Approved _____
Date

MINUTES OF THE SENATE COMMITTEE ON WAYS AND MEANS.

The meeting was called to order by Senator Paul Hess at
Chairperson

4:15 a.m./p.m. on March 14, 1984 in room 123-S of the Capitol.

All members were present except:

Committee staff present:

Research Department: Ed Ahrens, Mary Galligan, Lynne Holt
Revisor's Office: Norman Furse
Committee Office: Mark Skinner, Doris Fager

Conferees appearing before the committee:

Dr. Mike Harder, Secretary of Administration

Presentation on State Telecommunications Plan

Dr. Harder distributed Attachment A, an executive summary of the state telecommunications plan, and a booklet entitled "Telecommunications System Plan, Volume II, March 1984." He then reviewed the information in Attachment A.

There were questions from committee members concerning the plan Dr. Harder presented. There was specific discussion concerning Dr. Harder's authority under present law to begin the bidding process and construction of a state telecommunications system. However, Dr. Harder's staff indicated the system will fail if the Legislature isn't willing to staff the system. In FY 1985, three positions will be needed, and that would increase to 30 or 35 additional eventually.

Committee members expressed concern about buying a system and having it become obsolete in a number of years. Staff indicated it takes 30 years to make a technical change in the communications system. It was also noted that private enterprise will be doing all the work on the system, but additional people are needed to administer the operation.

There was concern about competitive bidding. Staff indicated there will be bids for a large switch, and the state will get a good price on it. There was a brief discussion concerning the method of funding the plan. Some options for funding were: vendor financing and certificates of parcipation.

Dr. Harder offered to give members private briefings on this matter if they would like additional information.

State Employees Health Insurance

Senator Hess asked Dr. Harder about the progress of the health insurance plan for state employees. Dr. Harder stated there has been one formal meeting since the law took effect. Some scheduling decisions were made at that meeting. The first set of hearings have been scheduled, and interested people have been invited to present innovative ideas regarding health programs. When asked if there will be time to get the plan in place for the next fiscal year, Dr. Harder answered that the only question is if it will be necessary to enter into a one year contract until a three year contract can be negotiated.

The meeting was adjourned.

STATE TELECOMMUNICATIONS PLAN:
EXECUTIVE SUMMARY

I. Overview

Rising costs, increased competition and economies of new technologies are some of the factors creating an environment which has encouraged large users of telecommunications services to reduce reliance on regulated telecommunications providers through development of various types of private telecommunications systems.

The State of Kansas, as a large consumer of telecommunications services, has been affected by increased costs and changing conditions. In anticipation of difficulty in controlling telecommunications costs, the Telecommunications Office began developing a private telecommunications system concept which was subsequently evaluated between 1980 and 1982 by the consulting firm of Booz-Allen and Hamilton. Booz-Allen concluded that the proposed system was technologically and operationally sound and that it was appropriate for stated requirements.

This document summarizes the State Telecommunications Plan, as updated, the current telecommunications environment, and the consequences of maintaining the status quo, the capital costs of the proposed system, the estimated savings to the state, the system's impact on telecommunications providers, implementation schedule, financing methodology, and management.

II. The present situation

On January 1, 1984, the Bell telephone system, which had for years provided telecommunications consumers with complete service, no longer existed. In its place are four new competing organizations which are restricted in terms of operating areas and functions, and which are prohibited from developing working relationships with each other. The four companies are:

1. Southwestern Bell Corporation (SWB-C). SWB-C provides local wire and switching services, and intra-LATA long-distance services. SWB-C is a fully regulated utility and is prohibited from providing inter-LATA long-distance service or customer premises equipment (CPE).

2. Southwestern Bell Telecom (SWB-T). SWB-T is a fully separated, unregulated subsidiary of SWB-C which sells, installs and services CPE. In Kansas, SWB-C and SWB-T are distinct entities that are prohibited from establishing mutual business arrangements (may have arms length transactions only).

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3. AT&T Communications (AT&T-C). AT&T-C is a regulated utility providing inter-LATA and interstate long-distance service, including private line services. Inter-LATA service is regulated by the KCC, interstate service by the FCC.

4. AT&T Information Systems (AT&T-IS). AT&T-IS parallels SWB-T in that it is a fully separated unregulated subsidiary of AT&T-C selling, installing and servicing CPE. It also owns and controls "embedded CPE" (leased CPE that was in place on customer's premises on 12/31/83).

