The Telecommunications Infrastructure in the City of New York

Mitchell L. Moss

Columbia Institute for Tele-Information
Graduate School of Business
809 Uris Hall
Columbia University
New York, New York 10027
(212) 854-4222

EXECUTIVE SUMMARY

New York City is the information capital of the United States. The information sector accounted for 55% of the city's private employment and 58% of the city's income in 1984. The intense concentration of information handling and processing activities in the City of New York has given rise to a sophisticated and diverse telecommunications infrastructure that is unmatched by any city in the United States. This report describes the city's telecommunications infrastructure and assesses the implications of telecommunications for the city's economic development.

Technological advances in conjunction with the deregulation of the telecommunications industry are strengthening the city's telecommunications infrastructure. New York City's telecommunications systems --- the wires, ducts, and channels that transmit voice, data, and video signals --- are vital to the economic growth of the city. New communications technologies enhance the productivity of the city's industries by allowing firms to extend their geographic reach and to market new products and services on a global basis. This is crucial for New York City's role as a world center for new and specialized information services.

This report provides a systematic inventory of the telecommunications systems that link New York City with the rest of the nation and of the major telecommunications systems for intra-city communications, including fiber optic, satellite, coaxial cable, and microwave systems. New York City is served by five long distance fiber optic systems, six satellite common carriers, and has a variety of coaxial cable and fiber optic systems. Telecommunications policies that foster competition and innovation have contributed to the development of the nation's premier urban telecommunications infrastructure in the City of New York.

This report gives a comprehensive overview of the city's telecommunications infrastructure and suggests policy options to promote telecommunications in the city's economic development. The report consists of four parts: 1) an analysis of the city's information sector; 2) an assessment of the city's telecommunications infrastructure; 3) a description of the telecommunications systems within New York City; and 4) policy options for using telecommunications in economic development. These policies include promotion of the city telecommunications infrastructure as a means to retain and attract private industry; decentralization of office activities to boroughs other than Manhattan through the use of new intra-city fiber optic systems; maintaining New York City as an information and financial capital, monitoring state and federal communications policy, and coordination of telecommunications policy within the City of New York.

ACKNOWLEDGEMENTS

This report was prepared for the Division of Policy Analysis, Office for Economic Development, City of New York. The author wishes to acknowledge the advice and direction provided by Ms. Eli Dickson. Ms. Beate Echols made important contributions to the report's discussion of telecommunications policy issues and was a valuable source of ideas and advice throughout the project. Joe Milano of the Port Authority of New York and New Jersey reviewed an earlier version of this report and offered helpful comments. Finally, the author expresses his appreciation to Mr. Andrew Dunau for his research assistance.

CONTENTS

INTRODUCTION: NEW YORK CITY'S INFORMATION SECTOR

The current strength and growth potential of New York City's economy depends substantially on the city's function as a headquarters site for major corporations, as a center for publishing, television, and other media, and finally as a capital for information-based services such as financial services, banking, law, management consulting, accounting, and advertising. These services have gained prominence during the past twenty-five years as the city's economy shifted from one of goods production and handling (i.e., manufacturing, trade and transportation) toward one characterized by a concentration of information-handling activities. In 1958, the information sector --- 18 of the 51 private non-agricultural industries --- accounted for 35 percent of the city's private employment. By 1984, the information sector had grown to 55 percent of the city's private employment, as illustrated in Exhibit I.

Furthermore, the information sector accounted for 41% of the city's income in 1958 and 58% of the city's income in 1984. These figures do not include federal, state and local government which also have a high information component. Banking, securities and business services together accounted for 23% of the total city value added in 1984, more than double that in 1958. These industries are highly information intensive.

Information handling and processing is not confined to

Exhibit I

Pecentage of New York City's Employment and Income in Information Intensive Sectors

Industry or Group	Employment* 1958	Employment* 1984	Income** 1958	Income** 1984
Printing & Publishing	4.0	3.2	4.2	3.5
Instruments and Electrical Machinery Manufacture	2.4	1.1	2.7	1.2
Communications	2.5	2.9	3.2	5.0
F.I.R.E.***	11.9	17.3	17.1	23.6
Selected Services****	14.1	30.6	13.6	24.4
TOTAL INFORMATION SECTOR	34.9	55.1	40.8	57.8

* % of total private non-agricultural employment.

** % of total value added of private non-agricultural establishments in constant dollars.

*** Consists of banking, credit agencies, securities, insurance and real estate.

**** Consists of business services; motion pictures; amusement services; health, legal and educational services; social services; non-profit organizations; miscellaneous services and museums.

Source: Drennan, 1985.

information-based firms, but impinges upon all economic activities. This is particularly true for New York City with its strong headquarters concentration. For example, firms engaged in goods production (e.g. apparel manufacturing) maintain their top management and support staff in New York City. Occupational employment statistics, in fact, show that in five of the six major industrial classes, New York City has a higher proportion of workers in white-collar, information-handling occupations than does the United States as a whole. (See Exhibit II).

Advanced communications systems have allowed manufacturing firms based in New York to coordinate production and marketing on a global basis and thus, to increase their use of information technology in corporate operations. Even the day-to-day activities of the city's hotels, retail stores, and theaters, rely extensively on new telecommunications systems. Finally, basic telephone service is essential to the local shopkeeper --- such as the pharmacy, drycleaner, and butcher --- to respond to customer orders, to make deliveries, and to order new stock. In all sectors of the New York City economy, information transmission systems play a vital role, and the city's future economic health will increasingly depend upon the capacity of private firms to make effective use of advanced telecommunications.

