coverage area have become virtually invisible to the consumer.

[46] For a fuller treatment of state regulatory policy concerning extended area service see Raymond Lawton and John Borrows, *Factors Affecting the Definition of the Local Calling Area: An Assessment of Trends*, (Columbus, Ohio: The National Regulatory Research Institute, 1990). As noted in that study, one of the key reasons for the differences in EAS policy has to do with the "incremental nature of the decisions about the local calling area [LCA]" with "[e]ach existing LCA represent[ing] the results of decades of decisions that sought to optimize the LCA using existing technology and other constraints." (iv)

in some cases on a flat-rate basis, as, for example, in Minneapolis-St. Paul, Denver, and Atlanta.

Calling *within the "local exchange"* has historically represented telecommunications service in its most basic form. Early in their formation, local exchange areas represented communities of interest, since within the local calling area subscribers had access to medical services, schools, places of employment, local government, and shopping facilities. Over time, however, this description no longer accurately characterized the local exchange area in an increasingly mobile society. Subscribers whose local calling is confined to other customers within the precise boundary of their home exchange have been confronted with an increasingly smaller calling scope relative to their *expanding* community of interest. This phenomenon may be the result of the population movement from rural to urban areas, changes in employment patterns, school district consolidations, revisions in health care delivery, or any number of other circumstances.

Extended calling areas (often referred to as *extended area service* or EAS) reflect communities of interest to or from other exchanges beyond the area physically located within the home exchange.[47] In some jurisdictions, explicit EAS surcharges are applied in the latter situation. The extended calling area may be represented by an adjacent exchange, or, in the case of large metropolitan areas, may incorporate multiple exchanges and many different local exchange carriers. In the past, the

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[47] The precise basis for the differentiation between a "local exchange calling area" and an "extended local calling area," may be more historic than practical. Local calling areas may involve one or more "zones" or "districts" of the same "exchange," or may include multiple exchanges. "Extended local calling areas" usually involve two or more separate "exchanges" that at some point in their history were converted from toll or local rate treatment.

initiative for extending an existing local calling area often came from the telephone company itself: A relatively high volume of interexchange toll calling which (prior to the introduction of direct distance dialing and mechanized billing) required manual call completion and toll "ticketing" by an operator, coupled with the opportunity to "reclassify" an exchange into a higher "rate group" and thereby generate additional *monthly* revenues, provided an economic basis for the policy. More recently, however, *consumers* rather than carriers have been required to initiate proposals for EAS, and approval of such programs frequently has involved an affirmative demonstration that a community of interest exists between the exchanges in question and that subscribers in the affected areas are willing to pay the higher rates associated with this expansion of local calling.

Over the years, requests for extended calling areas have escalated as subscribers look outside of their own communities for goods and services, schools, medical facilities, and employment opportunities. In some cases, subscribers were no longer satisfied by the increasingly smaller portion of their "community" that could be reached without placing a toll call, while in other situations subscribers who had migrated from urban centers to suburban communities within larger metropolitan areas continued to consider themselves a part of the larger metropolitan complex, including the entitlement to its greater calling scope.

An expansion of the local calling area reflects an enlargement of the *physical* boundaries of local calling to encompass one or more additional exchange areas, offering access to growing communities of interest. The physical size of a local exchange has been determined by a great many factors, key among which is the

geographical location of potential subscribers.[48] However, even though the physical properties of the calling area have been changed (enlarged), the basic telecommunications needs that are now met through the extended service areas are essentially the same. Merely having changed the dimensions of the calling area has not altered the *purpose or nature of local exchange calling.* The greater calling scope has been merely an accommodation to the underlying calling requirements of the local exchange customers. *Extended local calling continues to be local calling even though it occurs over a larger geographical area.*

Subscriber efforts to increase the number of access lines within their local calling areas have generally involved formal local calling area expansion and not merely some alternative discounted toll calling arrangement. For many customers, some form of discounted toll calling is already available, and does not effectively address their needs.[49] Nonetheless, in instances where requests for expanded calling

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[48] Typically, the boundary of an exchange has been determined administratively and the attributes of "exchanges" have sometimes varied. Following are some examples:

(a) A single community, served by a single central office, constitutes the entire exchange.
(b) Two communities, served by a single central office, constitute the exchange.
(c) Two communities served by separate central offices are nonetheless combined into the same exchange.

Local calling between the two communities served by the exchange in case (c) would be defined as *intraexchange*, whereas local calling between two (adjacent) case (a) communities (each of which constitutes its own exchange) would traditionally be referred to as "extended area service." In fact, of course, there is no technical or physical difference between these two situations.

[49] As recognized in a recent report on the introduction of intraLATA competition in the state prepared by the New Hampshire Public Utilities Commission staff, "[i]ntrastate competition offered to the residential market would possibly ease the inequity of the calling areas by reducing toll charges." However, staff proceeded

areas have been denied, some form of reduced toll rates may be offered as a second-best solution. In such situations, requests for extended local calling may continue to be made.

One important distinction between extended area calling (local) and interexchange toll calling is that, where local service is furnished on a flat-rate basis, the extended area service is usually offered on a flat-rate basis as well.[50] By contrast, toll calling almost always involves imposing usage-sensitive charges based upon such attributes as distance, duration, and time of day. In addition, "toll" calls generally cover longer distances than "local" calls, and historically distance has been one of the key factors affecting the cost of a given telephone call. Beyond the technological rationale for pricing "toll" calls higher than "local" lies the long-standing regulatory policy of using toll revenues to disproportionately contribute to the *non-traffic-sensitive* cost of the basic subscriber access line. The confluence of both of these conditions has been that, expressed on a per-call or per-minute basis, the *price* imposed for toll calls has been and remains considerably higher than that for local calls.

But both of these conditions are now undergoing dramatic and unprecedented changes. From a technological standpoint, distance is no longer as consequential as a cost driver, particularly for the range of distances typical of intraLATA calling. Also,

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to express concerns that "the IXCs are not interested in serving residential customers" and that "intraLATA competition may alter the data used to evaluate communities of interest when considering petitions to extend local calling areas." (Leszek Stachow and Kathryn Bailey, *Staff Report on Competition for IntraLATA Competition*, New Hampshire PUC, July 3, 1991), 112-113.

[50] Local measured service has replaced flat-rated local services in many jurisdictions, and in such instances, have blurred the distinction between local and toll calling, at least from the *subscriber's* perspective.

the introduction of competition in the long-distance marketplace generally has changed the view of toll as a source of contribution to the nontraffic-sensitive cost of the subscriber line. Indeed, at the federal level, the FCC has pursued an affirmative rate rebalancing policy since 1984 under which usage-based toll contributions have been replaced by fixed monthly end-user charges.[51] Nonetheless, the price for toll calls in most jurisdictions remains considerably higher than local calls, and LEC reticence to enlarge local calling areas frequently has been the result of the financial disincentives posed by a reduction in message toll traffic with its concomitant decrease in toll, settlement, and access charge payments or all three.[52] Interestingly, the strategic competitive implications of EAS appear to have been less compelling to the LECs. In the context of a competitive intraLATA marketplace, a nondominant interexchange carrier is also impacted by any local calling area expansion, since it will no longer have an opportunity to carry interexchange traffic between those exchange areas and collect revenue for that service.

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[51] See generally MTS and WATS Market Structure, CC Docket No. 78-72, *Notice of Inquiry and Proposed Rulemaking,* 67 FCC 2nd 757 (1978); *Supplemental Order (Phase I),* 94 FCC 2nd 852 (1983); *Phase I Order Modified on Reconsideration,* 97 FCC 2nd 682 (1983); *Phase I Order Modified on Further Reconsideration,* 97 FCC 2nd 834 (1984); Phase I Orders Affirmed in Part, *Remanded in Party sub nom; National Association of Regulatory Utility Commissioners v. FCC,* 737 F.2d 1095 (D.C. Cir. 1984); *Cert. denied,* 469 U.S. 1227 (1985); *Report and Order (Phase III),* 100 FCC 2nd 860 (1985); *Phase I Order Modified on Second Further Reconsideration,* 101 FCC 2nd 1222 (1985); *Aff'd sub nom. American Telephone & Telegraph Co. v. FCC,* 832 F.2d 1285 (D.C. Cir. 1987).

[52] When extended area service has been provided between exchanges, the compensation received by the LEC for originating or terminating the interexchange traffic often has been eliminated entirely, or else replaced with some intercompany payment that is a small fraction of that which the LEC would otherwise earn in a toll environment.

Despite LEC reluctance, many state commissions have expanded local calling areas and taken steps toward eliminating rate distinctions between local and toll calling generally or both. The policies adopted by these commissions have begun to recognize the dynamic state of both the local exchange and toll calling market, and have facilitated potential progress in both arenas. Five states, including New York, Delaware, Massachusetts, Arizona, and Georgia, provide useful examples of regulatory policy in this area. These examples also highlight the multifaceted nature of EAS policies and the distinction between policies intended to expand local calling areas per se, from those that primarily seek to lower toll rate levels.

The New York Public Service Commission (NYPSC) has had in place *explicit* EAS guidelines since 1973 "to provide for an orderly expansion of upstate local calling areas where circumstances warranted."[53] Prior to the establishment of those guidelines, requests for EAS were handled on an essentially ad hoc basis, not uncommon for state public utility commissions. As noted by the NYPSC staff, "[d]uring the 1960s, the provision of two-way Flat Rate EAS, in lieu of toll service, was generally economical to provide as the costs of the service were offset by the combination of (exchange) revenues generated, and toll cost savings realized," and EAS proliferated through upstate New York.[54] The 1973 guidelines established eligibility requirements for EAS to *adjacent* exchanges.[55] A petition requesting EAS

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[53] Memorandum of the New York Department of Public Service Communications Division, dated February 20, 1991, 1.

[54] *Ibid.*, 3.

[55] *Ibid.*, 4. Under the 1973 Guidelines, an adjacent exchange was eligible for EAS if call volumes over a toll route averaged 3 calls or more, per customer, per month *in either direction.*

to a *non-adjacent* exchange (which the PSC initially denied) led the PSC to reexamine the 1973 guidelines, and in 1978, the PSC modified those guidelines to allow EAS "between non-adjacent exchanges, at an additional monthly charge (a non-adjacent EAS surcharge), over and above any rate increases necessitated by rate group changes."[56] The revised guidelines also required a 60 percent affirmative consumer response before nonadjacent EAS could be authorized. While EAS continued to expand under the PSC's revised guidelines (once again through the customer petition process) the PSC was made "acutely aware of situations where small, outlying rural or suburban exchanges have substantial communities of interest with a larger, core exchange, yet toll-free calling on a two-way basis cannot be provided since Guideline-mandated customer surveys are usually negative in the larger exchange."[57] In March 1991, the PSC tentatively approved a staff recommendation to revise the EAS guidelines to provide for *one-way* EAS under more relaxed calling criteria.[58]

The NYPSC's EAS guidelines did not apply to *downstate* New York exchanges.[59] However, in 1987, the PSC adopted the so-called "Regional Call Plan"

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[56] *Ibid.*, 5.

[57] *Ibid.*, 6.

[58] Memorandum of the New York Department of Public Service Communications Division, Docket 91-C-0197, dated May 28, 1991, 1-2. The revised criteria would "replace the requirement for a 60% positive consumer survey approval level with a requirement that only a simple majority of those responding must vote in favor of the change." In addition, in order to qualify for EAS, "routes which have a minimum call rate of 3.0 *in any direction* should also have 50% making at least one call [per month] to the desired exchange." (Appendix 3, emphasis added.)

[59] "Downstate exchanges were not part of the Guidelines since Flat Rate service, for the most part, was unavailable and calls within the downstate region were on a local multi-message unit basis rather than on a toll basis." *Ibid* p.4.

(RCP) for the New York Metropolitan LATA, one dimension of which was to enlarge downstate local calling areas.[60] Specifically, the RCP replaced an intricate distance-sensitive rate plan consisting of message toll charges and local bands A-F with an integrated nondistance-sensitive toll and local measured rate plan. Only two sets of charges applied under the RCP: prices for calls within the home region (corresponding generally to county boundaries or significant fractions thereof) and prices for calls between regions. As part of the RCP implementation, local calling areas were expanded to incorporate the entire "home" region (in some instances incorporating distances of up to fifty miles), whereas previously local calling areas were limited to calling classified as "Band A" which were generally ten miles or less. The availability of $100 million in rate reductions facilitated the changes embodied in the RCP, which included both expansion of the local calling area to the entire home region and reductions in rate levels for interregion calling.

Effective January 1991, the Delaware Public Service Commission redefined Diamond State Telephone Company's flat-rate local calling areas to encompass county-wide calling throughout the state.[61] Previously, local calling areas within the state generally consisted of only same and adjacent exchanges. At the same time, the Delaware PSC adopted a non-distance-sensitive statewide toll rate schedule. As in New York, the availability of overall revenue reduction ($22-million in the case of

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[60] The New York Public Service Commission, Opinion No. 87-18, August 31, 1987 (Case No. 28961, 28978).

[61] Delaware Public Service Commission, PSC Docket No. 86-20 (Consolidated), Phase II, Rate Design, *Findings Opinion and Order*, October 1990.

Delaware) facilitated these rate changes.[62] Although EAS policy had not been a central focus of the rate case, residents in at least one exchange had made formal protests regarding their inability to make local calls to a larger urban center.[63] In adopting county-wide toll free calling areas, the PSC indicated its action was "an important step toward developing a rate structure with greater equality for all Delaware ratepayers regardless of their geographic location."[64] At the same time, its action was consistent with the goal of moving usage rates closer to incremental cost and the diminishing sensitivity of usage costs to distance.

In Massachusetts, the Department of Public Utilities (DPU) culminated a four-year-long investigation in June 1990, adopting a LATA-wide local calling plan for the western part of the state, and took the first step in a transition plan for implementing LATA-wide local calling in eastern Massachusetts (including the Boston metropolitan area) as well.[65] The plan implemented in the one Western LATA was a measured rate plan, but one that incorporated substantial rate reductions relative to present

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[62] As noted by the PSC, "the fact of a revenue decrease affords us an unusual opportunity to restructure rates to achieve public policy objectives without significantly increasing any of DST customers' rates.... Currently, rates are structured so that ratepayers located outside the population centers of Wilmington, Dover, and Georgetown cannot, as a rule, call into these centers as local calls, despite the fact that these cities and towns function as hubs for many activities of daily life. Thus, for instance, for these residents, telephone calls to doctors or hospitals and places of work are long distance calls and have been priced at levels well above cost. *Ibid*, 4-5.

[63] *Ibid.*, 3.

[64] *Ibid.*, 7.

[65] Massachusetts is divided into two LATAs--one comprised of the western half of the state (corresponding to the '413' area code) and the other comprised of the eastern half (corresponding to the '617' and '508' area codes).

measured rates.[66] The new rate scheme was introduced in the Western LATA for two major reasons: first, the revenue losses to New England Telephone associated with implementation of the new rate plan were relatively small in the western LATA as compared with the more populous eastern LATA, and, second, there had been a history of complaints from customers in the western LATA concerning the inadequacy of their local calling area and the unavailability of expanded local calling plans such as offered to customers in the eastern LATA.