AT&T-IS and SWB-T are competitors in the CPE market, along with a number of other vendors. AT&T-IS will also be in competition with its parent corporation, AT&T-C, as it can construct private telecommunications systems that would take business from AT&T-C. It is clear from the outline of four new companies' scope of operations that 1) consumers are now faced with a number of telecommunications vendors with competing interests; and 2) telecommunications consumers can no longer get all of their telecommunications service from one entity.

State government telecommunications needs are now served by these companies as follows:

1. CPE - AT&T-IS owns all of the leased CPE on State government premises as of January 1, 1984. Any new CPE is deregulated and therefore subject to competitive bid laws. AT&T-IS, SWB-T and a number of other vendors could provide new CPE. Following deregulation, the competition between CPE vendors has become extremely intense.

2. Switching; local service - SWB-C provides all local service and, in six locations, Centrex switching service. Centrex is a switching service for interoffice operations in a localized area, such as the Capitol Complex.

3. Long distance - AT&T-C now carries the bulk of long-distance service for the state government. All interstate and inter-LATA calls are under AT&T-C. Although SWB-C can provide intra-LATA service, intra-LATA calls for the state go over KANS-A-N, a private line network which is now under AT&T-C. A comparison of AT&T-C and SWB-C revenues from KANS-A-N before or after divestiture illustrates this change.

12/83 annual rate for KANS-A-N:

SWB-C	$ 4,333,960 per year
AT&T-C	1,343,940 per year
Total	$ 5,617,900 per year

2/84 annual rate for KANS-A-N:

SWB-C	$ 1,455,876 per year
AT&T-C	5,061,564 per year
Total	$ 6,517,440 per year*

* The difference in totals between 12/83 and 2/84 is due to increased rates.

III. Projections of post-divestiture telecommunications costs

Now that divestiture has occurred, State agencies will feel an immediate impact from higher telecommunications rates. The most recent rate case alone will result in increases of the following amounts for the last half of FY 84 and for FY 85:

Remainder of FY 84 $ 590,354

$ 189,616 - local service
$ 358,167 - KANS-A-N
$ 42,571 - other intercity services

FY 85 $ 2,758,326

$ 1,197,482 - local service
$ 1,465,907 - KANS-A-N
$ 94,996 - other intercity services

Total expenditures are projected to double over the next eight years.

FY 84	$14,896,472	FY 87	$20,695,000
FY 85	$17,815,000	FY 92	$29,100,000

Calculations for the costs projections listed above include the effect of the recently mandated access charges, the discontinuance of TELPAK in FY 87 and an 8% escalating factor to account for inflation, future rate increases and normal growth.

Of these factors, the imposition of access charges and the discontinuance of TELPAK will have the most dramatic impact on State telecommunications expenditures. Access charges applied to Centrex lines and to private lines such as KANS-A-N are scheduled to take effect in April, despite the suspension of residential access charges. These charges will add $450,000 to state expenditures in FY 85 and will increase until FY 89. In FY 89, access charges will equal $1,100,000.

TELPAK is a bulk discount rate that forms the largest portion of the KANS-A-N rate structure. TELPAK will be discontinued in FY 86, forcing all of KANS-A-N to fall under the interexchange tariff. This will result in an immediate increase of $1,600,000 per year for KANS-A-N.

Finally, the cost projections include an escalation factor of 8% to account for the combined effects of future rate increases, inflation and normal growth. This 8% per year factor is used throughout and, based on average, annual rate increases of 15-20% since 1976, is a conservative figure.

It is clear that, with an increase in telecommunications expenditures over the next seven years of nearly 100%, examination of alternative telecommunications systems is a prudent and necessary step.

IV. The State Telecommunications System: Description, Capital Costs and Financing

A. Description

The entire system, as proposed, consists of the following elements:

1. Digital switches. Three large "nodal switches" would be located at Topeka, Kansas City (KUMC), and Wichita (WSU) to serve State offices in those areas. The Topeka switch would also include central control features for the entire State system. Additional switches would be located at KU, KSU and Fort Hays State University. Small, "private branch exchange" (PBX) switches are planned for later installation at other population centers.

2. Customer Premise Equipment. The State would acquire its own customer premises equipment (handsets and related hardware) in the six cities where switches will be installed.

3. Fiber optics transmissions system. Transmission between major agency population centers would be provided by a fiber optic transmission system built into the highway right-of-way per the State's own specifications and used exclusively for governmental use. This approach would include short lengths of microwave transmissions for city entry purposes.