New York As An International Information Capital

New York City's growth as an information capital has been

Exhibit II

Proportions of White Collar and Blue Collar Workers by Industry, 1984

United States and New York City

	White Collar	Blue Collar
Manufacturing		
U.S.	37.2%	62.8%
N.Y.C.	48.0	52.0
Construction		
U.S.	21.4	78.6
N.Y.C.	26.2	73.8
Transportation, Communication and Public Utilities		
U.S.	49.3	50.7
N.Y.C.	56.1	43.9
Wholesale and Retail Trade		
U.S.	61.8	38.2
N.Y.C.	68.9	31.1
Finance, Insurance and Real Estate		
U.S.	92.9	7.1
N.Y.C.	88.5	11.5
Services		
U.S.	64.3	35.7
N.Y.C.	70.7	29.3

Source: U.S. data from U.S. Department of Labor, BLS, Employment and Earnings, January, 1985. N.Y.C. data from Drennan, 1985, derived from Occupational Employment Statistics, N.Y.S. Department of Labor.

made possible by the advent of telecommunications systems that facilitate both the concentration of financial and headquarters functions in the central business district and the movement of manufacturing and distribution functions. The rich web of face-to-face communications that provide New York firms with access to the latest information and ideas is closely linked to the new telecommunications technologies of the 1980's. Communications technologies allow firms based in New York to convert new information into profit making services and to produce decisions that result in the production of goods and services around the world. New York City's headquarters complex includes 62 of the Fortune 500 largest industrial firms, 11 of the nation's 50 largest commercial banks, 10 of the country's top 50 diversified financial companies, and 7 of the nation's largest diversified service companies.[1] In addition, more than 300 foreign banks are located in New York, the largest such center of foreign banks in the United States.

International commerce plays a growing role in the economy of New York City and in the economy of the nation as a whole. In 1972, international trade (the value of imports and exports) represented only 8.9% of Gross National Product (GNP). In 1984, this figure had grown to 18.7% of GNP. New York has emerged as the international gateway for overseas communications traffic. In 1981, almost one-fourth of all overseas business calls and 15

---

[1]. Fortune, April 29, 1985, vol. 111, no. 9, and June 10, 1985,vol. 111, no. 12.

percent of all overseas residential calls originated in New York City. (See Exhibit III for an analysis of the destination of overseas calls from New York City.) More than twice as many overseas message units originate in New York City than in Los Angeles, the second leading overseas telephone departure point in the United States. New York City has historically been a leader in international telephone services. The first commercial overseas telephone call was placed from New York City to London on January 7, 1927. Today, the city is the site for new international satellite services between New York City and London.

An Assessment of Telecommunications Systems in New York City

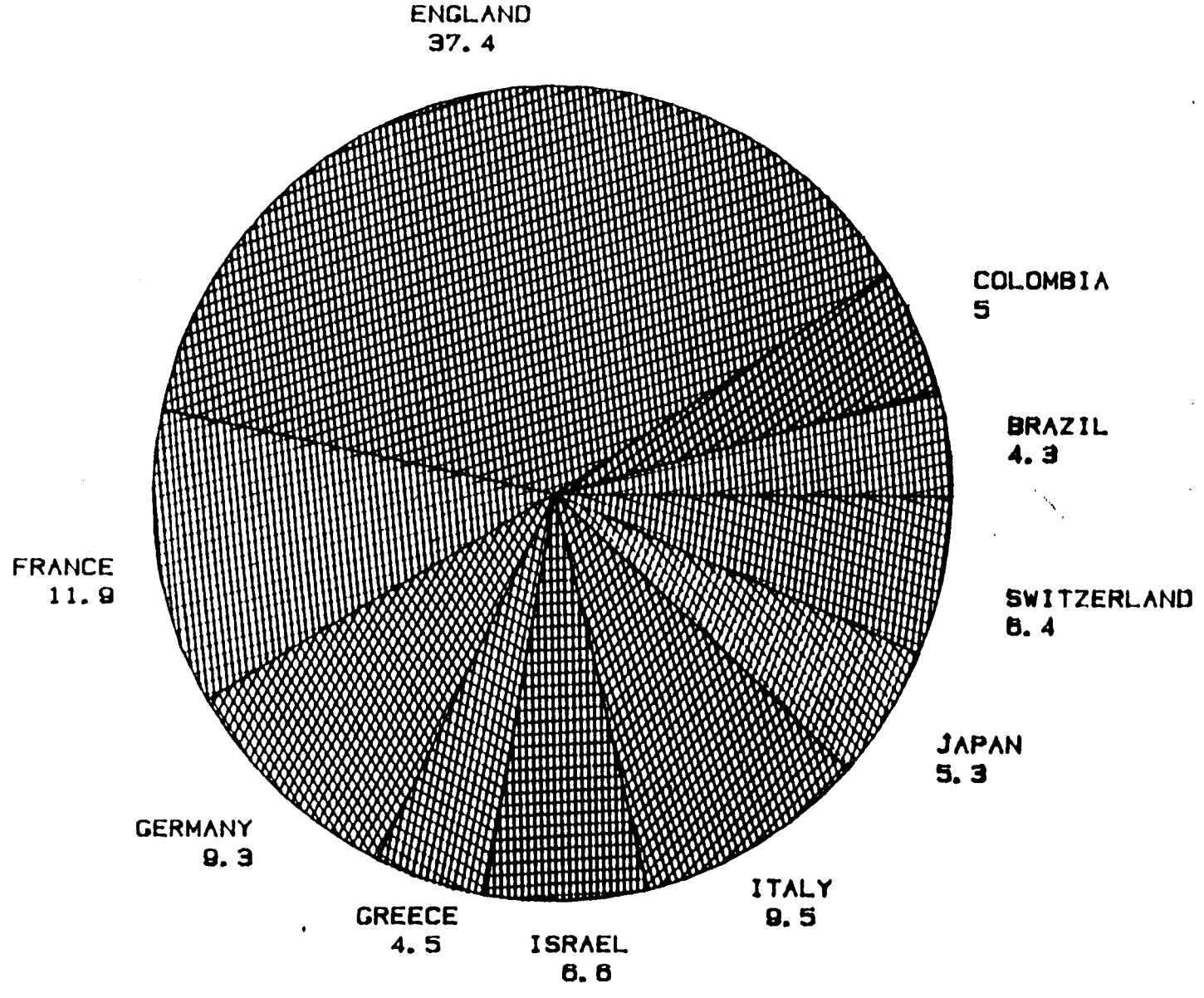
New York City's unmatched set of telecommunications facilities and services has been substantially strengthened through the deregulation of the telecommunications industry. No other city in the world has such a diverse and extensive telecommunications infrastructure, encompassing coaxial cable and fiber optic systems plus major satellite earth stations in outlying parts of the city. The availability of fiber optic systems throughout the city enhances economic development opportunities by information intensive firms. Further, the planned Metrotech facility in Brooklyn will contain an advanced telecommunications center, and this, in addition to the cable television systems in the boroughs outside Manhattan and proposed Digital Termination Systems (DTS) will constitute significant