In Arizona, a settlement agreement recently signed directed US West to implement flat-rate metro calling in the Tucson and Phoenix metropolitan areas by August and September 1992, respectively.[67] As part of the implementation plan, US West was directed to discount its interzone usage rates (charges that apply for calling outside the local exchange area) for these metropolitan areas by 25 percent effective immediately and by an additional 25 percent effective March 1992. At the same time, basic service rates for both residential and business customers were subject to significant increases, in part due to the size of the revenue award and in part due to the implementation of flat-rate metro calling. Requests for expanded flat-rate metro calling had been an issue before the Arizona Corporation Commission for some time, and the implementation of metro calling was an integral part of the rate case settlement agreement.

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[66] Massachusetts Department of Public Utilities, Docket No. 89-300, *Investigation by the Department on Its Own Motion as to the Propriety of the Rates and Charges Set Forth in Certain Enumerated Tariffs for New England Telephone*," June 29, 1990.

[67] Arizona Corporation Commission, Docket No. E-1051-91-004, Settlement Agreement, July 1990, 4.

Finally, Georgia provides an interesting example in two respects: first, expanded local calling was implemented as a result of a legislative mandate as opposed to state utility commission action, and, second, the emphasis of the legislation was on lowering usage rate levels, as opposed to explicitly expanding the basic service definition. Specifically, Senate Bill 524 required the Georgia Public Service Commission to implement county-wide toll-free calling by July 1, 1991.[68] As an interim measure, the PSC was required to implement a "community of interest" (COI) calling plan which provided toll-free calling beyond county boundary lines and reduced toll rates reduced "to a level comparable with inter-LATA toll rates" or both.[69] As part of the settlement agreement in which these changes were implemented, an "economic development fund" was developed "to mitigate the impact of these changes upon the independent telephone companies," who like Southern Bell, would experience "perhaps substantially" reduced earnings as a result of these changes.[70]

As evident from the above discussion, EAS policy has a number of different dimensions which can be explored within the context of both the public-good and private-good models of the telecommunications network developed in this study. From the private-good perspective, historically many instances of EAS were justified on the basis of cost savings and revenues generated. More recently, the diminishing sensitivity of usage costs to distance has provided another economic rationale for expanding local calling areas and reducing the distinction between local and toll usage rates (or both) which is sometimes offered as the next-best solution. On the other

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[68] Georgia Public Service Commission, Docket No. 3905-U, *Order Adopting the Stipulation between the Staff Team and Southern Bell Telephone and Telegraph Company as the Commission's Resolution of the Rule NISI Case*, September 26, 1990, 26.

[69] *Ibid.*

[70] *Ibid.*

hand, there is a clear public-good aspect to the EAS issue because of underlying community-of-interest and economic development considerations. In particular, the conflicts between core urban areas and outlying rural or suburban areas which emerge in almost all political and social forums are often a key dimension of the EAS issue. In addition, there is more public participation (and preference revelation) relative to EAS issues than occurs for perhaps any other issue that comes before state utility commissions, as evidenced by an often-active customer petition process. Because of the multifaceted nature of EAS, combined with the intricacies of geographic and political boundaries and the incremental and often ad hoc nature of decisions regarding the local calling area, there is no consensus regarding EAS policy among jurisdictions or even within a jurisdiction, despite the fact that the definition of the local calling area is a critical component of the basic service definition. In recent years, however, there does appear to be a trend toward local calling area expansion, although it is difficult to identify a trend given the diversity in EAS policy.

Example 4: Plant Modernization/Accelerated Technology Deployment

Historically, regulated telecommunications common carriers, as part of their mandate to provide service within their franchised operating territories, have been responsible for constructing, maintaining, and enhancing their network infrastructure to meet prevailing and potential consumer needs. Under rate of return regulation as traditionally practiced in state and federal jurisdictions, the franchised carriers would undertake the necessary research and development, formulate construction plans and capital budgets, and make the investments necessary to achieve their network development goals. Utility management, as opposed to regulators, made the major decisions regarding modernization (that is, decisions to replace plant with more technologically

modern facilities), including both "how much?" and "who pays?," subject to what in most instances amounted to "passive ratification" by the responsible regulatory agencies.[71]

Indeed, as long as their investment decisions reasonably satisfied the "used-and-useful" and "prudency" standards of economic regulation, franchised carriers generally have been assured full recovery of their capital outlays as well as a return on their net investment rate base. By insulating the providers of capital from most business and financial risks and by assuring full recovery and return even under adverse business or economic conditions, regulators have played an important role historically--albeit a largely indirect role--in encouraging capital investment in and modernization of the public telecommunications network. In the past, much (if not most) of the impetus for major capital investment in network upgrades was the mechanization of manual processes and implementation of other *cost-reducing* technologies. With most electromechanical systems now having been replaced by electronic hardware, opportunities for further cost reductions resulting from network upgrades have given way to opportunities for new network capabilities and service options, and, potentially, to increased *revenues* from an expanded market. The problem, of course, is that the actual extent of revenue enhancements is far more

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[71] For a fuller treatment of this subject and more specifically a discussion of the effect that changes in the telecommunications industry have had on the question of who pays, see Nancy J. Wheatley, Dr. Lee L. Selwyn, and Patricia D. Kravtin, *Telecommunications Modernization: Who Pays*, (Columbus, Ohio: The National Regulatory Research Institute, 1988) in particular, Section I, "A Perspective on Network Modernization." See also Raymond W. Lawton, *Telecommunications Modernization: Issues and Approaches for Regulators* (Columbus, Ohio: The National Regulatory Research Institute, 1988) which provides a conceptual basis for analysis and regulatory response to modernization issues, including the critical "who pays" question.

difficult to forecast than known sources of cost avoidance, not to mention the fact that these additional network capabilities may themselves not fall within the scope of "basic service" under traditional definitions and scope of that concept.

Accordingly, and not surprisingly, state and federal policymakers have responded to the "new" network modernization by becoming more actively involved in matters relating specifically to the modernization of the public network infrastructure. The tremendous strides in telecommunications technology in the past decade or so--including the advent of digital switching and fiber optic technologies,[72] among others--combined with the changing structure of the telecommunications industry[73] have brought telephone plant modernization issues to the forefront of the public policy agenda. However, perhaps one of the more dominant factors underlying the increased

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[72] The advent in digital switching and fiber optic technologies has created the prospect of massive rebuilds of the local telecommunications network infrastructure including the replacement of electromechanical and analog electronic switches with digital facilities and the substitution of fiber optic cable for existing copper plant. This rebuilding is on such a large scale as to involve potentially hundreds of billions of dollars in new capital investment on a national scale and correspondingly large rate increases for telecommunications consumers. For a discussion of this phenomenon and the potential policy conflicts which arise because of the strategic importance of major capital investment programs to the local exchange carrier's potential ability to enter unregulated lines of business, see Dr. Lee L. Selwyn, *Telecommunications Modernization: Resolving the Conflict between LEC Strategic Interests and National Needs and Priorities*, presented at the Twenty-first Annual Williamsburg Conference, December 11, 1989.

[73] *Ibid.* As discussed Wheatley, et al. in *Modernization: Who Pays?*, the industry structure has changed from a "closed" and highly regulated one to a more "open" market structure, both in terms of new entry into markets previously provided on a monopoly basis by the regulated carrier, but also in terms of the regulated dominant carriers themselves being permitted to engage in unregulated competitive lines of business out of a common corporate organization and resource base. In the latter case, the costs and the benefits of the utility's capital investments will necessarily be shared by both its ratepayers and its shareholders, and the issues surrounding how this sharing should take place have certainly emerged as key public policy questions.

level of involvement by regulators on issues concerning plant modernization and technology deployment is the connection between telecommunications infrastructure and economic development.[74]

This connection has, of course, always existed. As discussed earlier in this chapter, the promotion of universal availability of high-grade (that is one party) telephone service was an integral part of the rural economic development objectives of the Rural Electrification Administration (REA). However, it is only in recent years that modernization per se as an objective--entirely independent of the universal service objective underlying the REA program--has emerged as a major policy agenda item and economic development tool.

There are several reasons for the new regulatory focus on the telecommunications infrastructure/economic development connection, foremost among which are the dramatic advances in telecommunications technology of the past decade. These innovations have created many new uses for existing telecommunications resources, and have engendered considerable interest in extending the capacity and capability of the nation's telecommunications infrastructure to support high-bandwidth data and video services and a variety of "intelligent" network functions, perceived to be of increasing importance to today's fast-paced, sophisticated, and information-rich society. In addition, there is a growing perception--being promoted in part by the LECs themselves--that the United States is lagging behind other modern nations in

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[74] See, for example, Gail Garfield Schwartz, *Telecommunications and Economic Development Policy*, presented at NARUC 101st Annual Convention, Boston, November 13, 1989, 17.

the world in deploying the latest telecommunications technologies.[75] Legislatures and regulators in several states have drawn the connection between economic development in their jurisdictions and the condition of telecommunications resources, seeking to assure that they are positioned to maintain or develop their own respective competitive edge in this area.[76] Another key influence on regulators has been the movement toward alternative forms of regulation, in particular, incentive-based systems in which utilities are given the opportunity to raise earnings levels above authorized rates of return. Concerns that utilities may cut back network modernization programs to the detriment of service level and quality as a means of achieving higher profits

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[75] While the *perception* clearly exists that the US is lagging behind other modern nations with respect to the deployment of the latest telecommunications technologies, as a *factual* matter, this point has been, and continues to be, the subject of considerable national debate. A substantial record of opposing viewpoints on this subject has been amassed in the form of comments submitted in April of 1990 to the US Department of Commerce, National Telecommunications and Information Administration (NTIA) in response to the *Notice of Inquiry* of its *Comprehensive Study of the Domestic Telecommunications Infrastructure*, issued in January 1990. In response to LEC analyses supporting the need for an accelerated upgrade of the US telecommunications infrastructure in order to prevent the US from slipping into "second class status," some suggest that the LECs have sought to advance their own agenda of accelerating telecommunications infrastructure modernization by tying it to US concerns about productivity and global competitiveness, and that the factual foundation underlying the LEC position is not supported by available objective information. For a discussion of the latter view, see William P. Montgomery, Lee L. Selwyn, and Paul S. Keller, *The Telecommunications Infrastructure in Perspective*, a report prepared for the Consumer Federation of America and the International Communications Association, 1990.

[76] Interestingly, such "economic development" initiatives have exhibited far less interest in the *price* of telecommunications services than in the *availability* of advanced network capabilities. Indeed, policymakers have sometimes been willing to forego rigorous economic regulation of earnings and prices in exchange for commitments by the LEC to invest in new network resources. It is not certain why these policymakers believe that potential *users* of advanced telecommunications services are less concerned with the costs of the services they purchase than with their availability, particularly when such users can frequently acquire the necessary capabilities from non-dominant suppliers.

allowed under incentive-based systems of regulation has motivated regulators to require specific levels of modernization spending as part of new regulatory regimes.

These developments have led to a change in attitude on the part of telephone utilities with respect to regulator involvement on issues pertaining to modernization of the telecommunications infrastructure. Previously, the telephone companies (like other utilities) fought hard to keep regulators from getting too involved with the details of modernization and technology deployment, generally espousing the attitude that the investment decision-making process was best left to the utility's management, which was in a superior position to evaluate the economics, feasibility, and necessity or all three of any given modernization program. This attitude was certainly understandable at the state level, given the fact that in many instances where state regulators did get involved, it was to examine critically the utility's plant replacement practices and depreciation policies.

For example, the California Public Utilities Commission conducted a comprehensive multiyear proceeding to examine the plant replacement practices and decision-making of Pacific Bell.[77] Over the course of that lengthy and complex proceeding, a report was issued by CPUC staff consultants which concluded that a number of the modernization projects undertaken by Pacific Bell were unreasonably risky or likely to fail. The result of the CPUC investigation was the imposition of a financial penalty on the telephone company linked to its failure to achieve a target level of plant utilization.[78] Other state commissions, including Arizona's and Washington's, have

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[77] California Public Utilities Commission Application No. 85-01-034.

[78] California Public Utilities Commission, Application No. 85-01-034, Decision 87-12-067, December 22, 1987, 159-172.

also conducted investigations of the investment decision-making and plant utilization practices of the Bell telephone company within their jurisdictions.[79]

In addition, state commissions have indirectly slowed the pace of modernization within their jurisdiction by rejecting (or modifying) telephone company requests for faster capital recovery.[80] With the 1986 US Supreme Court ruling in *Louisiana PSC v. FCC*, the power of state commissions to set their own depreciation rates--independently of the FCC, which has generally supported much faster depreciation of telephone plant than state commissions--was significantly reinforced.[81]

However, conflicts between state and federal regulators, and between state regulators and the telephone companies they regulate, on issues relating to modernization and capital recovery have greatly diminished over the past few years. The "hands-off" message conveyed to state regulators by telephone companies has largely been replaced by an active effort on the part of the companies to encourage regulators to *affirmatively mandate* accelerated programs of modernization-related investment and depreciation reserve amortization. As noted above, such efforts are

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[79] See Dr. Lee L. Selwyn, Patricia D. Kravtin, and Paul S. Keller, *An Analysis of Outside Plant Provisioning and Utilization Practices of US West Communications in the State of Washington*, 1990. Also the Direct Testimony of Lee L. Selwyn submitted on behalf of the Arizona Corporation Commission Staff in Arizona Corporation Commission Docket No. E-1051-88-146, March 1989.

[80] There is a direct and undeniable relationship between the depreciation- related cost recovery and planned construction or modernization activity. For a regulated public utility, all rate base assets are depreciated and the depreciation charges are treated as current expenses to be recovered through operating expenses. These depreciation charges, in turn, generate funds to help finance future construction activity. Increases in depreciation rates and shortening of the recovery period greatly facilitate the utility's planned construction and associated plant retirements.

[81] Louisiana Public Service Commission v. Federal Communications Commission, 106 S. Ct. 1890 (1986).

typically in the context of an alternative regulation plan, in which accelerated modernization may be offered as the quid pro quo for excess earnings, increased pricing flexibility, or some other condition desired by the LEC. From the standpoint of the telephone company, to the extent an accelerated investment program is mandated by regulator recovery of that investment is effectively ensured. For their part, state regulators, increasingly sensitive to the connection between the telecommunications network infrastructure and economic development and concerned that their own state may fall behind if they do not act quickly, have frequently been receptive to this new "partnership" approach to modernization issues.[82]

Of those states in which some form of alternative regulation has been adopted, approximately one-half of those plans have included provisions for network modernization or accelerated technology deployment.[83] For example, under the terms of the new incentive-based regulatory framework put into effect January 1, 1990 by the California PUC (as previously indicated, one of the more active state commissions

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[82] Regulators have not been the only policymakers to take an interest in the accelerated deployment/economic development connection--state and federal legislators have also taken an active interest. In New Jersey, proposed legislation explicitly directed the State Utility Board to approve an "economic development program proposed by a local exchange company which is designed to develop a state-of-the-art telecommunications infrastructure" at the same time granting telephone companies with increased pricing and earnings flexibility and outright deregulation of services deemed competitive by the Board. At the federal level, bills in the House and Senate would require telephone companies to deploy switched broadband networks by the year 2015, in this case, the quid pro quo being telco entry into the cable television market. US House of Representatives, The Communications Infrastructure Modernization Policy Bill, H.R. 2546, introduced June 5 1991, and its companion bill S1200, named the Burns Bill, in the Senate.