The State system, although primarily designed to benefit the State through lowered operating costs, would at the same time provide the State with capability to economically add enhanced services, particularly in the rapidly-developing area of high speed data transmission. The technology used in the design of the system was chosen not only for its capability to provide such services, but also for its economy, reliability, efficiency and economy of maintenance. Finally, the system was designed not to be simply a short-term answer to rapidly rising costs, but to adequately provide for State telecommunciations needs over the next two to three decades.

B. Capital Costs, Financing and Repayment

Capital costs of the State telecommunications system are detailed in Volume II. A summary of the capital costs follows:

Local cable plant, switches, and CPE	$29,547,000
Central System Control Facility	$ 1,000,000
Project Management Costs	$ 1,170,000
Intercity Transmission Facilities	$ 6,597,000
Total Capital Costs of System	$38,314,000

The system would be acquired on a ten-year installment purchase basis. Several investment banking firms are interested in financing the project on a tax-free municipal funding basis, using certificates of participation financing, which would capitalize interest payments for the two-year construction phase. Repayment, which would start after the system has been cut over, would be made from fees charged to state agencies' communications operating funds. Financing could also be obtained from any of the large vendors. Throughout, all cost projections for the systems use an interest rate of 9.5%. The project would be centrally funded and managed by the Secretary of Administration.

C. Management

In order to protect an investment with the size and scope of the proposed State telecommunications system, and in recognition of the complexity of the post-divestuture telecommunications industry, the system would be managed on a centralized basis. New responsibilities related to the system would include supervision of vendor and maintenance contracts, engineering, planning and design, technical control of system operations, user services, and administration, including billing and usage tracking.

In order to carry the increased workload, 32 new positions would need to be added to the Department of Administration. Of these, 18 would perform clerical functions and 12 would have professional/technical responsibilities. No direct general fund appropriations would be necessary for those positions, as they would be funded through agency user fees.

V. Projected Costs Benefits to State

The capital costs of the State telecommunications system, which will be financed over a twelve-year period, total $38,314,000. During that same twelve-year period, state agencies will benefit from projected cost avoidances of $50,000,000 when compared with the costs of maintaining the status quo.

A more detailed examination of projected cost avoidance reveals that the switches and CPE are responsible for one-third of the total $50,000,000 savings, and that the bulk of the savings--two-thirds--result from the transmission system.

	Projected Costs of Status Quo (12 years)	Projected Costs of State System (12 years)	Projected Savings of State System
CPE Switches	$143.5 million	$127.2 million	$16.3 million
Transmission	220.1 million	186.0 million	34.1 million
Total	$363.5 million	$313.0 million	$50.4 million

All cost assumptions and details are presented in Volume 2.

VI. Effect of State Telecommunications Plan

The following projections of the effect of the proposed State Telecommunications Plan on regulated telecommunications providers and the general public are based upon expected operating costs for the State system during its first full year of operation (FY 88) and projected costs without implementation of the State Plan during the same year. The projections represent only effects that the Department is reasonably able to quantify using available information. Anticipated impacts that cannot be projected are also noted.

Impact on Southwestern Bell Revenues

When the State Telecommunications Plan becomes fully operational (FY 88), the impact on Southwestern Bell's revenues is estimated to be a decrease of only $963,000 in FY 88.*

*Some portion of the long-distance revenue that would be lost to AT&T under the State Plan represents access charges that AT&T passes on to Southwestern Bell. Southwestern Bell would lose some of these access charges under the State Plan, but no information is available that could be used to quantify that effect. The Department of Administration believes that the effect should be minimal.

Since divestiture (1-1-84), most of the long-distance traffic has been AT&T revenue. However, with State-owned transmission facilities crossing LATA boundaries, Southwestern Bell could receive all traffic within LATA's where they can serve us in accordance with the rules of divestiture. It is this point that greatly minimizes the effect of the State Plan on Southwestern Bell. Under the State Plan, Southwestern Bell revenue from intercity service will increase by $4,449,726 in FY 88. This helps offset a Southwestern Bell revenue loss of $5,412,949 in FY 88 from local service (14,800 Centrex lines) when State-owned PBX's become operational at the six Centrex locations.

Effect on AT&T

In FY 88, AT&T could lose $8,984,596 with the State Plan in effect. The estimated FY 88 revenue loss from implementation of the State Plan represents 7.9% of the estimated FY 88 AT&T gross operating expenses for Kansas intrastate services.