EXHIBIT III

OVERSEAS TELEPHONE TRAFFIC FROM NEW YORK CITY, 1982

SOURCE: AT&T LONG LINES, 1982

SUM OF PERCENT GROUPED BY COUNTRY



new elements in the city's telecommunications infrastructure.

New York City's advanced telecommunications infrastructure is a significant asset for economic development because it provides private firms with a wide choice of sophisticated services in a highly competitive environment. Advances in telecommunications technology contribute to the economic productivity of the city's industry by allowing private firms to extend their geographic reach and to market new products and services. For the small and medium-size firms that characterize the New York City economy, shared tenant services within large office buildings will provide those firms with the benefits of state-of-the art telecommunications technology without making a large capital investment in equipment and facilities. For the information processing activities that occur in the "back offices" of financial service firms, the extensive telecommunications infrastructure facilitates the decentralization of routine office activities to locations in Brooklyn, Queens, the Bronx, and Staten Island.

The enormous concentration of information-based firms in New York City has led to the development of New York City's unique telecommunications infrastructure. Ken Phillips, Vice-President of Citicorp and Chairman of the Legislative Affairs Committee of Corporate Telecommunications Users, has stated that the Manhattan Central Business District "has over twice the telecommunications switching capacity of the average foreign country, more computers than a country the size of Brazil, and more word processors than

all the countries of Europe combined. Capital investment by business users in private telecommunications systems, communicating word processing systems, computer mainframes, minis, and micros is currently in the billions of dollars and is growing annually."[2]

There are three segments to the telecommunications infrastructure in New York City: a) long-distance or inter-city systems that link New York City with other parts of the nation and world; b) intra-city transmission systems that link telephone central offices, connect subscribers to communications carriers, and/or provide alternative local distribution systems; and c) local area networks that transmit information within a single building or set of buildings. In light of New York City's role as the nation's leading information center, telecommunications policies and regulations designed to foster competition, including efficient pricing of telecommunications services, are crucial to the continued growth of telecommunications throughout the city.

---

2. Kenneth L. Phillips, "Telecommunications and New York in the Year 2000," Testimony Before the New York City Commission on the Year 2000, May 9, 1985, p.3-4.

NEW YORK CITY'S LONG DISTANCE TELECOMMUNICATIONS SYSTEMS

Long Distance Fiber Optic Systems

At the regional and national level, fiber optics are gradually replacing satellite and copper wire systems for the transmission of information at high speeds over long distances. There are several characteristics of fiber optic systems that enhance their use in telecommunications systems:

a. large capacity: a large amount of information can be transmitted rapidly in a very limited amount of space. The Office of Technology Assessment (OTA) estimates that "a quarter-inch diameter optical cable with two fibers carries as much data as a 3-inch copper cable with 2,000 wires."[3]

b. declining cost: compared with other telecommunications technologies, the cost per channel of communication over fiber is decreasing rapidly. Within the next three years, the cost of fiber alone will be approximately a few cents per meter. The primary financial constraints are right-of-way costs and installation of fiber and repeaters.[4]

c. high security: fiber is resistant to wiretaps or interference from external sources.

---

[3]. Congress of the United States, Office of Technology Assessment, Information Technology R&D: Critical Trends and Issues, February, 1985, p. 67

[4]. A. M. Rutkowski, "Satellite Competition With Optical Fiber," paper presented at Satellite Summit, April, 1985.

d. signal strength: fewer repeaters are needed to regenerate signals with fiber than with copper systems and thus maintenance and installation costs are reduced. Repeaters are needed at one-mile intervals for copper telephone systems, but only for every 50 miles with fiber systems.