[83] *Report on Telecommunications Alternative Regulation Plans by State*, Volume Three, issued by the Missouri Office of Public Counsel, for distribution at the May 1991 NASUCA Conference.

in terms of past scrutiny of telephone company plant replacement practices), the justification of telephone company investments in regulatory proceedings would no longer be required in order to encourage local exchange carriers to aggressively pursue new technologies and services.[84] In other states, explicit modernization programs or levels of expenditures have been established as part of alternative regulation plans.

In Vermont, one of the first states to implement an alternative to rate of return-rate base regulation, New England Telephone was required to spend over $280-million for network modernization during the period between 1987 and 1991.[85] The Vermont plan included a freeze on basic rates from 1987 through 1990, followed by increases in 1991 and 1992. NET also received significant flexibility with respect to the offering of new services. In another New England Telephone state, Rhode Island, the LEC was required by the Public Utilities Commission to invest a minimum of $50 million annually for network modernization as part of an incentive regulation trial in that state.[86]

The Kansas Corporation Commission adopted Southwestern Bell Telephone's proposal to invest $160 million in network modernization (including the replacement

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[84] California Public Utilities Commission, Interim Opinion in Phase II, Docket No. 87-11-033, Decision No. 89-10-031, October 12, 1989 (Vol 107 PUR, 1,January 5, 1990),
p. 209.

[85] *Investigation of the Proposed Vermont Telecommunications Agreement*, Public Service Board, Docket No. 5252, July 12, 1988; *Modified Vermont Telecommunications Agreement*, Docket No. 5293, December 30, 1988.

[86] State of Rhode Island and Providence Plantations Public Utilities Commission, Report and Order, Docket No. 1936, August 22, 1989, 8.

of all older switches with new digital systems) over a five-year period in connection with its approval of flexible pricing for non-basic services and rate stabilization for basic rates.[87] Similarly in Texas, another Southwestern Bell state, the Public Utilities Commission adopted a plan proposed by SWB and the PUC's General Counsel which provided for the Company to commit to a $168 million modernization program to upgrade all switches to digital facilities within five years.[88] As in Kansas, the Texas modernization program was tied to the potential for increased earnings levels for the telephone company, pricing flexibility for nonbasic services, and rate stabilization for basic rates. While rate stabilization may appear to represent a concession by the telephone company during a period in which the unit costs of telecommunications services have been declining, ratepayers may otherwise have experienced rate reductions for basic services. In other words, some or all of the earnings surplus experienced by telephone companies in recent years, brought about by decreasing costs and rising demand, has in many jurisdictions simply been transferred to new modernization-related investments rather than into rate reductions.

Tennessee provides an interesting example of a state in which the regulator took a proactive role in accelerated technology deployment in the name of economic development objectives, earmarking nearly all present and future excess earnings of

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[87] The State Corporation Commission of Kansas, Order, Docket No. 166,856-U ("TeleKansas"), February 2, 1990.

[88] Texas Public Utilities Commission, Final Order, Docket 8585, November 29, 1990, and Stipulation between the General Counsel of the Public Utilities Commission of Texas and Southwestern Bell Telephone Company, Docket 8585, February 2, 1990.

the dominant LEC to modernization-related investment.[89] In Tennessee, the PSC commissioned the development--and was the most vocal advocate of the implementation--of a ten-year master plan for accelerated technology deployment ("master plan"), calling for the installation of intelligent network capability (CCS#7), integrated services digital network (ISDN), and switched broadband service throughout the state.[90] The PSC implemented a three-pronged approach to alternative telecommunications regulation in the state which, in addition to the master plan, also included an excess earnings investigation[91] (in which the existence of some $157 million in excess earnings was identified as being available for disposition by the PSC) and a regulatory reform plan.[92] The regulatory reform plan provided carriers with both earnings and pricing flexibility in exchange for their commitment to the technology deployment plan. Excess earnings--both those amounts identified in the investigation as well as amounts to occur prospectively under the regulatory reform plan--were earmarked as funding sources for the $400 million-plus accelerated

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[89] According to a PSC statement dated July 31, 1990, accompanying the adoption of the Master Plan, promoted under the name "FYI Tennessee:" "'FYI Tennessee' is designed to further Tennessee's participation in the Information Age and enhance the state's competitive position for future economic development."..."We believe that 'FYI Tennessee' will give our businesses the edge in national and international competition, help us attract new high-quality jobs, help improve our educational and medical programs and give residential customers access to services they never dreamed possible."

[90] RCG/Hagler, Bailly, Inc., Doherty, Hogan Division, *Final Report of the Telecommunications Technology Deployment Analysis and Master Plan Deployment*, 1990.

[91] Earnings Investigation of South Central Bell Telephone Company, Tennessee Public Service Commission, Docket No. 90-05953, January 17, 1991.

[92] Tennessee Public Service Commission, Docket No. 90-06170, Order dated August 17, 1990, and Tennessee Regulatory Reform Plan, July 10, 1990.

technology deployment set forth in the master plan and other modernization projects or both at the Commission's discretion.

Finally, the Utah Public Service Commission has recently joined the growing list of state commissions explicitly recognizing economic development-related modernization programs and its role in "encourag[ing] timely, socially beneficial investments."[93] US West Communications was required by the PSC to implement a modernization plan involving the conversion of rural central offices to digital facilities and the deployment of fiber optic facilities in various locations, and in particular at educational facilities throughout the state.[94] Similar to Tennessee, the Utah PSC in announcing its plan justified the modernization program on the basis of corollary benefits in other sectors of the state's economy, including education, government, research needs, and health care. However, unlike Tennessee, the Utah PSC specifically rejected proposals for incentive regulation.[95]

Thus, while regulators in the past have followed what can be characterized as a "hands-off" approach to plant modernization decisions, recent history reveals a much different story, namely, an affirmative interest by regulators in exerting a direct influence on decisions and outcomes relating to modernization-related investment in

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[93] Public Service Commission of Utah, Report and Order, Docket No. 90-043-03 and 06, June 19, 1991, 81.

[94] *Ibid.*, 82-83.

[95] *Ibid.*, 94-96. In rejecting proposals for incentive regulation, the Utah PSC found "there is insufficient evidence to justify the assertion that traditional regulation...discourages modernization or the introduction of new technologies or services. The PSC also found that "liberal depreciation policies, such as those adopted by t[he] Commission since 1985, have a more direct and substantial impact upon modernization decisions than would an incentive regulation plan." (p.95).

their respective jurisdictions. As will be discussed in chapters 3 and 4, the views and actions of state regulators concerning modernization issues--in particular how those views and actions are aligned with the public-good or private-good aspects of the telecommunications network infrastructure--play a critical role in the context of identifying objectives that the public switched network should serve for POTS customers. What is clear from the discussion above is that if recent trends continue and regulators continue to view economic development objectives as an integral part of their mandate as regulators, then the "public" good model of the telecommunications network appears to be gaining momentum, despite evidence to the contrary of greater emphasis on the "private" good aspects of the network.[96]

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[96] See Eli Noam, *Network Tipping and the Tragedy of the Common Network: A Theory for the Formation and Breakdown of Public Telecommunications Systems,* (New York: Columbia University, September 1990).

CHAPTER 3

EVOLUTION OF THE NETWORK AND THE BASIC SERVICE CONCEPT

The evolution of modernization and the public switched network

Modernization of the United States telecommunications infrastructure historically has been an evolutionary process.[1] Over time, this process has tended to result in a significant expansion of the definition and scope of "basic telephone service" as delivered to the general body of residential and business users. Indeed, ever since telephone service was established in its present "public utility" mode around the turn of the century, local telephone operating companies have earmarked a portion of their funds for replacement of obsolete equipment and facilities with a more current technological vintage.

Switching technology, for example, evolved from the cord switchboard through crude electromechanical "step-by-step" and "panel" machines through several generations of "crossbar" electromechanical systems. In less than two decades, the industry has moved from analog stored program control electronic switches to digital electronic switching technology. A third generation of electronic switching, involving greater hardware and software modularity and a more flexible means of delivering digital signals directly to customer premises, will begin going on line within the next several years. A fourth software-based generation of switches, involving broadband

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[1] The discussion of the evolutionary nature of the public switched network is based upon the paper presented by Lee L. Selwyn, entitled *Network Modernization: An Evolving View of Basic Telecommunications Services*, at the Twenty-second Annual Williamsburg Conference, December 11, 1990.

switching capabilities and photonic (rather than electronic) technology, likely will emerge before the year 2000.

Network control and signalling has similarly passed through multiple generations over the past fifty years or so. In-band signalling has given way to the more efficient and highly flexible common channel signalling technology. Distinctions between "logical" and "physical" network addressing ultimately may pave the way for the introduction of the non-geographically-fixed "personal telephone number," as well as a variety of existing network call management and call forwarding functions. Network transport has also evolved from the crude space-division approach (separate copper pairs for each communications channel) through low-capacity frequency-division carrier technology, high-and ultra-high-capacity digital multiplexing systems used with broadband transmission media like fiber optic cables. Besides vastly increasing the number of "voice" conversations that can be carried over each network link, these new transport technologies have made it possible for new *kinds* of communications to be carried over the public network--video, large quantities of data, and perhaps even the ultra-high bandwidth medium of the next century necessary for full motion holography.

While development of new telecommunications technologies has been underway for more than a century, its pace clearly is accelerating. Most of the new equipment and systems have ultimately found their way into the public telecommunications network. However, the rapid pace of new developments--and the industry's desires to deploy them as quickly as possible--will place unprecedented demands upon the financial resources of the regulated telecommunications utilities. In the ten-year period from 1979 through 1988 inclusive, United States local telephone companies

invested some $168.6 billion in new plant. In the coming ten years, this investment level could more than double under some telephone industry scenarios.

The evolution of telecommunications network technology historically has been translated directly into an evolving definition of "basic" telephone service (see Table 1). As dial central offices replaced manual switchboards, "basic" service was redefined to embrace this new mechanized call-setup and signalling technology. The introduction of direct distance dialing in the 1960s similarly changed the character of basic telephone service, and evolved into the 1980s deployment of international direct dialing (IDDD) and "equal access" arrangements for multiple interexchange carriers. Technological changes bringing down the costs of usage and minimizing the distance-sensitivity of usage costs have encouraged the expansion of local calling areas and the incorporation of extended area service as part of basic service (see discussion in chapter 2). New technology also has allowed the definition of basic telephone service to be expanded to meet new social goals. Introduction of public safety communications systems (9-1-1 and Enhanced 9-1-1 as discussed in Section II) and TDD/voice relay systems for the speech and hearing impaired population are clear examples of this phenomenon.

Table 1

EVOLUTION OF THE "BASIC SERVICE" CONCEPT

Date	Basic Service Components
1900s:	Cord switchboards, party lines
1920s:	Limited local dialing, operators still required to place many metropolitan area and most rural area calls
1940s:	Metropolitan area dialing, increased dial exchanges in rural areas, operators required to place all long distance calls
1960s:	Introduction of national Direct Distance Dialing (DDD), most manual switchboards eliminated, use of party lines all but gone except in rural areas, Touch Tone introduced as premium service option
1970s:	Widescale replacement of electromechanical central offices with analog stored program control electronic switching systems, full mechanization of toll billing, limited introduction of central office based "custom calling services"
1980s:	General availability of International Direct Distance Dialing (IDDD), extensive deployment of digital carrier on interoffice and interexchange trunks, "Equal Access" to interexchange carriers, basic and "enhanced" 9-1-1 service, extensive use of public "voice" network for data communications.
1990s:	Full deployment of common channel signalling at the end office level, introduction of many new software-based network features, introduction of digital plant for business and residential subscriber access lines, adoption of Touch Tone as the "standard" offering, deployment of new "Open Network Architecture" interconnection and network access arrangements, introduction of limited ISDN at the subscriber level, implementation of TDD/voice relay systems.

Source: Lee L. Selwyn, *Network Modernization: An Evolving View of Basic Telecommunications Services.*

In some cases, however, the new network functions engendered by a "modernization" effort do not immediately result in a redefinition of "basic" service, but merely are offered as "vertical" or "premium" add-ons to the preexisting basic telecommunications capability. As discussed in more detail in Chapter 5, when touch-tone signalling was first introduced in the mid-1960s, it was treated as a "premium" service for which an additional fee was charged. In the case of touch tone, the typical monthly charge (usually in the $1 to $3 range) grossly exceeded the small incremental cost of furnishing this capability. In recent years, touch tone has been included within the scope of basic service in a growing number of jurisdictions.

In other cases, the definition and scope of "basic telephone service" has actually been narrowed. In many instances, the contraction of the basic service definition has occurred largely at the behest of the telephone companies as a means of increasing revenues. The introduction of separate charges for operator services, directory assistance, special number assignment, and the distinct measured service charges for local calling fall within this category.[2] In other instances, the contraction of the basic service definition happened in connection with changes in regulatory policy in certain markets which once were determined to possess natural monopoly characteristics. The unbundling of customer premises equipment and inside wire (both investment and maintenance components) from basic services are examples of this latter case.

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[2] While in the majority of jurisdictions, measured use is still considered part of basic service, in others, measured use is viewed as a "discretionary" service. This potential distinction is particularly important in the context of alternative regulatory plans in which a different level of regulatory protection is provided to the service on the basis of this discretionary-nondiscretionary distinction.

Identification of POTS objectives that have driven public network development

Perhaps the only explicit articulation of POTS objectives is found in the universal service doctrine which has its origins in the Federal Communications Act of 1934. In that Act, the United States Congress created the Federal Communications Commission and established "universal telephone service" as a *national* policy goal. As set forth in the 1934 Act, the FCC was created "[f]or the purpose of regulating interstate and foreign commerce in communications by wire and radio *so as to make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges...."*[3] The foundation of the universal service doctrine is clear, that is, the idea that a basic communications capability is desirable or "essential." However, the doctrine does not provide any guidance to the specific problem addressed in this report--namely, the identification of specific network features and functions which should be included as part of this "essential" or "basic" capability, to be made available to all at reasonable charges. A large part of the problem is that once society accepts the notion that a basic telecommunications capability is desirable or "essential" for all citizens--the very foundation of the universal service doctrine--it becomes difficult to delineate exactly what specific service elements qualify as part of that essential capability.