Effect on General Public

In considering the impact of the State Telecommunications Plan on the general public, any potential for increased rates due to lost revenues should be considered in light of the potential for reduced tax obligations due to lowered State costs. Although ratepayers and taxpayers cannot be assumed to be the same individuals in all instances, the comparisons should be a useful indication of the net impact on the general public.

Southwestern Bell. In any rate filing, individual consumers are affected differently than business users because rates are set by class of service, e.g., residential and various classes of business services. Therefore, two different measures of the effect on Kansas consumers due to Southwestern Bell revenue loss are presented.

1. The 1983 Telephone Engineering and Management Directory shows that, as of 1/83, Southwestern Bell was providing service to 1,610,594 telephones. If Southwestern Bell experiences a revenue loss of $963,000 in FY 88, and if there was no further growth in number of telephones served over the next four years, the monthly increase in rates, per telephone, would be 5 cents. However, this figure is artificially high; the number of telephones served by Southwestern Bell in 1988 should be higher than in 1983, reducing the effect per telephone.

2. Another way to measure the effect is to spread the revenue loss out per access line. Access lines are the lines coming into a premise. A residence would have one access line coming in, but may have more than one phone. Using a 1/84 figure of 937,050 for the number of access lines for Southwestern Bell, and applying the same methodology as above, the monthly increase in rates per access line would be 8.6 cents. Again, this figure is unrealistically high, as the number of access lines in FY 88 should have increased.

Using the access line measure, a residence with two phones may experience a rate increase of 8.6 cents per month, while the per telephone measure would result in an increase of 10 cents per month for the same household.

AT&T. As noted before, AT&T would probably lose 7.9% of estimated 1988 intrastate gross operating expenses. However, this loss does not automatically translate into a 7.9% increase in intrastate long-distance rates. A number of factors affect the long-distance tariffs, making it impossible to estimate the actual impact on Kansas consumers. One factor that would tend to reduce the impact is the availability for future use of transmission facilities abandoned after the State system becomes operational. AT&T capital investment in new facilities would be reduced for a time, as it would not have to build new facilities to accommodate growth.

Taxes. Kansas taxpayers could benefit from the State system through lowering of State operating expenses. The Department of Revenue reports that there are currently 1,056,445 Kansas taxpayers. The projected $50,000,000 in state savings over a 12-year period average $4.1 million/year or $3.94/taxpayer/year.

Summary of Effects Due to:

Southwestern Bell revenue loss* - increased rates of less than 5 cents/month/phone (60 cents/year), or less than 8.6 cents/month/access line ($1.03/year);

AT&T revenue loss - probably less than 7.9% increase in intrastate long-distance rates;

Reduced State operating expenses - decreased taxes needed in the amount of $3.94/ year/taxpayer.

*There could be some additional impact due to reduced access charges passed on by AT&T. However, the Department of Administration considers all of these projections to be based on a "worst case" scenario and believes that it is possible consumers may not experience any measurable change in their phone bills due to the State system.

Based on the above projections, the net impact of the State telecommunications system probably would be negligible or, in many instances, positive and beneficial.

VII. Implementation Alternatives

As the Department of Administration has reviewed the changes in the telecommunications industry and the future telecommunications needs of State government, three options have been identified:

1. Maintain the status quo (continue to use regulated providers as we do now).

2. Build the entire State system (switches, CPE and fiber optics transmission with leased private line to carry long-distance transmission not on the fiber optics routes).

3. Implement only the switches and CPE portion of the Plan.

Under the status quo, the State can expect its telecommunications costs to double over the next eight years. Therefore, the Department has concluded that the first option is unacceptable. However, the Department of Administration is not prepared, at this point in time, to make a final recommendation regarding the second and third options. Instead, the Department is proposing to keep both alternatives alive by soliciting two bids in mid-summer.

One bid would be for the switches and CPE. It would be followed by a bid for transmission with two options--constructing a fiber optics transmission system or providing existing digital transmission facilities on a leased, special assembly (unregulated) basis. By allowing vendors to submit bids for both types of transmission, the State will be able to evaluate both options and will be able to select the type of transmission which would be most cost-effective for state government. Only by requesting bids for both leased transmission facilities and for State-owned fiber optics transmission will the State have sufficient data to make an equitable, informed evaluation of the two alternatives.