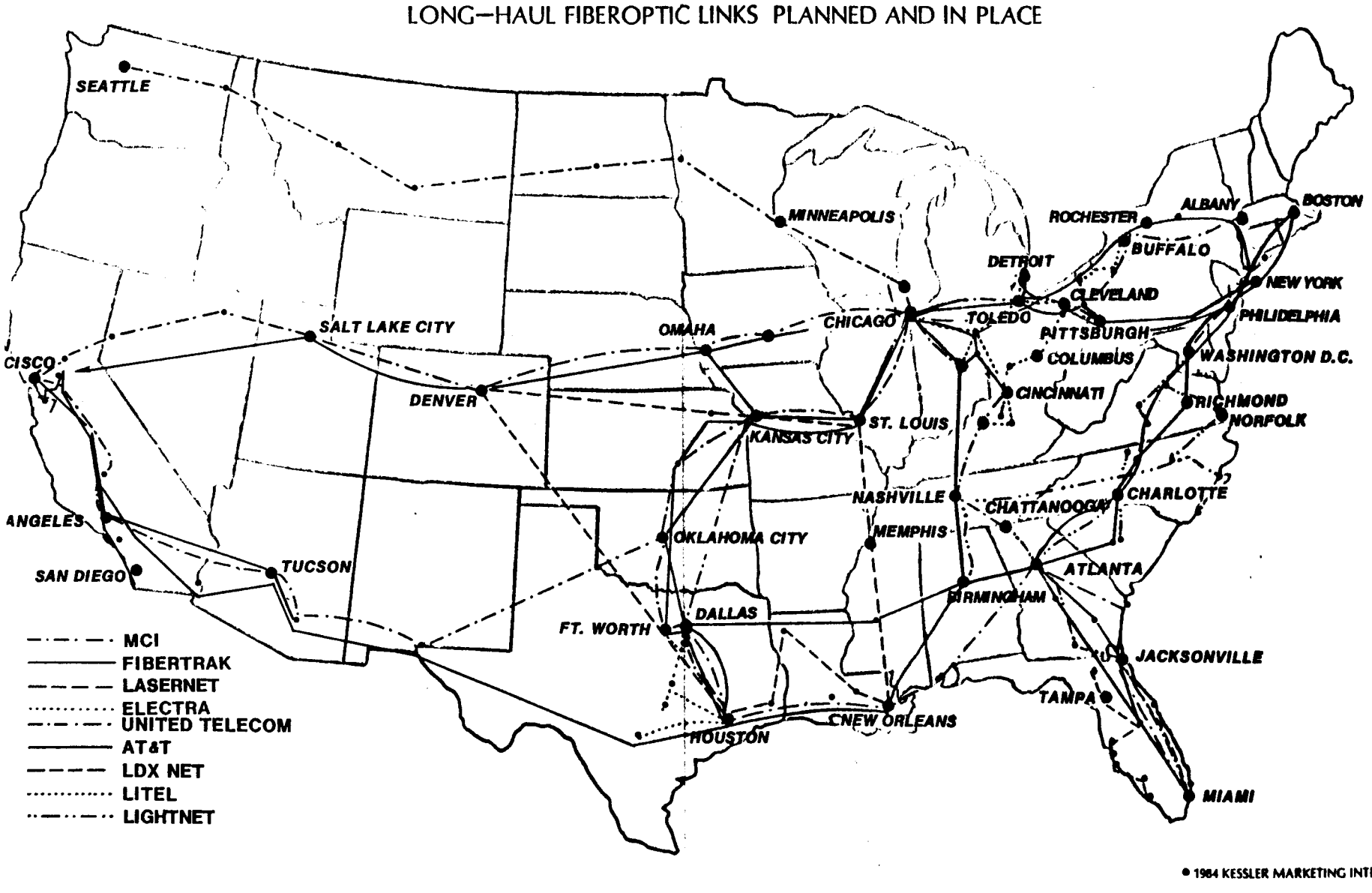
e. minimal delay: unlike satellite communication, which must travel 23,000 miles to outer space and back, information on fiber travels directly between points. Although the time delay over satellite is not significant for many forms of communication, it represents a major inefficiency, especially for the integrated digital networks that are increasingly being used for international communications.[5]

New York City is the largest single source of national and international telephone traffic and is therefore a major hub for the current and proposed fiber optic systems in the United States. There are five long distance fiber optic communications systems that serve or are planned to serve New York City-based customers. (A map of the proposed fiber systems for the United States is contained in Exhibit IV.) The provision of long-distance fiber optic service in New York City by several communications companies allows users located in the city the benefits of a truly competitive marketplace: choice of vendor, competition in price, an incentive for innovative services. The major long distance fiber optic companies serving

---

[5]. ibid, p. 3.

EXHIBIT IV


LONG–HAUL FIBEROPTIC LINKS PLANNED AND IN PLACE
SEATTLE
MINNEAPOLIS
ROCHESTER
ALBANY
BOSTON
BUFFALO
DETROIT
NEW YORK
CLEVELAND
PHILIDELPHIA
SALT LAKE CITY
OMAHA
CHICAGO
TOLEDO
PITTSBURGH
CISCO
COLUMBUS
WASHINGTON D.C.
CINCINNATI
DENVER
RICHMOND
NORFOLK
ST. LOUIS
KANSAS CITY
NASHVILLE
CHARLOTTE
CHATTANOOGA
ANGELES
MEMPHIS
OKLAHOMA CITY
SAN DIEGO
TUCSON
ATLANTA
BIRMINGHAM
DALLAS
FT. WORTH
JACKSONVILLE
TAMPA
NEW ORLEANS
HOUSTON
MIAMI
MCI
FIBERTRAK
LASERNET
ELECTRA
UNITED TELECOM
AT&T
LDX NET
LITEL
LIGHTNET
© 1984 KESSLER MARKETING INTELLIGENC

New York City are described below:

* AT&T has, in operation, a fiber optic cable linking New York City, Baltimore, Washington, and Philadelphia.

* MCI has a fiber optic cable connecting New York City, Philadelphia, Wilmington, and Washington, D.C. This cable will eventually extend to Miami. In addition, MCI's planned acquisition of Satellite Business Systems (SBS) will allow MCI to incorporate the SBS plan to link New York with Boston.

* US Telecom, a subsidiary of United Telecommunications plans to operate a 23,000 mile fiber network within the next three years. A fiber optic link from New York City to Chicago will become operational by the end of 1985.

* GTE Sprint is completing a fiber optic link from New York City to Sparta, New Jersey and is constructing a fiber optic link from New York City to White Plains, New York. There are plans to connect New York City to Boston by fiber as well.

* Lightnet, a joint venture of Southern New England Telephone and CSX Corporation, is building a 5,000 mile fiber optic network that will serve 43 cities in 24 states east of the Mississippi River. New York City will be connected to Philadelphia by late 1985, and a New York City to Washington and Chicago route will be

operational by early 1986. The New York City Lightnet terminal will be located at 60 Hudson Street; two fiber cables will enter New York City, and both are being brought in through an agreement with Teleport Communications, Inc. and the Port Authority of New York and New Jersey. Lightnet is also installing a fiber link for Teleport Communications, Inc. between New York City and Princeton, New Jersey.