In the early days of the telecommunications network, it was not so hard to determine that the basic connection to the network was the essential capability. That is not the case today. The vast majority of the United States population has access to

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[3] Federal Communications Act of 1934, Title I, Section I.

telephone service (both local and long distance) and the quality of that service, in terms of post-dial delay times, signal-to-noise ratios, interruptions or other failures, and so on, is exceptionally high. Consistently high penetration rates of greater than 90 percent, bolstered in recent years by Lifeline, Link-Up America, and other targeted subsidy programs, as well as by steadily rising per-subscriber usage levels, confirm the observation that high quality POTS is within affordable reach of essentially all who seek it.[4] Advanced telecommunications has become an increasingly vital component of modern life, however, and new technologies provide the network with a vast array of new capabilities. Trade-offs exist between the often-conflicting objectives of keeping the cost of "basic" service at "reasonable charges" and expanding the set of services and/or technologies "available" to "all people."

Indeed, it has become increasingly difficult today to determine which network features and functions are "essential" to the "public interest." A notable exception is 9-1-1 and E9-1-1 emergency telephone systems, for which, as discussed in Chapter 2, there is general consensus about its essentiality, and mandates for system implementation typically come down from state legislatures or other public authorities. Another notable exception is TDD-voice relay systems for the speech and hearing impaired; as in the case of emergency telephone service, implementation of TDD-

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[4] As of November 1990, telephone penetration in the U.S., as measured by the percent of households with telephones, was 93.3%. The number of households with telephone service is obtained as part of the Current Population Survey (CPS) conducted monthly by the Bureau of the Census. "The specific questions asked in the CPS are: 'Is there a telephone in this house/apartment?,' and, if the answer to the first question is no, 'Is there a telephone elsewhere on which people in this household can be called?' (FCC Comprehensive Monitoring Report on Telecommunications Service, CC Docket 87-339, January 31, 1991, 9, 13).

voice relay systems has evolved largely in response to legislative mandates.[5] For the vast majority of other services, the demanding task of determining which network features and functions are "essential" to the "public interest" and thus should be provided as part of basic telephone service has fallen squarely on the shoulders of state regulatory commissions, although state legislatures are becoming increasingly involved in this issue in connection with their consideration of comprehensive telecommunications regulatory reform legislation.

As an example, a 1987 proposal filed by US West ("Mountain Bell") in Arizona would have required the Arizona Corporation Commission to make an explicit finding regarding the public nature of each service and apply different standards of regulation depending on the nature of that finding.[6] More recently, in North Dakota, a state

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[5] Federal law passed in 1990 (The Americans with Disabilities Act (ADA)) requires telecommunications carriers to provide telecommunications relay services in every state by 1993. (Public Law 101-336, Title IV - Sec. 401, Telecommunications Relay Services for Hearing-Impaired and Speech-Impaired Individuals, July 26, 1990). In response to the ADA mandate, the Federal Communications Commission, in Docket CC 90-571, amended its rules to implement telecommunications relay services in the interstate jurisdiction. Several states have already implemented or are soon to implement TDD/voice relay services, including California, Georgia, Kentucky, Missouri, Nebraska and most recently Vermont. (State Telephone Regulation Report, December 27, 1990) In Vermont, the provision of TDD/voice relay services was heralded by the Vermont Public Service Board as "another step forward toward universal service telephone access for Vermonters." (*NARUC Bulletin* 27-1991, July 8, 1991, 26)

[6] Arizona Corporation Commission Docket No. E-1051-87-272. Specifically, US West proposed to categorize services into three categories: (1) services determined by the Commission to be "essential and integral to the provision of basic services", "imbued with the public interest," meaning of interest to the "public as a whole;" (2) services "currently imbued with a public interest but which do not require full traditional regulation due to their optional or specialized nature; and (3) services that are "clearly not imbued with the public interest." Only services falling into the first category, under US West's proposal, would continue to be subject to full regulatory treatment. Pricing flexibility would be permitted for services falling in the second category, while services falling in third category would be completely detariffed.

law deregulated rates for "nonessential" services and mandated a price-caps form of regulation for essential services as part of a comprehensive measure to remove telecommunications companies from rate of return regulation.[7] While the law provided guidance, the Public Service Commission was responsible for determining the distinctions between essential and nonessential services in connection with the implementation of this law. As might be expected in the wake of reduced regulation for "nonessential" services, the LEC (another US West company) espoused a narrow interpretation of "essential" services, taking the position that only services such as access and two-way switched local exchange services that are necessary or indispensable should be considered essential. The Commission staff, on the other hand, advocated a more expansive view that included "every local exchange two-way

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Interestingly, under US West's plan, only basic local exchange access, usage within the local calling area, and E-9-1-1 services would be included in the first category. Most other existing US West services, including interzone calling (i.e., non-toll measured calling outside the local calling area), MTS, Touch Tone, private line and switched access services, fell into the second category of non-essential services, and accordingly subject to less regulatory scrutiny. The ACC rejected US West's proposal and maintained rate of return regulation in Arizona.

[7] North Dakota SB 2320, July 1989. The law defined essential service as service that is "necessary for access to interexchange telecommunications companies for both residential and business service within a local exchange area and designated certain services to be included within the "essential" category." Specifically included were the following services: "access; new services deemed essential by the Public Service Commission after notice and hearing; billing and collection of essential services; directory listing and local exchange directory assistance; emergency 9-1-1 services and operator assistance in those areas in which 9-1-1 service is not available; mandatory flat-rate extended area service to designated near-by local exchange areas except as otherwise provided; service connection to the local network; service provided to allow transmission service and termination between an interexchange company's premises and the local exchange central office switch for the origination and termination of the interexchange company's services; and transmission service between the end user's premises and the local exchange central office switch including signaling service such as touch-tone used by end users for essential telecommunications services."

switched telecommunications service and every access service to interexchange telecommunications carriers ... regardless of whether it is indispensable" as well as "any service that is necessary for the provision of those two categories of service."[8]

Indeed, the notions of essentiality and the public interest in telecommunications are not at all straightforward. For example, to define only basic local voice service as essential assumes that the only important communication that customers initiate takes place within a small geographic area, and that all other communication is "optional" or "discretionary." At the same time, with increasing use of on-line computer services and data transmission in some aspect of the daily lives of almost all Americans, it would be questionable to assume that data communication is not essential to the public interest.[9]

One standard for measuring the essential nature of a service is how widely the service is used by customers. Widespread use is not by itself a *sufficient* basis for classifying a service as "essential;" it would also be necessary to establish that the service possesses "natural monopoly" attributes or some other unique "public interest" distinction. Services like touch tone which require central office functions could thus

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[8] North Dakota Public Service Commission Case No. PU-2320-89-33, issued December 29, 1989. Included within the PSC Staff concept of essential service, for example, are services such as Touch Tone, call waiting, three-way calling service and intercom type service.

[9] For example, millions of Americans now possess and regularly use Automated Teller Machine (ATM) cards for routine banking transactions. While the "customers" of the telecommunications services that support ATM networks are nominally the banks, the ultimate users of these services are individual consumers. Viewed in this context, the deployment of telecommunications services to support ATMs in the 1990s is as much a fulfillment of the "universal service" goal as was the provision of basic public network connectivity to residential consumers a half-century ago when the Communications Act was initially made law.

fall within this category because of their widespread use and the apparent efficiency of producing this service from a central office. Services like speed calling or voice mail, which can be supported quite efficiently by CPE, probably would not as the use of these services is not widespread, and the decentralized provisioning does not correspond to the natural monopoly concept. Basic network functions (such as the ONA "Basic Service Elements" that are required for certain types of voice mail services) may be provided centrally on a monopoly basis by the LEC, and yet do not have the same penetration as touch tone.

In any event, the very nature of the public interest dictates that it is the public, and not the telephone utility, that is to decide what the objectives of the public switched network ought to be. The telephone company has an economic incentive to define essential or basic service narrowly, since there is much less pressure to keep rates down (or even regulated) for services classified as nonessential. As the examples identified in Chapter 2 illustrate, most of the alternative regulation plans adopted throughout the country provide increased pricing flexibility and reduced regulatory oversight or both, principally for nonessential services.

It is a well-established principle that underlying the economic-political-regulatory system in this country is the maximization of *individual* satisfactions, or in economic jargon, individual "utilities."[10] Although this maximization process can (and

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[10] See Richard A. Musgrave and Peggy B. Musgrave, *Public Finance In Theory and Practice*, (New York: McGraw-Hill Inc., 1980) 83-84. As explained, "Social goods as well as private goods are experienced by individuals and included in their own preference systems"...however, "[t]o say that wants are experienced individually...is not to deny the existence of social interaction." "Utilities are interdependent and this fact broadens the range over which the economics of social goods applies.. what matters is that satisfaction is experienced in the last resort by A and B individually and not by a mysterious third entity called A+B."

is) generally achieved through the marketplace, in certain situations either the market fails completely (for example, in situations where there exist significant externalities) or it functions only in an inefficient way (for example, in situations where only one or a very limited number of firms possess a large degree of monopoly power). In these situations, society must instead rely upon an inherently political process to implement a program that provides for an efficient use of resources that is in line with individual preferences--but which does not interfere with those individual preferences.[11] To achieve this objective, individual preferences must be revealed and aggregated for purposes of developing collective consumption decisions, and then ultimately be translated into monetary or budgetary decisions through a political process.

This fundamental point is extremely important in the context of identifying objectives that the public switched network of the future should achieve for POTS customers. Policymakers should not lose sight of the fact that despite the collective consumption or "public good" aspects of the telecommunications network, it is ultimately the preferences of the individual customers that should dictate how the public switched network is to be defined. The overriding objective for regulators in designing the public switched network for POTS customers should be to reflect as closely as possible the preferences of individual POTS customers while at the same time taking into account the interdependence of individual satisfaction or utility (for example, the existence of external benefits) and other considerations (for example, existence of economies of scale and scope in production) that individuals would normally exclude from their own private cost/benefit calculus. The public switched

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[11] *Ibid*, 85.

network--as its name implies--must be designed to serve the collective interests of the "*public*." What is not trivial, however, are decisions regarding which types of customers or services should be included within the definition of "public" versus those whose fate we, as a society, are willing to leave to the *private* market.

In situations where external benefits do not exist (that is, where there are little if any indirect benefits associated with the consumption of the service), decisions made via the private market mechanism may be preferable to a public decision-making process. In the private sector, resources flow in response to customer demand (that is, willingness-to-pay), and firms (or investors) absorb the economic risk associated with the market decision (for example, the failure of demand to materialize or costs that exceed projections). In theory, the unrestrained competitive market result maximizes economic efficiency with the value of any particular service to consumers equalling the cost to society of producing that service. To the extent that at least one of the roles of the regulator is to provide a surrogate for competitive marketplace forces and that at least some aspects or benefits of the telecommunications network are private in nature, then it can certainly be argued that such services should be provided only to the extent that consumers' willingness to pay exceeds the costs of providing the service, and the less interference by well-meaning regulators in search of the public interest, the better.

CHAPTER 4

ANALYTICAL FRAMEWORK FOR IDENTIFYING POTS OBJECTIVES FOR THE PUBLIC SWITCHED NETWORK

The analytical framework presented below provides an approach that appropriately balances consideration of individual and collective consumption preferences, public-versus private-good aspects of telecommunications, and considerations of economic efficiency and equity. The framework builds upon two contrasting views of the nature of the telecommunications public switched network--views which have remarkably different, yet equally plausible, implications for identifying objectives of the public switched network and for defining POTS or basic services. These contrasting views are the telecommunications network as a "public good" versus the telecommunications network as a "private good." In actuality, the telecommunications network is an "intermediate good" possessing attributes of both "public" and "private" goods.[1] An analytical framework developed for the purposes of

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[1] As noted in a recent paper on the telecommunications network:

> A pure public good admits everyone, a pure private good, only one. But there is a wide spectrum between the pure private good and the pure public good. A telecommunications network is one intermediate example. It is not a private good, yet it does not meet the two main conditions for a public good: non-rival consumptions and non-excludability. In fact, non-excludability has to be established as a legal requirement -- the universal service obligation. What has been happening in recent years to telecommunications, and what goes by the more dramatic labels of divestiture and deregulation, is largely a shift toward the direction of a private good.

Eli M. Noam, *Network Tipping and the Tragedy of the Common Network: A Theory for the Formation and Breakdown of Public Telecommunications Systems,* (New York:

identifying objectives of the public switched network and for defining POTS or basic services must therefore recognize and reconcile these two polar views.

The Private-Good Model

The private-good model places emphasis on the direct benefits of network modernization, that is, those benefits that are internally or privately experienced by the consumer of the telecommunications service. Economic theory assumes that if a customer is willing to pay a certain price for a product or service, that customer must realize a "benefit" equal to or greater than that price. The total revenues that can be generated by offering new services to customers establishes a floor for the *direct* societal benefits that the investment creates. The introduction of new network technology under the private-good model is viewed as enhancements to the existing basic network to be paid for exclusively by those utilize the enhancements and who are willing to pay for them. The private-good model thus is consistent with a *demand-driven* approach to the evolution of the public switched network. Perceived customer need for network infrastructure investment will be translated through the free market process, and the private sector will respond by providing the necessary infrastructure where it is cost-effective given the specific level of customer demand.[2]

Columbia University, 1990) 16.

[2] See Gail Garfield Schwartz, "Telecommunications and Economic Development Policy," 18. Dr. Schwartz succinctly characterizes this approach as a "total free-enterprise attitude" which "leads to the conclusion that economic development policies are not needed at all since if the perceived need is translated into effective demand, the private sector will provide infrastructure where it is cost-effective."

The private-good model implies a working definition of the POTS customer which is largely frozen at today's lowest common denominator of "basic" service both in terms of scope and definition. This concept was introduced in an earlier NRRI study in the context of providing an answer to the question who pays for telecommunications modernization? and is further described in that report as follows:[3]

> The definition of "basic" service would thus be based upon the standard network offering as it exists at a given point in time (e.g., today). Any enhancement of the infrastructure beyond the capabilities necessary to support that "frozen" definition of basic service would be automatically and *permanently* treated as "non-basic." As such, any network enhancements beyond those embraced by the fixed definition of "basic" would have to be priced at a level sufficient to fully recover all of the costs of upgrading the network to a point where the enhancement can be offered.

Table 1 presented earlier provides a summary of general trends in the evolution of the basic service concept. Using Table 1 as a guide, this working definition, if frozen today, in general would be limited to:

- the basic one-party access line with "equal access" capability,
- "local" two-way switched calling, tending to encompass flat-rate extended area service,
- touch tone,
- 9-1-1 service, and
- TDD-voice relay system.

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[3] Nancy J. Wheatley, et. al. *Telecommunications Modernization: Who Pays?* (Columbus, OH: National Regulatory Research Institute, 1988) 5.

Any "extra" services or features desired by the customer over and above this narrowly defined definition of basic service would be available only to those willing to pay an "extra" charge sufficient to recover the incremental costs of augmenting the network to support their provision.[4] Subscribers with a strong individual preference for a new or additional service (as evidenced by their willingness to pay for it) would not be likely to voluntarily subsidize access to the new service by others with a less strong individual preference. Similarly, subscribers with weak individual preferences for the new service, by definition, are not willing to pay much more for basic service in order to obtain the new or additional service capability.