Conclusions

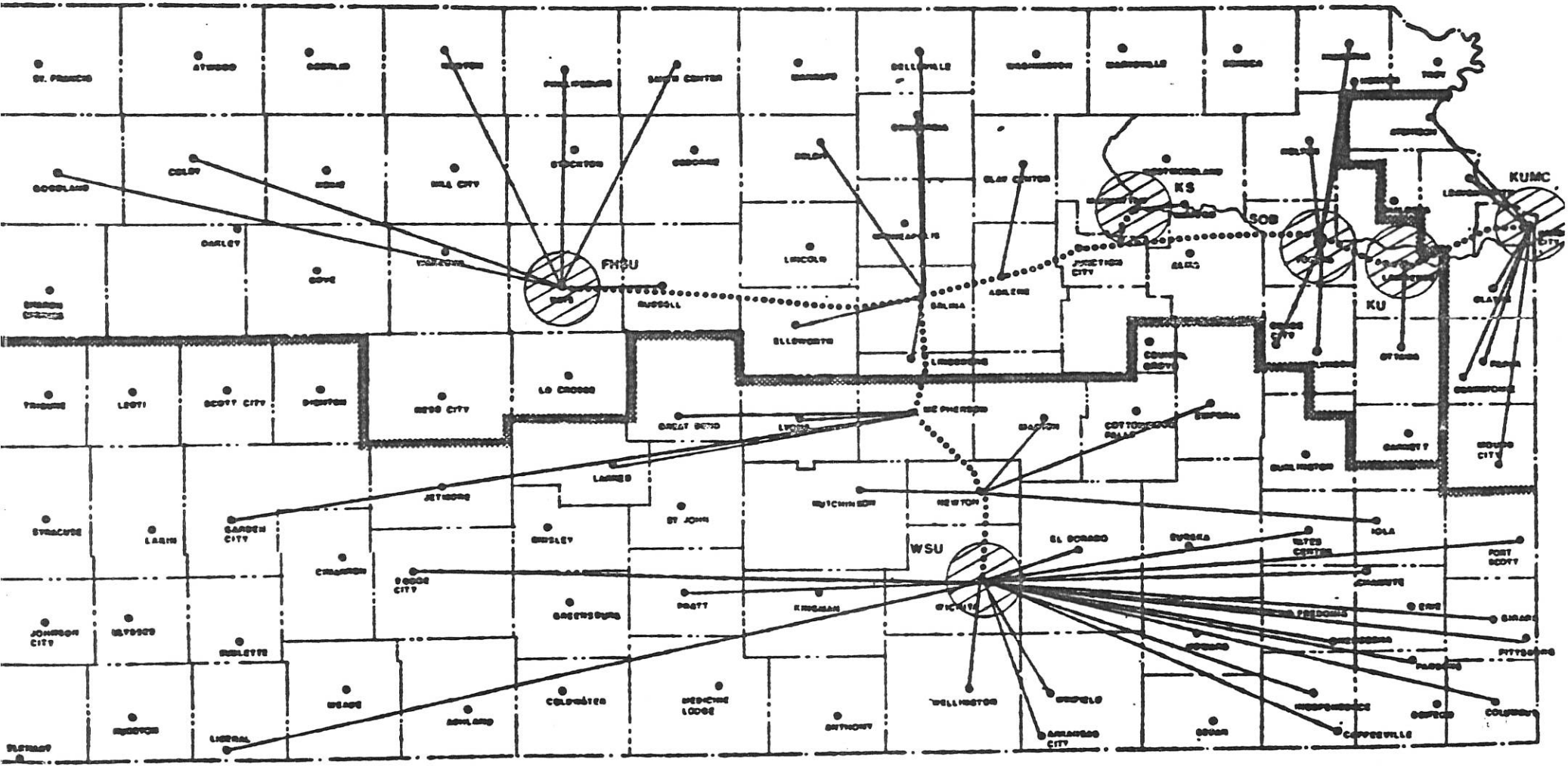
Divestiture and deregulation have now occurred. The immediate and long-range effects on State telecommunications costs can now be predicted with reasonable accuracy. The State can expect a doubling of State expenditures over the next eight years.

The Telecommunications Plan, now fully developed and refined, offers one viable means to reduce telecommunications expenditures. The Department of Administration projects that over a 12-year period, the proposed State system would result in cost avoidances of $50,000,000.

Legislative support of additional staff needed as the system is implemented will be critical. These additional staff will be funded by user charges and will not require a general fund appropriation.

The Department of Administration recommends proceeding with preparation of bid specifications for the entire system. RFQ's, to be released in mid-summer, will state that vendors can bid on the fiber optics transmission system or propose a leased transmission system. Such an approach will allow the State to directly compare the proposed fiber optics transmission system with leased transmission to determine which will be most cost effective for the State.