Satellite Facilities in New York City

Developed during the 1960's, communication satellites provide a vital link for long distance communications between New York City and other parts of the nation and world. Communication satellites are accessed by dish-shaped antennas known as earth stations, with large dishes (up to 100 feet in diameter) used for both sending and receiving signals, and smaller dishes (3-15 meter) primarily used for receive-only purposes. Commercial satellites have, until recently, used the C-band transmission frequencies between 3.0 and 6.2 GHz. These frequencies, however, coincide with those used for microwave transmission on earth and this has been a constraint on satellite earth station installations in urban areas already heavily congested with terrestrial microwave traffic, such as New York City. As a result, most satellite facilities serving New York City have been located in Vernon Valley, New Jersey or in Suffolk County, Long Island, with microwave transmission used to link New York City locations to the satellite earth stations outside the city.

Advances in technology and the desire to avoid this congestion problem have led to increased use of Ku-band transmission frequencies for satellites, which rely on transmission at higher frequencies. The growth of Ku-band satellites has contributed to the installation and operation of new satellite earth stations within New York City by both private users and common carriers. Ku-band satellites, by utilizing a stronger signal, are able to reach smaller satellite dishes, and, consequently, such satellite dishes can be installed with greater ease on rooftops of office buildings. In addition, the Federal Communication Commission's recent deregulation of a portion of international satellites services has allowed international satellite facilities to be located within New York City. The partial deregulation of international satellite traffic will allow firms located in New York City to obtain the benefits of a competitive marketplace in international telecommunications as well as in domestic services. Given New York City's preeminence as a center for international communications, the latest innovations in international services are being developed in New York and other world financial capitals first. The following section will describe the major satellite facilities within the City of New York:

Teleport: A Public-Private Partnership

The largest satellite facilities in New York City are being developed by Teleport Communications, Inc., a joint venture of

Merrill Lynch Telecommunications, Inc. and Western Union Communications Systems, Inc., the City of New York, and the Port Authority of New York and New Jersey. The idea for a teleport was based upon the belief that a public entity should provide a facility, similar to airports but for access to communication satellites. The large volume of information flowing into New York City by electronic means led the City and Port Authority to consider access to communication satellites as vital to the city and region's economy. Microwave congestion within New York City reinforced the need for an alternative local distribution system and led to the creation of a fiber optic network linking the Teleport on Staten Island to New York City and New Jersey. The 100-acre site on Staten Island was chosen because of its interference-free characteristics plus its access to both New York and New Jersey. In addition to the satellite earth stations to be built, the site will accommodate back office functions plus a Telecenter, a 56,000 square foot building that will control all Teleport Communications services and provide advanced data and voice services on a 24 hour a day basis.

Teleport is designed to serve 17 earth stations; satellite communications started on June 20, 1985 with the inauguration of the Comsat antenna. Portions of Teleport's regional fiber optic network have been in operation since April, 1985. Several major firms, including Dow Jones, Bankers' Trust, Citicorp, and Private Satellite Network are hooked into Teleport's fiber optic cable. In addition, the Catholic Telecommunications Network of

America plans to move its broadcast facilities to the Teleport and will transmit its programming across the country from the Teleport.

Teleport's most distinctive success to date has been as a provider of an alternative means of local communications through its 220 kilometer fiber optic network. AT&T has announced that it will use Teleport's fiber system to link Merrill Lynch to an AT&T office in lower Manhattan, thus "bypassing" New York Telephone's local network. Teleport's fiber system provides an important intra-urban telecommunications system, at relatively low cost, to major users located in the City of New York and surrounding metropolitan region.

Within New York City, Teleport's major service nodes will include 77 Water Street, 2 World Trade Center, 60 Hudson Street, the Empire State Building (350 Fifth Avenue), the Fisk Building (250 West 57 Street), Astoria Studios, 161 Street and Jamaica Avenue, Queens, and the Polytechnic Institute of New York in downtown Brooklyn. In New Jersey, Teleport's major service nodes are in Newark, Jersey City, and the Forrestal Center Campus in Princeton.

Satellite Common Carriers in New York City

There are six companies that operate communication satellite facilities in New York City, providing access to their earth stations on a common carrier basis to major communication users. The common carriers include:

* Hughes Communication, now part of General Motors, operates an earth station from its Spring Creek, Brooklyn satellite facility. This earth station is linked to Hughes' three satellites, one of which is devoted to video transmission and two of which are devoted to data transmission by private businesses.

* ITT Satellite Services, a unit of ITT World Communication Inc., ITT offers voice, video, and data transmission to firms located primarily in the lower Manhattan financial district. The Federal Communications Commission has authorized ITT to build an 8 meter fully digital earth station on the roof of its 60 Broad Street building. This earth station will provide ITT customers with satellite connections between the United States and 200 other nations.

* GTE Space Net, located at Wall Street and Battery Park West, GTE operates an earth station that provides comprehensive services to over 100 corporations. This earth station communicates with GTE's three SPACENET satellites and two GSTAR satellites.

* Private Satellite Network (PSN), headquartered at 215 Lexington Avenue, PSN develops, installs and maintains Ku-band satellite systems that provide point to multipoint teleconferencing

services. PSN is connected to Teleport's fiber optic network and uses the Teleport node located at the Empire State Building. PSN provides satellite services to such large firms as J. C. Penney, Merrill Lynch, and Ford Motor Company.

* MCI/SBS, through its planned acquisition of Satellite Business Services, MCI will have access to two SBS earth stations at 1 State Street in lower Manhattan. SBS primarily provides voice transmission by satellite and has extensive ground equipment throughout the United States to provide satellite communications.