There are many advantages to this "private" or "free market" approach. First, it provides the lowest basic service rate for those customers who do not express a preference for more advanced network features and functions. In a sense, this model establishes a definition of basic service analogous to those used by regulators and telephone companies in establishing "lifeline" type service, that is, a relatively inexpensive alternative designed first and foremost to encourage or maintain high rates of penetration of telephone service. Indeed, results of a survey conducted in conjunction with this report confirm that the services currently covered under the category lifeline service closely match the "frozen" definition of basic service identified on the previous page. Another point related to the relatively narrow definition of

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[4] This assumes, of course, that such "incremental costs" are capable of being identified to the specific and individual network enhancement(s) and that such costs will establish a price floor for the "new" service capabilities. To the extent that the costs of enhancing the overall network can be allocated to frozen "basic" services by any of several "cost allocation" devices, it is possible that subscribers who are not "willing to pay" for the new network capabilities will nevertheless be forced to do so *even though they do not personally gain access to any of the new services or features.*

basic service associated with the private model is that the fewer the services included within the definition of basic service, the less expensive it will be to achieve "universal service" goals or obligations. Specifically, the regulator can impose a lighter subsidy burden on other network users in order to make "basic" service affordable to all, thereby reducing the pressure for those network users to leave the public network and seek their own private network alternatives.[5]

A second major advantage of the private-good model is that it is at least capable of producing a regulatory outcome consistent with the "competitive result standard." That is, the benefit to consumers from a new service is validated by their willingness to pay for the new service (reflecting underlying individual preferences), and that collective willingness to pay is equal to the cost to society of producing the service. Moreover, to the extent there are substantial risks involved in projecting costs and comparative benefits of committing capital funds to telecommunications projects, the private model is conducive to isolating POTS customers from bearing that risk.

For example, it is entirely possible within the context of the private good model to develop a market mechanism in which the responsibility for evaluating speculative costs and demand of network investment would be shifted to "*private*

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[5] In his paper, "Network Tipping and the Tragedy of the Common Network," Professor Eli Noam argues a "pro-expansion policy creates incentives to form alternative networks," and "the more successful network policy is in terms of achieving universal service and 'affordable rates,' the greater the pressures for fractures of the network." Prof. Noam describes the "tragedy of the common network," which "[i]n the case of telecommunications, the tragedy is that the breakdown of the common network [is] not caused by the failure of the system but rather from its very success -- the spread of service across society and the transformation of a convenience into a necessity. (38)

entrepreneurial investors" and away from risk-insulated local exchange carriers. Clearly, the LECs have the incentive to overstate expected net benefits of infrastructure investment, because if proven incorrect they can always seek to recover their losses from captive monopoly ratepayers.[6] This approach would necessarily require that the direct profits resulting from expanded investment be distributed to these private investors and not reallocated within the telephone company; however, at the same time, any loss incurred as a result of an imprudent investment would be borne entirely by the same venture capital suppliers and not by the carrier's ratepayers or by the government.

In order for the private-good approach to work to the benefit of POTS customers, however, two important threshold conditions must be satisfied. First, the new service must be fully compensatory, that is, the incremental revenues received through rates charged consumers for the new service must be sufficient over a reasonable timeframe to fully offset the incremental investment and related costs of providing this service, such that costs would not be borne by POTS customers in the form of a cross-subsidy of the new service.[7] Second, network externalities must be deemed sufficiently unimportant so as not to be invoked by the policymaker.

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[6] This concept was discussed by David N. Townsend in "Investment in the Telecommunications Infrastructure: Principles for Policy Development," a paper presented at the *National Association of Regulatory Utility Commissioners Biennial Regulatory Information Conference*, Columbus, OH, September 12, 1990.

[7] To the extent that the telephone company experienced direct cost savings for existing services attributable to the new facilities, the compensatory test could be relaxed to account for these demonstrable direct cost savings. At the same time, the "compensatory test" assumes that the incremental costs of the "new" services can be accurately isolated.

The requirement imposed by the first threshold condition can be quite onerous, however, particularly in situations where there exist sizable amounts of joint and common costs. Cost allocation manuals (CAMs) such as those currently utilized by the Federal Communications Commission and state regulatory agencies are "more art than science" and are deficient in many respects.[8] Joint costs in particular pose serious challenges to the policy analyst, since many telecommunications services are provided across various customer groups using an extensive common basic network infrastructure. There is an undeniable incentive for the telephone company to overallocate costs of network modernization to monopoly services for which captive customers have no choice but to pay increased charges, and to allocate small portion of the joint cost to new or competitive services.[9]

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[8] In particular, the reliance of the CAMs on relative-use allocators to attribute costs as between monopoly and competitive services or regulated and nonregulated services tends to underallocate costs to the competitive or nonregulated services.

[9] Cost allocation issues relating to the provision of "Individual Case Basis" (ICB) Centrex service (i.e., customer specific pricing arrangements) in the District of Columbia provides a interesting case study of the problems that arise. Indeed, the issue of how the costs of new switching technology should be allocated to ICB Centrex Service has been an important focus of a multi-year proceeding (Formal Case No. 828) by the District of Columbia Public Service Commission (DC PSC). In a recent order approving eight specific ICB tariffs, the Commission noted that several of the ICBs will be served "from wire centers where new digital switches recently have been, or soon will be, deployed for network reasons." Order No. 9710, dated May 21, 1991, 11-12. The Commission indicated that "it is important that C&P demonstrate that digital switches placed into service for network reasons at wire centers serving ICB customers have not been deployed to reduce the incremental cost of serving the ICB customer." The Commission recognized the possibility that "[t]he deployment of new digital switches may be appropriately justified for reasons that have nothing to do with a particular ICB customers," "[h]owever, the placement of a new digital switch may create a situation of excess capacity in the old analog switch or in the new digital switch, which may allow C&P to offer ICB service at little or no incremental investment cost. *Ibid*, 12. In a previous order, the Commission had determined that "[i]f a digital switch is deployed for network reasons, the incremental cost of providing service to an ICB customer may be insubstantial," "[h]owever, if a digital switch is

In addition, the private-good approach makes no realistic provision for the possibility that adequate revenues will *not* be generated--the result being the very real possibility that the general body of ratepayers (POTS customers) will end up effectively paying for the network enhancements anyway, but will not derive any direct benefit from the new network capabilities because the scope and definition of basic service has been frozen. Presumably, if the LEC is successful in translating the new network capabilities into new, successful *revenue-producing* service offerings, the capital provider and risk taker (the captive ratepayer in this instance) will be made whole. However, if significant new revenues do not materialize, or are otherwise diverted away from flowing to the regulatory revenue requirement, or if investment costs have been underallocated to the "new" services, prices of monopoly services will rise (or fail to decline) while the added benefits will be minimal. Not surprisingly, many consumer advocates and others representing *customer* interests in LEC ratemaking proceedings have argued that the general body of ratepayers should be financially insulated from paying for services they neither require nor desire. Of course, the real point to be made here is that if the threshold conditions necessary to apply the private good model had been met, these types of investments would never have occurred in the first place.

As an example of a potential application, investment in fiber optic distribution plant would allow the transmission of new types of video services to businesses and homes. Such services include full-motion video teleconferencing, high-definition

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deployed specifically to provide service to an ICB customer, the full incremental cost of that switch must be assigned to that customer. *Ibid*, footnote 10, citing Order No. 8756 at 229,230.

television, video-on-demand ("video dial tone"), and generally the ability to offer consumers significantly more channels than can be accomplished through over-the-air and conventional coaxial cable television distribution systems. Consistent with the private-good model, the total revenues generated over time from these new services made possible as a result of the higher bandwidth associated with fiber should reflect the value that consumers and industry place upon the availability of fiber video capability and fully recover the costs of the investment without need for subsidy from the consumers of non-video or non-enhanced services (that is, POTS customers). According to one view, "[a] system of discriminatory flat-rate prices which taxes characteristics such as maximum bandwidth and priority could distinguish POTS users from business data and residence video users so that the large fixed costs of the broadband network could be recovered without significant increases in the real price of basic telephone service."[10] However, there is an important caveat expressed, and that is "[it] remains to be seen, however, if sufficient price discrimination is possible so that the immense fixed costs of a broadband network can be recovered in flat rates from subscribers without significantly increasing the real price of POTS."[11] To the extent that revenues from video subscribers would not be sufficient to provide full cost recovery of the fiber investment, and this view is held by many industry

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[10] William E. Taylor, "Generic Costing and Pricing Problems in the New Network: How Should Costs be Defined and Assessed?", presented at the Twentieth Annual Williamsburg Conference, December 1988, 21.

[11] *Ibid.*, 15-16. According to Dr. Taylor, whether the huge fixed costs of a broadband network can be recovered without negatively affecting rates for POTS customers represents "the decisive test which must be met if a broadband network is to develop rapidly in the United States."

scholars,[12] then excess costs would be borne by the general body of telephone ratepayers whether or not they used the new video services, and regardless of other, less expensive means of providing video services by using existing and emerging technologies to exploit the full potential bandwidth capacity of the existing copper distribution infrastructure.[13] Under these conditions, investment in fiber distribution plant would fail the first threshold test of the private-good approach.

Another case in point can be found in the so-called "CLASS" services that can be offered by a LEC out of central offices equipped for common channel signalling system 7 (SS7). These include, among other things, calling number identification ("Caller ID"), selective call rejection, distinctive ringing, automatic callback, and call trace. Monthly tariff rates for each of these service features typically run in the $5 to $10 range, yet their underlying incremental cost (once the SS7 capability is in place

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[12] Dr. Gail Schwartz observes that "few residential customers have demanded these services [that depend on fiber optics and digital technology]" and "[a] great many residential users seem satisfied with the single-line, voice-grade, basic service carried over copper cable." Observing the "remarkably low--sometimes as low as 5%" penetration rates for special services such as call-waiting and call-forwarding, Dr. Schwartz concludes that "[i]f demand for these relatively inexpensive special services is this low, the assertion that households 'need' even more sophisticated services that depend on fiber optics and digital technology strains credulity." She further comments that "[b]ecause installing fiber-optic subscriber loops would be costly, inattention to the realities of residential demand could result in a significant waste of resources." In "Getting From Here to There, Investing in Infrastructure," *GAO Journal*, 12, Spring 1991, 18.

[13] While T-1 and lower data rates cannot yet support true broadcast quality (NTSC) full-motion video, this may be possible in the future. However, significant advances in real-time video compression technology make T-1 and even lower speed lines capable of supporting quite acceptable full-motion video for use in video teleconferencing, distance learning, picturephone and similar applications. In addition, pre-processed compressed video signals can be downloaded from a central library to individual subscribers using customer-premises processing equipment to achieve near-broadcast quality video.

and "sunk" from an investment standpoint) in each instance is minimal. In fact, customer demand for these services is quite small; even in communities where the CLASS features have been available for as long as three years the penetration rate is of the order of only 3 percent to 5 percent. At the typical tariff rates and relative to *short run* marginal cost (that is, ignoring the initial investment in the SS7-equipped central office itself) these services are, individually, highly profitable. However, when considered in the context of the actual investment cost and the scant penetration percentages, precisely the opposite conclusion becomes apparent. Of course, the benefits of SS7 are not limited to the CLASS features, but it should certainly be apparent that revenues from these services could never, standing alone, justify the SS7 investment. The problem is that, with the CLASS penetration percentages as low as they are, most customers will end up paying for SS7 while only those few that actually elect to pay the *additional* $5 to $10 per month will directly benefit from the new features. The threshold condition underlying the private good model that only those who benefit should pay clearly fails in this instance, because if it were to be enforced, the average monthly rate for CLASS features (assuming a 3 percent penetration rate) would have to be unrealistically high.[14] Admittedly, this is a highly simplified

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[14] Suppose that a LEC spends $10-million to replace an existing analog electronic central office switch with a new SS7-equipped digital central office switch capable of serving 30,000 subscriber lines. Suppose that 3% of these lines subscribe to CLASS services at an average of $6 per month each. In this scenario, the LEC will generate a total of $64,800 in annual CLASS revenues. Even if we assume away all marketing and other recurring expenses, and further assume that the short-run marginal cost of these services is zero (by treating the $10-million investment in the switch as sunk), an annual revenue increment of about $65,000 hardly recovers a $10-million investment outlay. In fact, if we assume a 35% total annual carrying charge (capital recovery, return, taxes and operating expenses) and further assume that *every one of the 30,000 customer lines elects to pay the $6 per month for the CLASS features*, there will still be an annual revenue shortfall attributable to this investment in the

example--in reality, SS7 will support more than just the CLASS-type features. However, the same *principle* applies: In order for the private-good model to apply to CLASS-type features, it would have to be demonstrated that the demand for all of the SS7 capabilities taken together, at presubscription or per-use prices that LEC marketing departments see consumers as willing to pay, will be sufficient to recover the investment costs associated with the deployment of this technology.

The other major threshold condition associated with the private-good approach, that is, that societal benefits of network modernization-related investment can be assumed away, is equally problematic. Societal benefits do exist, and come in many varieties. As discussed in Chapter 2, they include the economic growth and development aspects associated with the Rural Electrification Administration and accelerated modernization programs as well as the public health, safety, and welfare aspects of 9-1-1 services. They also include the classic "positive" or "benefit" network externalities which relate to the increased value to individual network users that results from the presence of and potential interaction with other network users. These benefit externalities produce a divergence between the private outcome (based strictly upon the internal benefits to the individual consumer as measured by that consumer's willingness to pay for the service) and the socially optimal outcome (which recognizes the interdependence of individual utilities and the additional social benefits uncaptured by the individual private calculus of the costs and benefits of network services). If left to the private market, services of real value to society as

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range of $1.4-million.

demonstrated by both internally and externally realized benefits would not necessarily be provided and would be provided at less than optimal levels or both.

Another indirect benefit to the economy that may not be captured by subscribers' short-run willingness to pay relates not so much to purely external societal benefits, but rather to the deferred benefits accruing specifically to end users, whose payoff may occur gradually over many years following implementation of new or expanded telecommunications technology. The likelihood and measurability of individual subscriber benefits associated with expected future efficiency gains (for example, savings on consumer purchases due to wider market access, and avoidance of superfluous transportation and other costs) or other long-term economic benefits, may be too abstract for less sophisticated telecommunications users to adequately express preferences in short-term demand patterns. Yet these types of real economic benefits realistically can be expected from many forms of telecommunications investment, and could under certain circumstances justify some level of increased consumer spending to obtain new service offerings.[15]

A final drawback of the private-good approach is that it may preclude an orderly evolution of basic network services over time. As discussed earlier in this report, the public switched network historically has evolved as new technologies have emerged, and accompanying that evolution has been an expansion of the definition of basic service. Yet, under the private-good approach, the concept of basic network service would be largely frozen as of a given, inherently arbitrary point in time (for example, "now"), and might be difficult to change in the future.

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[15] For a fuller discussion of these deferred benefits, see Townsend, "Investment in the Telecommunications Infrastructure," 11-12.