PROPOSED STATE TELECOMMUNICATION SYSTEM



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STATE PLAN
TELECOMMUNICATIONS FACILITIES PROJECT
CAPITAL COSTS
January 1984

Telephone Switch, Microwave, and Cable Plant		
1.	Topeka Capitol Complex 7,500 ports	$ 7,130,000
2.	Kansas University Medical Center 4,500 ports	4,200,000
3.	Kansas University 7,000 ports	7,400,000
4.	Kansas State University 5,900 ports	6,230,000
5.	Wichita State University and Wichita Complex 3,025 ports	2,932,000
6.	Fort Hays State University 2,000 ports	1,655,000
	Sub-Total	$29,547,000
Intercity Transmission Facility		
1.	Kansas City, Topeka, Salina, Wichita	$ 5,200,000
2.	Salina, Hays	1,397,000
	Sub-Total	$ 6,597,000
Central System Control Facility		$ 1,000,000
Project Management Costs (Capitalized)		$ 1,170,000
	Total Capital Cost of Project	$38,314,000

Encl. 2

POSED TELECOMMUNICATIONS INSTALLATION SCHEDULE

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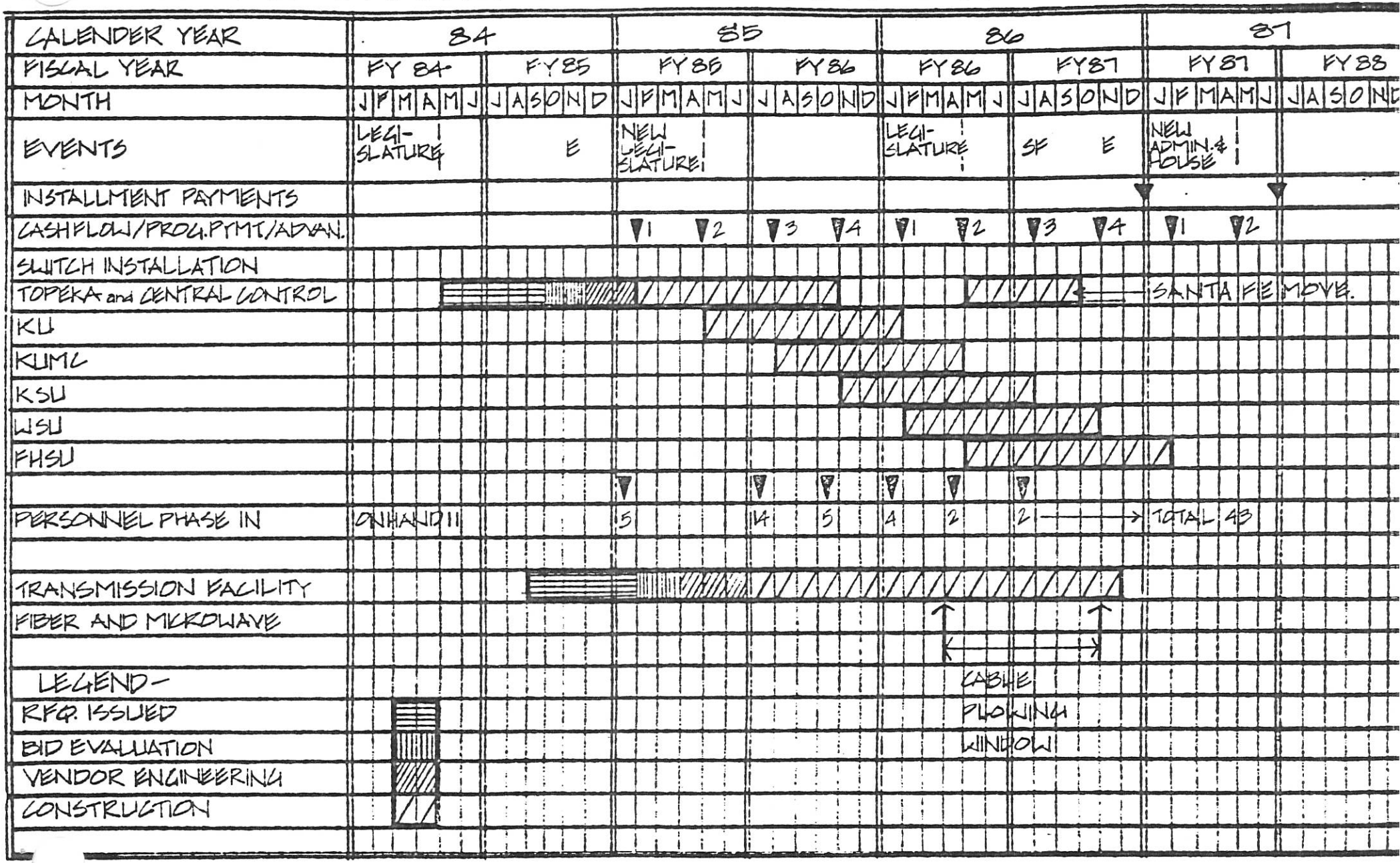