* International Relay Inc.(IRI), is the first company to offer a fully digital satellite link from New York City to international locations. IRI has a Ku-band satellite earth station at 345 East 46 Street in Manhattan. Customer access to this site is provided by New York Telephone, Manhattan Cable Television, and by microwave. IRI has a high speed data link with London, through an agreement with Mercury Communications, Limited. The first user of the IRI-Mercury link is the Associated Press; the London Stock Exchange will provide real-time London stock quotations to New York through the IRI-Mercury link as well.

Private Earth Stations in New York City

New York City is the capital of the nation's broadcast television industry. These firms make such extensive use of

satellite communications systems that it is cost effective to have an earth station devoted exclusively to their operations. For example, NBC maintains and operates an earth station on top of the Celanese Building at 48th Street and the Avenue of the Americas, and ABC-TV maintains and operates an earth station in Manhattan as well.

Isacomm, a subsidiary of United Telecommunications, has a satellite earth station on the roof of 245 Park Avenue that is used for videoconferencing. Several other firms have their own private earth stations in New York City, and there are many receive-only satellite dishes in New York that are used for purposes such as internal corporate data communications, videoconferening, and access to the "Reuters" information service.

Public Communication Networks

New York City is also a central link for public communication networks that use packet switching to provide corporations with low cost domestic communications services. By making maximum use of existing communications facilities, these network services provide a large number of small and medium-size firms access to sophisticated computer-based communications. Packet switching stations operate as a common interface for firms that want to link their computer facilities but cannot do so because of incompatible computer protocols. By operating as a translator, these public networks enhance

computer-based communications. The major networking services in New York City include:

* GTE Telenet offers comprehensive services to more than 250 cities and more than 40 countries. In addition, GTE operates a hybrid network service that allows organizations to maintain a private network between commonly used points and access to GTE's public network for intermittently used points. GTE's New York packet switching facilities are located at 1 Penn Plaza.

* Uninet, Inc, a subsidiary of United Telecommunications, Uninet provides comprehensive service to 275 domestic metropolitan areas and, through an association with international record carriers, to several overseas locations. Uninet's packet switching facilities are located at 2 Penn Plaza.

* Tymnet, a subsidiary of McDonnell Douglas Company, offers comprehensive service to more than 500 domestic metropolitan areas, and, through association with international record carriers, to more than 50 countries.

* ARGO Communications, headquartered in New Rochelle, New York, uses satellites to provide long distance domestic network services, and microwave and leased telephone lines to transmit information within a region. ARGO offers fully digital high speed data services to 11 other American cities.

NEW YORK CITY'S INTRA-CITY TELECOMMUNICATIONS SYSTEMS

New York City has more than 5 million telephones. This is the largest concentration of telephones in any American city, and the third largest in the world, after Tokyo and the Paris area.[6] The copper wire linking New York City's telephones is the only two-way communications link universally available to households and businesses in all five boroughs. The major provider of communications within New York City is New York Telephone, a subsidiary of NYNEX, one of the seven regional holding companies created through the divestiture of AT&T. In addition to copper wire, information is transmitted within New York City by optical fiber, microwave, coaxial cable, and cellular mobile telephone systems.

It is important to recognize that most telecommunications usage is local; more than 75% of all telephone calls from Manhattan are to points within Manhattan. Similarly, more than 60% of the telephone calls from Brooklyn, Queens, Staten Island and the Bronx are to points within each respective borough. The recent breakup of the city into two area codes, 212 and 718, was designed, in part, to reflect the localized character of much of the telephone traffic within the city. The large volume of local telephone traffic within New York City is what makes possible,

---

6. The World's Telephones: A Statistical Compilation as of January, 1983, AT&T Communications, Morris Plains, New Jersey, 1985.

and indeed necessary, the extraordinarily diverse and dense set of telecommunications facilities and systems.

Fiber Optic Communications Within New York City

Fiber optic cable is particularly attractive to use in the City of New York because it requires relatively little duct space, a particularly scarce resource in New York. Moreover, fiber is most appropriate to high volume point to point communications, such as connecting telephone switching centers or linking data processing centers. New York Telephone has been quite active in using fiber optics to replace copper wire in its telephone plant. A 48,000 circuit fiber "Ring Around Manhattan" (RAM) has been built that connects the twelve major switching centers in Manhattan. Ducts have already been laid to increase RAM's capacity by a factor of four if and when demand exists. New York Telephone also has a fiber optic network to provide "Video Around Manhattan" that provides Manhattan business firms with enhanced digital services, including wideband video transmission.

By the end of 1985, New York Telephone is scheduled to complete its Interborough Optical Network that will connect 31 central offices in Brooklyn, Queens, the Bronx, Manhattan, Nassau County and Westchester County. The Interborough Optical Network consists of 130 miles of cable with a capacity of 5.8 million voice or data conversations and will tie in with New York

Telephone's existing fiber network in Manhattan. This system will provide the latest telecommunications services to the boroughs other than Manhattan and will enhance not only the telecommunications infrastructure throughout the city but also the city's economic development potential outside Manhattan.

New York Telephone is one of several fiber optic systems, albeit the largest, within New York City. As discussed above, Teleport Communications, Inc., operates a fiber system connecting Manhattan, Staten Island, Brooklyn, Queens, and New Jersey. In addition, major corporate users have installed their own fiber optic systems within specific areas of Manhattan. Examples of such fiber systems include:

* Manhattan Cable Television and Group W Cable use fiber optic trunks in their respective head-ends at 120 East 23 Street and 5120 Broadway.

* ITT operates fiber optic cables in the lower Manhattan financial district. These cables are used as a link to ITT's earth station and to ITT's Long Distance Center at 1 Whitehall Street.

* Citicorp uses fiber optics in its MICRONET system that links its downtown offices at 20 Exchange Place, 111 Wall Street and 55 Water Street with its headquarters at 399 Park Avenue and Citicorp Center.

* McGraw-Hill has a fiber optic link between their headquarters at 1221 Avenue of the Americas and their offices at 1633 Broadway.