The Public-Good Model

A public good can be defined as "any publicly induced or provided collective good" that "arise[s] whenever some segment of the public collectively wants and is prepared to pay for a different bundle of goods and services than the unhampered market will produce."[16] In sharp contrast to the private-good model discussed above, the emphasis of the public-good model is on the *total* societal benefits--both direct and indirect--associated with network modernization. As applied to the telecommunications network, the public-good model is based upon the premise that the costs of achieving and supporting a modern, state-of-the-art network infrastructure are ultimately borne by the general body of ratepayers as opposed to limited subsets of customers who exhibit a high demand for specific new services. The public-good model is conducive to establishing social policies which provide for a "supply driven definition" of infrastructure. The discussion on the REA in Chapter 2 provides a clear demonstration of an historical example of infrastructure investment being made largely independent of market demand (that is, customer willingness to pay), and as also discussed in Chapter 2 in the context of plant modernization, there is a renewed interest on the part of many state regulators in the connection between economic development and the telecommunications network. In addition to economic growth and development benefits, other contexts in which societal benefits can be attributed to investment in the telecommunications network infrastructure include public health, safety and welfare enhancements (for example 911 and TDD/voice relay services),

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[16] Peter O. Steiner, "The Public Sector and the Public Interest," *Public Expenditure and Policy Analysis*, edited by Robert H. Haveman and Julius Margolis, (Chicago, IL: Rand McNally College Publishing Co., 1977) 31.

classic "positive" network externalities, and other indirect or intangible subscriber benefits.

Under the public-good model, infrastructure investments that are in the "public interest" are mandated by regulatory commissions, which act as surrogates for marketplace forces for the very reason that those forces break down either because of the enormous risks involved because of uncertainty with respect to costs and demand or both, or because of the intangible or unmeasurable societal benefits which are not valued by the marketplace. Dr. Schwartz aptly sums up a prevailing attitude toward socially motivated infrastructure investment in her comment that "good things have resulted from the decision to collectivize the risk of certain infrastructure investment even in the face of uncertain demand for their use."[17]

The public-good model implies a working definition of the POTS customer which is constantly evolving to incorporate the latest deployed technology and service capability or both implemented on the basis of a public interest standard and the collective consumption aspect of the public network. As illustrated in Table 1, the standard definition of basic service historically has indeed changed over time in response to the introduction of new technologies and new applications. Under strict adherence to the public good model, this evolution might be even more dramatic, given recent and anticipated advances in telecommunications technology.

Besides recognizing the societal benefits of many telecommunications network services, perhaps the key defining feature (and one of the most socially appealing aspect) of the public-good approach is that it assures that all ratepayers who have

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[17] Schwartz, "Telecommunications and Economic Development Policy," 18.

funded the infrastructure investment required to provide new features and functions actually receive direct benefits from that investment. In other words, the new features or services would not be limited to those who can afford (or are willing to pay) additional charges to the telephone company for "premium" services.[18] The public-good approach assures the broadest possible dissemination of new telecommunications capabilities throughout all sectors of society, since "access" to the new technology would not be limited to those potentially few customers willing or able to pay according to what the market will bear.

If properly structured, this approach can provide for a more orderly investment in telecommunications resources and one that is considered in the larger context of other community and national priorities and goals. Ratepayers as a community, through regulators acting as surrogates for the marketplace, could establish a set of network feature enhancement goals that would be used to guide the expansion of the capabilities of the public network and to enlarge the scope of basic services.[19] These goals would necessarily need to be developed consistent with the specific demographic, economic, social, and political conditions extant in particular states. National and global trends are naturally relevant, however, as discussed in more detail below, under the public good model, regulators must ultimately see themselves as auxiliary "taxing" entities, directly connected to the political process in which evaluations of all public

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[18] An expanded discussion of the distributional issues associated with the funding of modernization-related infrastructure investment is presented in Selwyn "Modernization, Who Pays?"

[19] This concept was first introduced in a paper by Selwyn, "An Evolving View of Basic Telecommunications Service."

infrastructure funded by taxation in their state--not just the telecommunications network--are made.

The set of network enhancement goals envisioned here would incorporate individual milestones which can be expressed in terms of specified percentages of coverage for the availability of particular network features or functions. Given state-of-the-art technology, class-type features, ISDN, and fiber-optic distribution plant might be included within such a set. Following is an *illustrative* timetable for a set of network enhancement goals in the context of a fifteen-year public-good based plan:

- by 1995; 40 percent of the state equipped with ISDN, 60 percent equipped with CLASS services, and 20 percent served by fiber distribution plant;
- by the year 2000, 70 percent equipped with ISDN, 80 percent equipped with CLASS, and 50 percent served by fiber; and
- by the year 2006, 100 percent of the state equipped with ISDN, CLASS, and served by fiber.

The evolution of the scope of basic services would go hand in hand with these milestones, with CLASS-type features, ISDN, and ubiquitously deployed fiber-optic distribution plant (which as discussed above, are unlikely to pass the threshold test associated with the private good model) all embraced within the scope of basic services concurrent with their deployment by the telephone company.

The development of an actual timetable or set of network enhancement goals for any given jurisdiction would be an arduous undertaking, one which must necessarily consider, among other things, collective preferences in that jurisdiction for specific advanced network features and functions and the relative cost-effectiveness of

varying investment programs. The public-good approach thus places enormous responsibilities on the shoulders of regulators to make "socially correct" collective consumption decisions. Such a decision-making process requires, among other things, an open and highly accessible public forum for (1) the expression and revelation of individual preferences or both which must then be translated into a set of collective preferences, and (2) the consideration of information on the relative cost-effectiveness of varying investment programs. These are the requirements that apply in the case of any "public good," and investment in telecommunications infrastructure *if justified on the basis of the "public interest"* is in no way exempt just because it does not have to go through the same budgetary channels as investment in other social programs or infrastructure. To the extent that regulators are going to direct telephone companies to spend substantial sums of money on modernization-related network infrastructure investment and justify that investment on social grounds, then the two requirements set forth above apply, and the regulatory process must be structured (or restructured) to deal with those requirements.

As should be clear from the discussion in Chapter 3, the task of determining which network services, features, or functions are "essential" or in the "public interest" is quite a difficult one. Regulators must be able to separate their own personal views, and most importantly, the strategic interests of the telephone company they regulate, from the expressed needs or desires of their constituency. The regulatory process inherently lends itself to a public process, with rules for obtaining public and expert witness comment already in existence. In addition, a number of regulators are elected to their position, and therefore must answer directly to the electorate. Where

appointed by a governor, the process of accountability to the electorate is one step removed, but still exists.

In practice, however, the process may break down. If anything, there is a growing trend toward less openness in the regulatory process, largely as a result of the movement throughout the country toward more relaxed forms of regulation. An open decision-making process in which the public is exposed to "issues and conflicts both among objectives and among alternative means" is truly key to assuring that decisions made "by elected (or otherwise responsible) public officials [are] a reasonable approximation to the collective values that we call the public interest."[20] Unfortunately, programs to educate the public on regulatory issues so that they can participate in the regulatory process are sorely lacking and deficient or both. Furthermore, because many telephone companies have been operating in declining-cost environments, it has been much easier to implement large investment programs "behind the public's back." The fact that rates would be going down rather than holding steady (or going down by an even greater percent) does not trigger the same public reaction that is associated with large rate increases. However, regardless of how politically painless an investment program may be, economic efficiency would still demand that the program pass a cost-benefit test for the investments to qualify as *good public policy*. In the absence of such a test, the public cannot necessarily have

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[20] Steiner, "The Public Sector and the Public Interest," 64. Prof. Steiner writes that because "at present [] we conceal so many issues and conflicts, both among objectives and among alternative means, that we increase the discretion of the policymaker beyond that necessary or desirable."

more confidence that a regulatory agency will make socially optimal investment decisions than would a telephone company management's unilateral actions.

Indeed, if we focus only on the perceived advantages of improved telecommunications technology, almost any investment that improved the capability of the public switched network could be deemed worthwhile on the grounds that it would enhance society's ability to communicate and improve economic productivity and the quality of life. The point is that such improvements are not costless. Other public investments in such sectors as public transportation, schools, environmental management, energy, and housing, would also bring undeniable benefits to society as a whole. Unlike telecommunications, however, most of these sectors rely explicitly upon political and budgetary processes which take into account all other possible uses of public resources (that is tax revenues) to determine the level of public resources which will be spent on improvements in any one sector. In the case of telecommunications services, regulatory officials, by way of their control over rates charged by the telephone company, are in a position to effectively impose taxes on ratepayers to fund network infrastructure projects, but do not have the obligation to consider projects related to other vital public infrastructure. To the extent that other projects which may be even more critical to achieving the very same economic development or other social goals that the network infrastructure investment project is intended to achieve, then the public interest has not been well served. Unfortunately, there is not a clearly defined political process for evaluating the merits of applying the revenues produced by this effective "taxation" of ratepayers to telephone network enhancement programs, as opposed to other intrinsically beneficial public causes. *The*

challenge of applying the public good model to the telecommunications network is to develop a proxy for that explicit political process in the context of the regulatory process.

Another disadvantage associated with the public-good model of the network is that it establishes a potentially expansive application of universal service. Strict adherence to the public-good approach would potentially require that all network features and functions be universally and ubiquitously available to all, at potentially large cost to society. Although if the public model was applied correctly--specifically, if regulators fulfilled their obligation to evaluate the cost-effectiveness of investment programs both with respect to alternative means of providing the desired telecommunications function as well as other non-telecommunications-related uses of the public resources--then this problem would be of less concern. However, because of the complexities associated with this public policy obligation, and the strong vested interests on the part of the regulator and the telephone company alike to invest in telecommunications technologies, the concern of an overly ambitious and highly costly to sustain basic service definition is a valid one.

Reconciling the public- and private-good models

It is clear from the preceding discussion that there is an inherent conflict between the private and public aspects of the telecommunications network infrastructure, and correspondingly between the private-good and public-good models examined above. One model is not necessarily more "correct" than the other. If either model is *applied under proper conditions* and the limitations of the model are explicitly clear and well understood, then the public interest may be well served. Of course, depending on the model that is applied, a remarkably different definition of

basic or POTS service will follow. A clear consensus on the definition of POTS therefore may not be possible or even desirable at a federal level, given potential (and indeed likely) differences across states and across regions or both. What is important, however, is that a clear consensus exists with respect to fundamental principles. These principles include:

- Regulators should explicitly embrace a particular model or view of the network as an integral part of an open decision-making process;
- In adopting a particular model or view of the network, regulators should, as a precondition, ensure that the threshold conditions that determine whether that model can be properly applied are fully satisfied; and
- Once a particular model or view of the network is adopted, the identification of POTS objectives for the public switched network, and accordingly, the definition of POTS service itself, must be fully consistent with that choice.

In other words, the underlying policy choice should drive both the investment program and the decision as to whether a service is to be considered as "basic." Regulators should not justify investment in the public switched network on the basis of a *public* good model (for example to realize economic development objectives), and then proceed to implement a policy that limits the availability of services that are made possible as a result of that investment on the basis of *private* ability or willingness to pay. Thus, if the capability to trace the source of incoming calls is considered as meeting an important public safety need and thus is used, in part, to justify a "public

good" basis for investment in signalling system 7, the "call trace" feature should not then be restricted to those subscribers who can afford to pay a premium price for this "essential" public service.

The previous sections of this report detailed the two extreme views or models of the network. They are capsulized in Tables 2 and 3 below.

Table 2

THE PRIVATE-GOOD MODEL:

Motivation:	maximization of direct (internally experienced) benefits
Activation:	demand-driven; relies upon market mechanism, private market forces, individual consumption decisions
Threshold conditions:	new service features and functions must be fully compensatory with no possibility of cross-subsidization; business risks are absorbed by shareholders and/or private beneficiaries versus ratepayers in the aggregate; benefit externalities are insignificant
Guidelines for defining POTS	freeze definition of POTS at today's lowest common denominator of basic service, although definition is subject to periodic redefining in response to changing threshold conditions
Illustrative definition of POTS:	basic one-party access line with equal access capability, local two-way switched calling (may include flat-rate extended area service), touch tone, 9-1-1, and TDD/voice relay system

Table 3

THE PUBLIC-GOOD MODEL:

Motivation:	the achievement of social objectives, total societal benefits, both direct and indirect
Activation:	supply driven; relies upon political process, public intervention
Threshold conditions:	must reflect true collective preferences; incorporate strict standards of cost effectiveness as would be required for any use of public funds; and be guided by a set of specific network enhancement goals that drive the expansion of public network capabilities
Guidelines for defining POTS:	expand definition of POTS to incorporate all latest technologies features, and functions, in parallel with the expanded set of network capabilities and consistent with threshold conditions
Illustrative definition of POTS:	all services included under private good model (see Table 2), digital plant at subscriber level, switched 56kb service, CLASS services, basic ISDN

Of course, policymakers are not limited to the "pure" cases and can adopt some combination of the two in recognition of the hybrid nature of the telecommunications network. For example, the regulator could choose to adhere to the private-good approach generally, but overlay a public-good approach for specific (limited) kinds of investments deemed to be in the public interest but which the private sector would not be willing to support. The fundamental principles outlined above, however, would be equally valid under such "*hybrid*" approaches.

The public- and private-good approaches do, however, have different implications with respect to the nature of regulation associated with the modernization policy. In particular, application of the public-good model requires a rigorous regulatory structure consistent with the threshold conditions identified in Table 3 (specifically the requirements that individual preferences be revealed through an open and highly accessible public forum, and the relative cost-effectiveness of varying investment programs be subject to intense regulatory scrutiny). Application of the private-good model, on the other hand, allows for a more relaxed regulatory structure (for example incentive regulation), provided that the threshold conditions identified in Table 2 can be satisfied (that is, new services are demonstrated to be fully compensatory, and business risks are absorbed by shareholders or private beneficiaries rather than ratepayers in general).

Evaluating the implementation of the analytical framework

The analytical framework discussed in the previous chapters and summarized above focuses on the development of models and principles to guide the policymaker's decisionmaking with respect to modernization-related *investment*. The identification of POTS objectives as reflected in the definition of POTS service follows naturally, once the policymaker has embraced a particular model or view of the public switched network. However, the emphasis on infrastructure investment for purposes of developing an analytical construct should not obscure the fact that ultimately what is at issue here is not infrastructure, but the availability of specific *services* to POTS customers at reasonable rates, that is, as part of "basic" service. In this context, the analytical framework presented in this study is also designed to help policymakers ensure that the definition of POTS service includes those types of services which are inherently "basic" in nature, and conversely, excludes other types of services which are inherently "nonbasic."

To this end, Table 4 provides a classification system for defining "basic" and "nonbasic" services. As a general matter, attributes of services falling under the "basic" category are associated with the public aspects of the public switched network. Similarly, attributes of services falling under the "nonbasic" or "enhanced" category are associated with the private aspects of the network. These attributes cover a wide range of economic, social, and political criteria which, when taken as a whole, can be evaluated in the context of the public-good and private-good models.