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PROJECTED ANNUAL COSTS (000's)

STATE SYSTEM PLUS RESIDUAL COMMERCIAL SERVICE

Cost Elements	FY 85	FY 86	FY 87	FY 88	FY 89	. . .	FY 95	FY 96	FY 97	FY 98	TOTAL
Fixed Costs: Capital Repayment	- -	- -	2,330	6,425	6,415	. . .	6,305	6,290	5,915	- -	65,515
Variable Recurring Costs											
Intercity Servcie (Residual)	7,562	9,579	9,728	8,194	8,849	. . .	14,043	15,166	16,379	17,690	163,259
Local Exchange Service	6,864	7,610	1,087	1,166	1,252	. . .	1,929	2,076	2,234	2,405	34,425
Total Variable Recurring Costs	14,426	17,189	10,815	9,360	10,101	. . .	22,277	23,532	24,528	20,095	197,684
State Costs	604	641	3,330	3,596	3,884	. . .	6,163	6,656	7,189	7,764	64,433
Tax Revenue Lost	- -	- -	626	895	969	. . .	1,485	1,597	1,718	1,848	15,158
Total State System Projected Costs	15,030	17,830	17,101	20,276	21,369	. . .	29,925	31,785	33,435	29,707	342,790

PROJECTED ANNUAL COSTS (000's)

CONTINUE SBC AND AT&T SERVICES

Cost Elements	FY 85	FY 86	FY 87	FY 88	FY 89	. . .	FY 95	FY 96	FY 97	FY 98	TOTAL
Fixed Costs: Capital Repayment(CPE)			2,268	2,268	2,268	. . .					11,341
Variable Recurring Costs											
Intercity Service	7,562	9,579	11,786	12,729	13,747	. . .	21,815	23,560	25,445	27,480	240,801
Local Exchange Service	6,864	7,610	5,987	6,579	7,116	. . .	10,661	11,428	12,257	13,152	125,304
Total Variable Recurring Costs	14,426	17,189	17,773	19,308	20,863	. . .	32,476	34,988	37,702	40,632	366,105
State Costs	584	534	1,537	1,660	1,792	. . .	2,844	3,072	3,317	3,583	30,283
Total Telco Projected Costs	15,010	17,723	21,578	23,236	24,923	. . .	35,320	38,060	41,019	44,215	407,729
Total State System Projected Costs	15,030	17,830	17,101	20,276	21,369	. . .	29,925	31,785	33,435	29,707	342,790
Avoidance (000's)	- -	- -	4,477	2,960	3,554	. . .	5,395	6,275	7,584	14,508	64,939
Cumulative Cost Avoidance (000's)			4,351	7,311	10,866	. . .	36,572	42,847	50,431	64,939	64,939

Encl. 4

FOREWORD

For the last four years we have been working in an atmosphere of uncertainty regarding the future structure and functioning of a major portion of the telecommunications industry. Now that uncertainty has been essentially dispelled and new realities have emerged.

Whereas in the past we had one organization to serve and provide our "cradle to grave" telecommunications needs, today we have several. Whereas in the past continuous rental of facilities was the norm, today that is no longer a viable option, and ownership is the accepted and preferred mode. Whereas in the past almost all costs of service were specified by regulatory bodies, today and in the immediate future, more and more of these services are being subjected to competition in the market place.

Similarly, there was uncertainty about the new digital and fiber optic technologies and fears of technological obsolescence. But now standards have been established and while continued marginal "tweaking up" of the technology will occur, there is a virtual stampede in the telecommunications industry to adopt these technologies now, in order to compete and participate in the "Information Age" presently in its infancy. Additionally, it is a matter of historical record that major technological changes have occurred only about every 30 years since the days of Napoleon's trans-European semaphore system. We are at the end of the "analog" period and just starting on the "digital" period and there is nothing in sight at this time to indicate that any great change will occur in the next 30 year period. In fact, the elemental nature of the digit mitigates against any disabling changes in a digital format for telecommunications purposes.