* SIAC, the Securities Industry Automation Corporation, has a combined fiber optic and coaxial cable link between the New York Stock Exchange, the American Stock Exchange, and SIAC's information processing center at 55 Water Street.

* Western Union provides fiber optic communications for their customers and for other communications carriers. Western Union has the legal authority to use public right-of-way for communications systems, such as fiber optics.

Cable Television Systems In New York City

There are two cable television systems that are operational in New York City, both in Manhattan, with plans underway for cable television systems to be built in Brooklyn, Queens, Staten Island, and the Bronx. Manhattan Cable Television operates from 86 Street on the east side and 79 Street on the west side, south to Battery Park and including Roosevelt Island. Manhattan Cable TV has approximately 207,000 subscribers and provides 33 channels of cable programming. Manhattan Cable Television also has a subsidiary, Manhattan Cable Communications Systems, that provides

data transmission service to 12 organizations, including Bankers Trust, the Chase Manhattan Bank, Shearson American Express, Morgan Guaranty and the City of New York.

Manhattan Cable Television data transmission services are not distance sensitive and thus provide an advantage to users between lower Manhattan and midtown Manhattan. Once regarded as unreliable for data transmission, cable television systems have been improved their facilities, and Manhattan Cable Television has installed a redundant transmission system in the central business district. Furthermore, Manhattan Cable Television will soon be linked to the New York and American Stock Exchanges.

Group W Cable operates in upper Manhattan and has approximately 105,000 subscribers and provides 27 channels of cable programming. Because Group W Cable is located outside the Manhattan Central Business District, its services are primarily limited to providing residential customers with cable television.

An important example of how coaxial cable can be used for internal corporate communications is provided by the Chase Manhattan Bank's "Metronet" system in lower Manhattan. Chase Manhattan uses coaxial cable to link four buildings, 59 Maiden Lane, 80 Pine Street, 1 New York Plaza, and Chase Manhattan Plaza for high speed data transmission among these facilities. In addition, Chase Manhattan uses the coaxial cable for video conferencing between New York Plaza and Chase Manhattan Plaza and plans to eventually use the system for voice communication.In addition, the Chase "Metronet" system is connected via Manhattan

Cable Television's data transmission system to Chase Manhattan facilities at 350 Park Avenue as well.

Terrestrial Microwave Systems In New York City

Microwave transmission systems are used for point to point communications. Transmission occurs over a straight line, and this requires a line of sight transmission path. Users of microwave technology include broadcast television stations for their studio to transmitter links, AT&T, New York Telephone, RCA, and large commercial banks. Users of microwave transmission include:

* Hughes Communication links its Manhattan-based customers to its satellite earth station in Brooklyn.

* Broadcast Television Stations use microwave to connect studios to transmitters atop the World Trade Center. Mobile television vans use microwave to transmit "live news" to television studios, and WNET also uses microwave to link its Newark, New Jersey and Manhattan studios.

* Citicorp uses microwave transmission to communicate between facilities within New York City and to connect with its satellite facilities in New Jersey.

* Manufactuers Hanover uses microwave transmission to link its

corporate headquarters at 270 Park Avenue with its computer center at 4 New York Plaza and back office operations located at Hicksville, Long Island.

* McGraw-Hill has a microwave link from its headquarters in Manhattan to its corporate data processing and warehouse facilities in Heightstown, New Jersey.

* The New York Times uses microwave to transmit "news copy" to its printing presses in New Jersey and to satellite earth stations for distribution to printing presses across the country.

* RCA operates a private line voice and data service from its central terminal office at 50 Broad Street to its earth station in Vernon Valley, New Jersey.

* American Satellite Corporation has a microwave link from the World Trade Center to its earth station in Vernon Valley, New Jersey.

* Eastern Microwave is a common carrier microwave company that provides microwave transmission to a variety of private and public users. It has microwave relays at the World Trade Center, Penn Plaza, the Gulf and Western Building on Columbus Circle, and at other locations in New York City.

At the present time, it is virtually impossible to obtain a low frequency (and more reliable) microwave transmission path in Manhattan. Users must either do a search of FCC records and of actual frequency routes before an application is made to the FCC, or a user may lease a frequency from a regional common carrier, such as Eastern Microwave, that has been assigned groups of frequencies.

Cellular Mobile Radio In New York City

Until recently, mobile telephone service in the United States was highly limited. The advent of cellular mobile radio has created a new environment for mobile telephone service, and the Federal Communications Commission has authorized two firms to provide cellular mobile service in New York City, NYNEX and Cellular Telephone Company. NYNEX currently has more than 10,000 subscribers and expects to have 110,000 customers by 1990. The Cellular Telephone Company's system was given FCC authorization in October, 1984, and it is expected to go on line by the end of 1985.

Smart Buildings and Local Area Networks In New York City

A smart building can refer to a) an integrated management system for elevators, energy, security and other building services; b) an integrated telecommunications network for local, long distance and enhanced services, such as voice mail

and teleconferencing; or c) a building that provides integrated telecommunications and building management services. A local area network (LAN) provides a communications link, within a single building or among a number of buildings, for personal and mainframe computers, data storage banks, printers, and other computer and telecommunications equipment. The LAN can be provided by coaxial cable, copper telephone wire, or fiber optic cable, depending on the particular design and use.

Smart buildings usually offer "shared tenant services" (STS), sophisticated telecommunications services that are marketed to building tenants and which provide economies of scale and one-stop convenience for small and middle-sized firms. For real estate developers, shared tenant services offer a service to tenants and a potential source of revenue; in most cases, developers have formed partnerships with telecommunications firms to market and manage such building-based communications services. The leader in this evolving industry is Olympia and York, the largest real estate developer in North America and the owner of more than 14 million square feet of office space in New York. It is currently constructing the World Financial Center in Battery Park City, which will be the headquarters for American Express, Dow Jones, and Merrill Lynch.