Individual attributes identified in Table 4, for example, *demand penetration* or *applications*, do not by themselves provide a sufficient basis for classifying a service as a basic POTS service. It would also be necessary for the service to possess other

Table 4

DEFINING BASIC TELEPHONE SERVICES FOR POTS CUSTOMERS

ATTRIBUTE	BASIC SERVICES	NONBASIC SERVICES
✓ Economics	Demonstrate economies of scale and scope, declining average costs	Offerings by many possible suppliers other than LECs
✓ Availability	Available ubiquitously to all customers, offered under a public service obligation	Market conditions govern where, when offered
✓ Applications	Stand on their own or used as basic inputs to vertical customer applications	Provide diverse vertical applications
✓ Provisioning, pricing	New applications added to existing definition of basic service, priced at reasonable, nonpremium rate levels	Components of the service unbundled, pricing left to the discretion of service providers
✓ Demand penetration	Relatively inelastic demand, penetration expected (or desired) to exceed 50%	Relatively elastic demand, low penetration levels even at inexpensive charge
✓ Source of cost recovery	Effective taxation, or rates paid by all telephone company subscribers	Rates paid by users of service, or risks shifted to telco shareholders or private investors
✓ Network externalities	Critical mass of users required to create value and/or achieve additional societal benefits	Benefits primarily private in nature, internally realized by users of service, public purpose incidental
✓ Public input	Uses, applications, and cost-effectiveness of new technology well-understood by regulator, technology and pricing decisions reflect collective preferences as revealed through open public forum	Technology and pricing decisions market-driven, individual preferences revealed through willingness to pay, public forum not required if POTS customers fully insulated from investment risks

characteristics such as the *economic* attribute of declining average costs, or to produce societal benefits attributable to *network externalities* and/or ubiquitous *availability.* Consistent with this classification scheme, the *source of cost recovery* for such a service would more appropriately be a mechanism or rate structure which spreads the burden evenly across all telephone company subscribers as opposed to a system of premium pricing. These conditions are all associated with the public-good model of the network and would call for the inclusion of the service within the basic service definition. Touch-tone service, for example, would fall in this category (although for reasons discussed in the next section, the elimination of premium pricing for this service has been difficult to achieve). By contrast, other services such as speed calling and voice mail, would be less likely to fall in this category, primarily because these types of services can be supported efficiently by customer premises equipment alternatives. Further corroboration for this classification comes from the perspective of another economic attribute--demand--since these services tend to exhibit relatively elastic demand and low penetration rates. In situations like these, a good case could be made for the private-good model of the network, with such services excluded from the definition of basic POTS service, and pricing and availability of these services left to the market.

With regard to new potential service offerings, such as the numerous CLASS services provided using SS7 technology, or the more futuristic video services provided over fiber optic distribution plant, an evaluation of the attributes identified in Table 4 should assist regulators in their deliberations concerning which model of the network they embrace, and following from that, whether these services should be included or excluded from the definition of basic POTS services. As noted earlier,

there is no one "correct" model of the network, and as a corollary, no one "correct" definition of POTS service. Rather, it is the identification of and consistent application of a particular model of the network that is critical to protecting the "public interest." In this context, the classification system provided in Table 4 should provide an important cross-check on regulators' adherence to the principles which have been set forth above relative to the implementation of the analytical framework, as well as an independent guide to the identification of POTS objectives for the public switched network of the future.

CHAPTER 5

TOUCH-TONE SERVICE: IMPORTANT LESSONS TO BE LEARNED

This section examines the historical development of touch-tone dialing.[1] The evolution of this particular service offers regulators a useful analogy for assessing their role with respect to the development of emerging technologies, and in particular, with the adoption of an evolutionary definition of basic service. This discussion of touch-tone service builds naturally from the previous section in which an analytical framework was developed for state regulators to utilize in order to arrive at the best possible approach to defining the POTS objectives of the public switched network. Touch-tone provides an excellent example of a service's passage into general use from what was, at that time (the late 1950s to early 1960s), just an emerging technology.

While touch-tone service made its first public appearance at the New York World's Fair in 1964, its development--from an engineering standpoint--predates that event by several years.[2] For the sixty-five years preceding the development of touch-tone, the rotary dial had been synonymous with automatic switching. Touch-tone's development was spurred in 1948 by Bell Laboratories' invention of the transistor.[3] According to a member of the technical staff assigned to the Signalling Systems

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[1] Touch-tone is the AT&T-Bell trademark: the generic name is Dual Tone Multi-Frequency or DTMF signalling.

[2] J. H. Ham and J. F. Ritchey, *Touch-Tone Card Dialer Set*, Bell Lab Record, 41, July-August 1963: 273. Field trials for touch-tone in Hagerstown, Maryland; Roanoke, Virginia, Findlay, Ohio; and Greensburg, Pennsylvania actually occurred prior to the World's Fair.

[3] N. Lazo and A. S. Martins, *Central-Office Modifications for Touch-Tone Calling*, Bell Laboratories Record, 39, December 1961: 437.

Engineering Group at Bell Laboratories in the mid to late 1950s, this new service was developed because of the understanding that customers now favored pushbuttons over rotary dial, and the potential for customers to perform end-to-end multifrequency signalling in the future.[4] It was also recognized that touch-tone would furnish the Bell System with revenue generating opportunities when offered as a premium service.[5] Generally, rotary dial pulses could not be dependably transmitted beyond the originating end office, so end-to-end signalling could not be reliably supported prior to the introduction of tone dialing.[6]

The implementation of touch-tone was fairly gradual, and required both central office (CO) and customer premises equipment (CPE) upgrades and/or replacement.[7]

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[4] Reply Testimony of Ralph N. Battista California Public Utilities Commission,Docket I.87-11-033, 15-16. Battista describes the early development of touch-tone technology as follows:

> In 1948 ... a small trial was held using early models of pushbutton telephones (not Touch-Tone) that generated damped-wave tone signals from vibrating reeds that were plucked when the buttons were depressed. Although user reaction was favorable, the technical and economic aspects of this particular signalling implementation were not attractive. It was not until transistor technology became practical, in the 1950s, that a reliable *cost-effective* [emphasis added] pushbutton dialing system could be developed.
>
> The "4-by-4" touch tone scheme, the one we use today, was conceived around 1956. This pushbutton-controlled system was purposely designed to generate a special set of tones in the voice frequency range so the signals, in addition to serving the call set-up function, could travel end-to-end over any dialed up connection used for voice transmission.

[5] *Ibid.*

[6] *Ibid.*

[7] At the time that touch-tone was introduced, the telephone companies owned and supplied the entire installed base of telephone sets. The cost of central office upgrades paled by comparison with the cost that would have been required to replace

It was recognized early on that a wholesale replacement of the embedded base of central office equipment and CPE was not practical.[8] The development of an "automatic translator" that allowed touch-tone to be used with the existing central office equipment, together with continued support for rotary-dial telephones even in newer central offices, made this gradual implementation of service possible.[9]

The first generation of tone-dial telephone sets probably cost more to manufacture than their rotary-dial counterparts. Certainly the *price* charged the Bell Companies by Western Electric was considerably higher for a touch-tone set (such as a WECO Model 2500) than for an otherwise equivalent rotary-dial phone (for example Model 500). Typical local telephone company tariffs provided for per-line and per-telephone surcharges for touch-tone service, reflecting both central office and CPE resource requirements. Around the time of CPE certification (1977-78) and

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and/or upgrade the entire installed base of CPE for tone signalling. In the "post-CI-II" era, when LECs do not provide CPE, the economics associated with the introduction of a new central office-based service are decidedly different than they were when touch-tone was first offered to the public.

[8] Indeed, this is the case with network modernization programs generally (where there exists a large amount of embedded equipment) and is particularly relevant today in light of recent and increasingly frequent requests by telephone companies to accelerate their depreciation schedules in order to upgrade equipment to the latest available technology, etc. (See the discussion in Chapter 2, Example 4, on Plant Modernization/Accelerated Technology Deployment.)

[9] H. E. Noweck, *The Versatility of Touch Tone Calling*, Bell Laboratories Record, 39, September 1961: 314. As described in this Bell Lab Record:"

> Since our existing central office (CO) equipment was designed to understand dial "language," an automatic "translator" has been designed to translate Touch-Tone language into one that present [1961] CO equipment can understand. This will allow the Bell System to introduce Touch-Tone Calling gradually, while it continues to use equipment in which it has a multi-billion-dollar investment.

subsequent deregulation (1984), a number of manufacturers entered the market for basic telephone sets, and in general a tone-dial unit could be produced using solid-state components and sold for the same or perhaps even less than the cost of a rotary-dial instrument. To accommodate customers whose central offices had not been equipped for tone dialing, or who had elected not to pay the monthly touch-tone line surcharge, dual-mode (that is, tone-rotary) sets were introduced whereby the caller, using a toggle switch, could generate tones or rotary pulses from the same pushbutton pad. Such phones were particularly attractive to subscribers to "alternative long-distance services" who would reach the access number of an other common carrier (OCC) by means of rotary pulse signalling and then switch to tone signalling to enter their "PIN" code and desired telephone number.

The range of applications for tone signalling has grown dramatically over the past decade, with many of the capabilities envisioned with the development of touch-tone now a reality.[10] Tone signalling is now required for a broad array of customer

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[10] Even today, however, we have not yet experienced all of the applications originally envisioned for touch tone service. The "automatic store" is one such example:

> One particularly intriguing application of Touch-Tone Calling is the concept of an "automatic store" which is, in reality, an automatic supermarket. Present-day shoppers [1962], however, would not recognize such a supermarket. There would be no check-out clerks, no shopping carts, and most significant of all, no customers. Instead, the supermarket would resemble a warehouse with enormous storage bins, conveyor belts, and automatic packaging machines.
>
> The busy housewife of tomorrow would simply take her Touch-Tone set and, using a coded grocery list appearing in the daily papers, order the food supply for her family from this automatic store. She would not have to identify herself or the order verbally. Instead, automatic number identification would be used for identification and billing; the Touch-Tone set would be her slow-speed data transmitting, or ordering,

applications, ranging from simple telephone answering machines through sophisticated voice mail-voice messaging systems, information-database retrieval services, interactive services such as on-line banking, merchandise ordering, airline-hotel reservations, pay-per-view television, and many others. The proliferation of such usage is demonstrated by Pacific Bell's recent announcement that its touch-tone actuated "Message Center" now has more than 100,000 subscribers.[11] A growing number of business telephone systems are being equipped with so-called "auto attendant" capabilities, enabling the calling party to dial the desired PBX extension after the incoming call has been answered automatically by the PBX. In fact, the need for and use of touch-tone by business customers is at least as great, and perhaps even more essential, than for residential subscribers.

The growing number of applications for touch-tone is also instructive in that it demonstrates how a supposedly discretionary service or feature may become essential to the use of other advanced services. The unrestrained or uneconomic pricing of an underlying service (such as tone dialing) could discourage the development and utilization of other potentially beneficial derivative services. This point is particularly relevant at the present time, as many regional Bell holding companies (RBHCs) are still developing their Open Network Architecture (ONA) plans. ONA is intended to provide the framework for telephone company and competitor provision of an array of

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> device. Special equipment at the supermarket would be able to identify the housewife, and select and package her order. The order would then be delivered to her house, almost free of human intervention. (Noweck, *The Versatility of Touch-Tone Calling,* 316)

[11] "Pacific Bell's Message Center Hits 100,000," Pacific Bell News Release, dated July 8, 1991, (Contact Person: Dori Sera Bailey).

entirely new services over the public switched network, including voice mail and messaging, videotex, protocol conversions to permit different computers to intercommunicate, and so forth. There is reason to believe that many of these services will be found sufficiently useful to become widespread and considered indispensable within the next decade. Irrevocably defining essential services as limited to existing POTs offerings, just as these new types of services are being introduced, might well stymie their development.

In general, it appears that touch-tone is rapidly evolving from a convenient but supplementary feature into an integral part of the local exchange infrastructure and an indispensable tool for consumer access to information. Touch-tone capability is present in over 95 percent of the access lines served by most telephone companies.[12] Its current penetration rate, however, is significantly lower. Figure 1 presents a sampling of state penetration rates obtained from a survey conducted in conjunction with this report.[13] For those states responding, penetration rates for touch tone currently vary from a high of 100 percent to a low of 40 percent, with the average falling in the 70 percent range. A primary reason for the discrepancy between availability and penetration--particularly with respect to residential subscribers--lies in the fact that, historically, touch-tone has been priced as a premium service, that is

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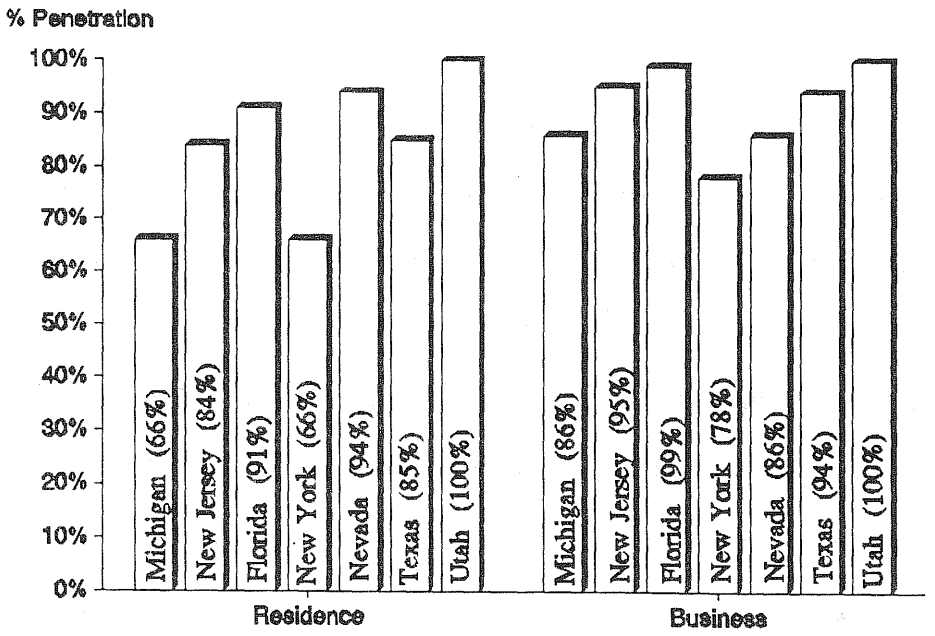
[12] Of the thirty-one states responding to a survey question on touch-tone capability, twenty-five indicated that touch-tone capability was available to 100 percent of the access lines served by the largest telephone company in the state.

[13] Thirty-six state public utility commissions responded to a survey, yielding a fairly strong consensus with respect to a number of basic questions about touch-tone.