Olympia and York has formed a joint venture with United Telecommunications, Inc., to create OlympiaNet, a telecommunications network that will offer advanced data, voice and video services to all its tenants. OlympiaNet services will

include a shared private automatic branch exchange (PABX), long distance telephone services, telephone equipment and two-way, full motion color video conferencing. There will be three OlympiaNet teleconferencing sites located in New York City, with the initial facility at 55 Water Street, and subsequent facilities to be opened at 237 Park Avenue and 1 World Financial Center. Additional OlympiaNet teleconferencing facilities will be located in Boston and Toronto with links to Chicago, Los Angeles, San Franscisco, Dallas, Atlanta, Washington, D.C., London, Paris, and Tokyo.

Tishman-Speyer is also constructing a "smart building" at 375 Hudson Street in lower Manhattan that will be designed to accommodate the latest telecommunications and computer systems. There will be facilities for satellite transmission from the roof, large floor areas for computer facilities, and vertical duct space for advanced transmission systems. Several other office buildings are under construction in New York City with similar capabilities for "shared tenant services."[7].

---

7. Eric N. Berg, "Sharing Telephone Services," The New York Times, August 27, 1985, p. D1.

TELECOMMUNICATIONS AND ECONOMIC DEVELOPMENT

From an economic development perspective, the City of New York has two separate interests concerning the telecommunications market and infrastructure. First, private firms require access to sophisticated telecommunications services and facilities, and New York City has a large number of information intensive industries that rely on competitively-priced telecommunications services. Second, an advanced telecommunications industry must remain a vital element in the city's economy. Because of the high demand for specialized telecommunications services, New York City has always been a leader for the introduction of new and innovative telecommunication services.

These economic development stakes depend upon regulatory policies that promote technological innovation and contribute to New York City's role as a world center for information-based services. Conversely, economically inefficient regulatory policies could constrain market competition and technological innovation and limit the continued development of the city's telecommunications infrastructure. One major policy issue concerns the growth of competitive technologies that allow large volume telecommunications users to "bypass" the public network operated by New York Telephone. Organizations have always been able to bypass the public network (often through services provided by New York Telephone), but the availability of new telecommunications systems and the desire to avoid long distance

access charges have contributed to increased use of bypass technologies. The Federal Communications Commission defines "bypass" as "the transmission of long distance messages that do not use the facilities of local telephone companies available to the general public, but that could use such facilities."[8]

It is useful to distinguish between "economic" and "uneconomic" bypass. "Uneconomic" bypass refers to the use of alternative communications facilities whose actual costs are below the telephone company's rates, but that may still be in excess of the telephone company's underlying costs. By contrast, "economic" bypass involves genuinely more efficient telecommunications service by alternative means.

A widely held concern is that new telecommunications systems will permit "uneconomic bypass" by encouraging providers to enter the market primarily to serve businesses with high telecommunications costs located in the central business district, and draw them away from the public telephone network. This has serious implications for the financial base of the telephone network since one-third of New York Telephone's long distance revenues are generated by three-tenths of one percent of its business customers.[9] New York Telephone reports that one in three of its largest customers already engage in

---

8. Federal Communications Commission, Common Carrier Bureau, Bypass of the Public Switched Network, December 19, 1984, p.7.

9. Michael Wines, "Teleports May be the Newest Threat to Bell Companies' Local Dominance" National Journal, 11/12/83, p.2352.

bypass and that more than half of New York Telephone's largest customers plan to bypass in the future.[10] The issue of "bypass" is under consideration by the New York State Public Service Commission, and the City of New York clearly has a major stake in its ultimate resolution.

---

[10]. Supplemental Testimony of Dr. Joseph S. Kraemer, New York Public Service Commission, Case 28710, June 1, 1984, p.2.

POLICY RECOMMENDATIONS

For the short-term, there are several steps that the City of New York can take to incorporate telecommunications into its economic development policy agenda. These include:

1. Promote the City of New York as a center for advanced telecommunications services. The vast array of satellite, fiber, and coaxial cable systems described in this report should be regarded as a strategic asset that can attract and retain firms engaged in information handling and processing. New York City has the most sophisticated and diverse telecommunications infrastructure of any city in the United States; this infrastructure is a comparative advantage that no other city can match at this time. The city's promotional efforts should emphasize the city's telecommunications infrastructure as an important part of the quality of life for business in New York City.

2. Encourage the decentralization of office activities from the central business district by using the optical fiber systems located throughout the city. The availability of two intra-city fiber systems, one operated by Teleport Communications, Inc., and one by New York Telephone, should be treated as a force for encouraging office development in low-cost locations outside Manhattan.

3. Preserve and maintain New York City as an information, financial and cultural content center. Much of New York City's pre-eminence in telecommunications is owed to the presence of leading publishing, entertainment and financial organizations that are leaders in the use of information and telecommunications technology. This critical mass of institutions provides the market for the innovative and competitive telecommunications industry within the City of New York.

4. Monitor state and federal telecommunications policymaking. Decisions made at the state and federal level influence the telecommunications services provided within the City of New York; consequently, the City has a major stake in assuring state and federal policymaking that allows the continued growth of the telecommunications industry in the City of New York. There is currently a major generic rate design proceeding before the New York State Public Service Commission with significant implications for the cost of telephone services within New York City that will determine pricing structures and rate-setting for future rate cases. Further, New York City has interests in other telecommunications policy issues: universal telephone service, lifeline telephone service for low-income residents, and a range of issues related to efficient pricing of telecommunications services currently under review by state and federal regulators.

5. Coordinate telecommunications policymaking within the City of New York. The City of New York, itself a major user of telecommunications services, should coordinate the different interests that it has in the regulation and development of telecommunications services and systems. This includes protecting the interests of both its residential and business communities. A coordinated city telecommunications agenda would identify and formulate policies for assuring adequate telecommunications facilities and services, thus contributing to the city's overall economic viability.