Figure 1

SAMPLE TOUCH TONE PENETRATION RATES
Estimated % of Residence and Business Subscribers



Based upon information provided by responding states.

rates for the service have generally been set much higher than the small cost of touch-tone provision.[14]

However, many states have reduced or eliminated tariffed recurring rates for touch tone service, and a growing number of states have incorporated the service into the basic monthly charge, as shown in Table 5. The evolution of the role of touch-tone has been recognized by at least eleven state regulatory commissions: Arizona, California, Connecticut, Idaho, Iowa, Nebraska, New York, Nevada, South Dakota, Utah, and Washington state. These states have already adopted policies to eliminate or phase out separate touch-tone charges and incorporate touch-tone into the definition of basic service.[15] According to survey results (see Table 5), a number of

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[14] Above-cost charges for touch-tone service could in the past be rationalized both under the "premium service" theory as well as on the need to "manage" the migration from rotary to tone CPE. In effect, the charge for touch-tone service was a form of "rationing" that would protect the telephone company from demand for wholesale replacement of its installed CPE base. In modern electronic central offices, there is no discernable cost premium for tone signalling; indeed, because of the reduced dialing time and more accurate dialing characteristic of tone signalling, it is possible that the cost of supporting rotary phones is actually *higher* than for DTMF-equipped units. Indeed, in many cases a central office cannot readily block the use of tone signalling by a subscriber who has not paid the per-line surcharge; since the LECs can no longer control the deployment of DTMF-equipped CPE, their ability--as well as their *need*--to manage the implementation of touch tone is significantly reduced.

[15] See Settlement Agreement, Arizona Corporation Commission Docket No. E-1051-91-004; California Public Utilities Commission, Decision 90-11-058 (November 21, 1990), Docket I.87-11-033; Connecticut Department of Public Utility Control, Docket No. 89-12-05, Phase II, (June 28, 1991); Idaho Public Utilities Commission Order No. 22350, Case No. MTB-T-88-13 (February 27, 1989); Iowa State Utilities Board RPU-88-9 (December 22, 1989); Nebraska Public Service Commission Order C-595 (1987); New York Public Service Commission Decision 90-C-0191 (December 26, 1990); Nevada Public Service Commission, Docket No. 88-1001; Utah Public Service Commission Docket No. 85-049-02; and Washington Utilities and Transportation Commission, *1991 Report on the Status of the Washington State Telecommunications Industry*: "Commission policy with respect to basic service is that universal single party service with touch tone dialing is the minimum service standard." (42).

Table 5

TOUCH TONE SURVEY RESULTS - A SUMMARY

State	Current regulatory status of touch tone	Is touch tone considered a *basic* or *premium* service?	Is touch tone *bundled* into the monthly charge or is it a *separate* line item?
AL	rate regulated	premium	separate
AR	rate regulated	premium	bundled
CA	part of basic service	basic	no charge
CT	rate regulated	basic	separate
DE	rate regulated	basic	separate
FL	rate regulated	basic	bundled
IA	rate regulated (1)	basic	bundled
ID	TT charges eliminated	basic	no charge
IN	rate regulated	premium	bundled
KS	rate regulated	premium	separate
KY	rate regulated	premium	bundled
LA	rate regulated	premium	bundled
MA	rate regulated	premium	bundled
MD	rate regulated	premium	bundled
ME	rate regulated	premium	bundled
MI	rate regulated	not defined	separate
MO	rate regulated	basic	bundled
MS	rate regulated	premium	separate
MT	rate regulated	non-basic	separate
NC	rate regulated	premium	bundled
NE	part of basic service	basic	bundled
NH	rate regulated	basic	bundled
NJ	rate regulated	premium	separate
NV	rate regulated	premium	separate
NY	rate regulated	basic	separate
OK	rate regulated	premium	separate
OR	rate regulated	basic	bundled
RI	rate regulated	basic	separate
SC	rate regulated	premium	bundled
SD	deregulated	premium	bundled
TX	rate regulated	premium	separate
UT	TT charges eliminated	basic	bundled
VA	rate regulated	premium	bundled
VT	price of TT is "capped"	premium	bundled
WA	rate regulated	basic	no charge
WI	rate regulated	generally premium	bundled

(1) Rate regulated, except for GTE North.

Source: ETI Survey, June-August, 1991.

other states, including Delaware, Missouri, New Hampshire, Oregon, and Rhode Island have recognized touch tone service as basic, but have not eliminated separate charges for the provision of touch-tone capability to subscribers.

In addition to the states which have entirely eliminated touch-tone charges or recognized touch-tone definitionally as basic, the surcharges on telephone bills for touch-tone service have been reduced in a number of other states. These include Kentucky,[16] Maine,[17] Florida, and Rhode Island, among others. Downward adjustments in the price of touch-tone service may be transitional rather than flash-cut (to avoid abrupt rate rebalancing), but they are taking place.

Rates for touch-tone at the time of its introduction in the mid 1960s were in the $1.50 to $2.00 range with a nonrecurring charge in the vicinity of $5.00.[18] Today's average rate for touch-tone, by comparison, is close to $1.00 for residential service and $1.90 for business service. In the intervening period, business touch-tone rates generally increased, while residential touch-tone rates slowly but steadily decreased. For the most part, then, touch-tone rates have remained relatively stable or declined slightly since the 1960s, although there have been a few exceptions where rates actually have increased.[19] For instance, business rates tended to increase around the time that touch-tone first became generally available, increasing from an average of

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[16] Docket Nos. 10105 and 90-256 address South Central Bell's Incentive Regulation Plan. Schedule III of the plan addresses rate reduction priorities, with touch tone listed among those priorities.

[17] Touch-tone charges have already been eliminated for Contel in Maine.

[18] This information is based upon survey results.

[19] This comparison does not account for changes in inflation. In "real" terms, the price of touch tone service has declined by an even greater percentage.

$2.06 in the mid 1960s to an average of $2.22 in the mid 1970s. Missouri has had relatively high touch-tone rates for business service. In 1982, the rate for touch-tone was $4.35 per line. Even today, touch-tone is priced at $3.88 per line, still well above the average price (of survey respondents) which is $1.90.

Information on the historical progression of tariffed touch-tone pricing in Indiana, provided in response to the survey, is probably typical of the experience elsewhere around the country. In 1964, when touch-tone was first introduced in the state, there was a nonrecurring charge of $5.00, and a monthly charge of $1.50 and $2.00 respectively for business and residential subscribers of individual and party line service (on party lines, the rates applied to each subscriber individually). The residential touch-tone rate in Indiana peaked at $2.00 in 1975 and is now at $1.55 where it has remained unchanged since September 1987. Business touch-tone rates peaked in 1986 at $3.10 per line. The current rate for business touch-tone is $2.85.

The costs of providing touch-tone capability have long been well below the prices charged. A study by New England Telephone found the marginal costs of touch-tone service in Massachusetts to average $0.07 per month per line. An estimate of this magnitude is corroborated by cost data from other jurisdictions.[20] These cost estimates strongly support the finding that touch-tone is greatly overpriced relative to costs. Indeed, on a forward-looking basis, the avoidable cost of touch-tone may be effectively zero, since virtually all of the switching technology currently being offered

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[20] For example, a Michigan study determined that touch-tone's fully embedded cost was $0.0533 and its long run incremental cost was $0.0484. In Connecticut, the long-run incremental cost of touch-tone service is identified as $.05. A study conducted in Utah found embedded investment per line in 1989 to be $7.14, an average embedded monthly cost of about $0.17 per line. This information was provided in response to the survey.

by vendors come equipped to provide touch-tone as part of their standard operating software. Moreover, it is entirely possible that touch-tone may actually present the telephone companies with negative costs vis-a-vis rotary-dial service, in that modern electronic analog and digital switches can process tone signals without any special equipment, and total off-hook times are typically shorter when calls are originated from touch-tone telephones than from rotary dial sets.

By continuing to price touch-tone at high levels that have no relationship to the cost of providing the capability, telephone companies are artificially restricting customer demand for touch-tone capability. These companies are thereby limiting access to new customer applications that are critically dependent upon touch tone signalling, impeding the full dissemination of the benefits of these applications to the general body of ratepayers, who, in effect, have *already paid* for touch tone capability as part of their funding of telephone company modernization programs. Furthermore, as the demand for touch-tone service becomes increasingly widespread among basic-service customers, there will be little impact on the average basic service subscriber from reducing (or eliminating) the price of touch-tone and offsetting that reduction with an increase in the basic monthly charge.[21]

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[21] The Massachusetts Department of Public Utilities made this explicit finding in its Decision D.P.U. 89-300:

> The widespread and increasing demand for touch tone suggests that most consumers now consider it part of basic service. To the extent that subscription to a service like touch tone (or any other supplemental service) becomes so widespread as to be considered basic service to most customers, there may be no real difference between maintaining the rates above cost for that supplemental service, or reducing the rate for the supplemental service and increasing the basic monthly charge. Indeed, if the cost for a universally accepted supplemental service is very low, at some point it may be appropriate to eliminate the separate

The treatment of touch-tone as a premium service--well after touch-tone became associated with essential service capability--offers useful lessons to regulators as they look to the introduction of new services which may be envisioned as being essential to the networks of the future. What we have seen is that touch-tone premium pricing became an attractive and continuing, reliable source of revenues to the telephone companies that could always be tapped for a little extra when needed.[22] It was, and continues to be, difficult for regulators to remove this excess revenue-generating pricing, even after a public consensus has been established that touch-tone should be considered a part of basic service.[23] Another lesson to be learned from the

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charge altogether and make the service part of the basic exchange service. (D.P.U. 89-300, 146-147)

The D.P.U. did not however choose to reduce or eliminate the rates for touch tone service in its decision, based upon the finding that "[because of continuity and universal service considerations, it would be inappropriate to reduce the rates for these services in order to move them toward cost." (*Ibid* 147)

[22] Interestingly, a case could have been made for the charging of much lower rates by the telephone companies at the time of touch tone's introduction under either the public good or private good models presented in this study. Under the private good model, lower rates could have stimulated increased penetration of the service early on which could have produced an even greater revenue flow to the telephone company and greatly diminished the market for dual-mode telephone sets provided by CPE suppliers (as opposed to the telephone company). Lower rates could similarly have been justified under the public good model although for the very different reason of promoting the universal availability of touch tone service to the basic telephone subscriber.

[23] For example, in its recent decision in Phase II of Docket 89-12-05, the Connecticut Department of Public Utility Control (CT-DPUC) incorporated touch tone into basic service, but "accordingly ... increased residential local exchange rates [to compensate for the] additional value to these subscribers gained by incorporating touch tone service into basic exchange service. As a result of making touch tone a part of basic service, the revenues from touch tone service will now be recovered in the basic exchange category...requir[ing] an increase in annual revenues of $41.6 million on a net basis." Connecticut DPUC decision in Docket No. 89-12-05, June 28, 1991, 32.

touch-tone experience is that it is difficult to predict either the significance and range of applications or future penetration rates of new services or capabilities.[24] This suggests that there is merit in a definition of basic service that is flexible enough to respond to both changing technology and changing consumer needs and demand. In addition, it is important that regulators recognize that where the general body of ratepayers have funded the network enhancements as part of the telephone companies' modernization programs, they should not be deprived of the benefits of the service, as a result of a non-cost based premium pricing program.

Florida provides an interesting example of the conflicts that can develop between the regulator and the telephone company when the regulator begins to redefine basic service. Southern Bell listed touch tone as a premium service in response to a survey question designed to determine whether touch tone is considered a basic or premium service. However, the Florida Public Service Commission (PSC) noted that it disagreed with Southern Bell's response, saying that the PSC has begun to view this service as a basic service.[25] In fact, in several cases, the Florida PSC has reduced rates for touch tone service in the belief that, due to touch tone's high penetration rates, it appears to be a necessary service.[26] As another example, in a recent general rate proceeding in Arizona, US West supported residential touch tone service as basic, yet asserted that touch-tone is, and should continue to be, treated as

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[24] As noted by the Massachusetts D.P.U., "today's discretionary service may be considered to be 'plain old telephone service' tomorrow" 146.

[25] Letter dated May 29, 1991, Ann Hinson Shelfer, Florida Public Service Commission.

[26] *Ibid.*

a premium service with premium pricing for business service. US West's view was not affirmed, however. The case has been settled and touch tone for business as well as residence customers is now part of the basic monthly rate in Arizona.[27]

It is instructive to view touch-tone service in the context of the analytical framework presented in this study. At the time the service was originally introduced, the private-good model was perhaps more applicable. Existing central office equipment was being modified in specific locations in order to support touch-tone service, and this investment was generally supported based upon the new revenue flow from custom calling services, of which touch-tone was one.[28] None of the more sophisticated applications for touch-tone service (in particular, applications which produced efficiencies or access to other sectors of the economy) were available at the time. At least initially, touch-tone service provided the convenience of pushbutton dialing--a convenience generally producing an internalized private benefit.

However, LEC modernization-related investments have been occurring at an ever-increasing pace, with justification for those investments shifting from *identifiable* cost savings and new service revenues to economic development-related objectives such as the need to provide the public access to new technology. As described in Chapter 2 in the discussion of plant modernization, several modernization programs authorized in the last several years have involved the wholesale replacement of remaining nondigital switching facilities in a state. As a result of LEC modernization efforts, touch-tone capability has become available to the vast majority of subscribers,

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[27] Settlement Agreement in Arizona Docket No. E-1051-91-004, 3.

[28] Other custom calling services include call waiting, call forwarding, and three-way service, that were generally introduced at the same time as touch-tone service.

and along with that (or perhaps because of), the range of meaningful applications for touch tone service has grown almost exponentially and large percentages are subscribing to the service. Given these conditions, the "public good" model is certainly applicable to touch-tone service.

The history of touch-tone service thus underscores the problems associated with a frozen definition of basic service--a concept inherent in the private-good model, as well as the problems associated with enlarging the definition of basic service to include either an existing service currently priced as a premium service or a new service potentially priced as a premium service--a likely issue under the evolutionary basic service concept inherent in the public-good model.

CHAPTER 6

CONCLUSION

As modernization of the public switched network continues at an ever-increasing pace and communications customers and their needs become more sophisticated, it has become increasingly important to develop a clear regulatory statement regarding the identification of objectives for plain old telephone service. Policymakers stand at an important crossroads with respect to determining the definition of basic service that best serves the interests of the average POTS customer. This question is especially difficult to answer because of the contrasting, yet equally plausible, views of the public switched network as a private good, a public good, or some hybrid of the two. Each of these possible views of the network has remarkably different, yet potentially valid, implications for the definition of basic POTS services. The challenge, then, becomes one of recognizing and reconciling these divergent views in order to provide guidance to regulators faced with the task of directing the future development of the public switched network.

To this end, this study identifies three fundamental principles that transcend a particular view of the telecommunications network:

- Regulators should explicitly embrace a particular model or view of the network as an integral part of an open decision-making process;
- In adopting a particular model or view of the network, regulators should, as a precondition, ensure that the threshold conditions that determine whether that model can be properly applied are fully satisfied; and

- Once a particular model or view of the network is adopted, the identification of POTS objectives for the public switched network, and accordingly, the definition of POTS service itself, must be fully consistent with that choice.

Although these principles will not result in a necessarily uniform definition of basic service for POTS customers across states and across regions or both, the application of these principles will help assure that the definition which emerges from this process is tied to an explicit identification of POTS objectives determined in a manner that serves the public interest.

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