The realities which have emerged from the preceding developments that have relevance to our circumstances today are; that we are at the "trough" or low point in the research and development/production cost curve for both fiber optic and digital technologies and; that the major manufacturers and vendors of products using these technologies are in intense competition for a share of the market. There will never be a better time to accquire a system based on these technologies than now.

The state system uses these technologies and it will serve state agencies well and faithfully for many years to come. It will be immediately cost effective at cutover and increasingly so in the future. But cost alone is not the single most important criterion. We are building a system for the future and the real benefits are downstream a few years, three to seven years, as the "Information Age" gains momentum and we are finally able to extend the power of the computer wherever needed for state purposes because the telecommunications system necessary to do that is in place.

I can only urge that we proceed with system implementation without further delay.

Laurence J. Kunkel
Director of Telecommunications

STATE OF KANSAS
TELECOMMUNICATIONS SYSTEM PLAN

VOLUME II

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APPENDIX A - ENCLOSURES

STATE OF KANSAS
TELECOMMUNICATION SYSTEM PLAN
VOLUME II

SECTION I. THE SITUATION

DEREGULATION AND DIVESTITURE

For the past four years we have been observing developments in the telecommunications industry and speculating what the end results of deregulation and divestiture might be. On 1 January the need for speculation ceased, as reality emerged. Following is the reality we must deal with today.

1. "Ma" Bell no longer exists to provide our "cradle to grave" telecommunications needs. It has been replaced in Kansas by four separate entities each having clearly defined, and in some cases, severely restricted operating areas and functions. None are allowed to have a subsidizing business arrangement between them, but must deal at "arms length" or on equal terms with all customers basis, and all are in competition with each other. These entities, all operating in the State of Kansas, are:

    a. Southwestern Bell Corporation (SBC)
    b. Southwestern Bell Telecom (SBT)
    c. AT&T Communications (AT&T-Comm)
    d. AT&T Information Services (AT&T-IS)

2. Southwestern Bell Corporation is allowed to provide Local Exchange, Intra-LATA (Local Access Transport Area - see Figure 1) wire and switching service. It may not provide communications services across LATA boundaries and it may not own, sell, or manufacture Customer Premises Equipment (CPE). It now occupies a position in the economy which is similar to that of a local electric power or gas service utility. All services are provided under a tariff approved by the K.C.C.

3. Southwestern Bell Telecom is a fully separated subsidiary of SBC. It has no connection with the local SBC organization in Kansas and is only related to it at the corporate level in St. Louis. SBC and SBT must deal at "arms length" with each other and may not have a subsidizing business arrangement between them. SBT's purpose is to sell, install, and service CPE. Its function is similar to that of an appliance distributor.

4. AT&T Communications provides inter-LATA and interstate long distance switched and private line telecommunications service. It now provides and operates all KANS-A-N facilities. Interstate rates are tariffed by the F.C.C. and intrastate interLATA rates are tariffed by the K.C.C. In this latter matter, the K.C.C. has decided to discontinue authorization of the "Telpak" (bulk transmission service) tariff at the end of 1985. Thereafter, all KANS-A-N transmission service will fall under the Interexchange (IXC) tariff with an immediate cost increase of $1,600,000 per year for KANS-A-N. See Figure 2.

LATA filing defines service areas; Kansas to have three

Areas served by Southwestern Bell in its five-state territory will be grouped into 25 regions called Local Access and Transport Areas (LATAs), according to a plan filed in federal district court in Washington, D.C.

Three of the LATAs will be in Kansas, James B. Ellis, assistant vice president-revenues and public affairs in Topeka, said.

LATAs—which must be approved by Judge Harold Greene—define the areas in which local companies, such as Southwestern Bell, will operate after divestiture. Southwestern Bell will provide all local exchange service and any long distance service within each LATA. AT&T and other long distance carriers will handle calls between points in different LATAs.

"The Oct. 4 filing in general calls for Southwestern Bell-served exchanges in the 913 and 316 areas codes to become the Topeka and Wichita LATAs, respectively," Ellis said. "Metropolitan Kansas City would make up a separate LATA and includes communities on both sides of the state line."

Any long distance carrier wishing to provide service between LATAs would be given access to a particular LATA on an equal basis with all other long distance carriers seeking to serve the area, Ellis pointed out.

"The charge for access to the LATAs, that is, to the local network, will be based on the cost of providing that service," Ellis said. "Specifics of how those access charges would be structured aren't worked out yet," he added.

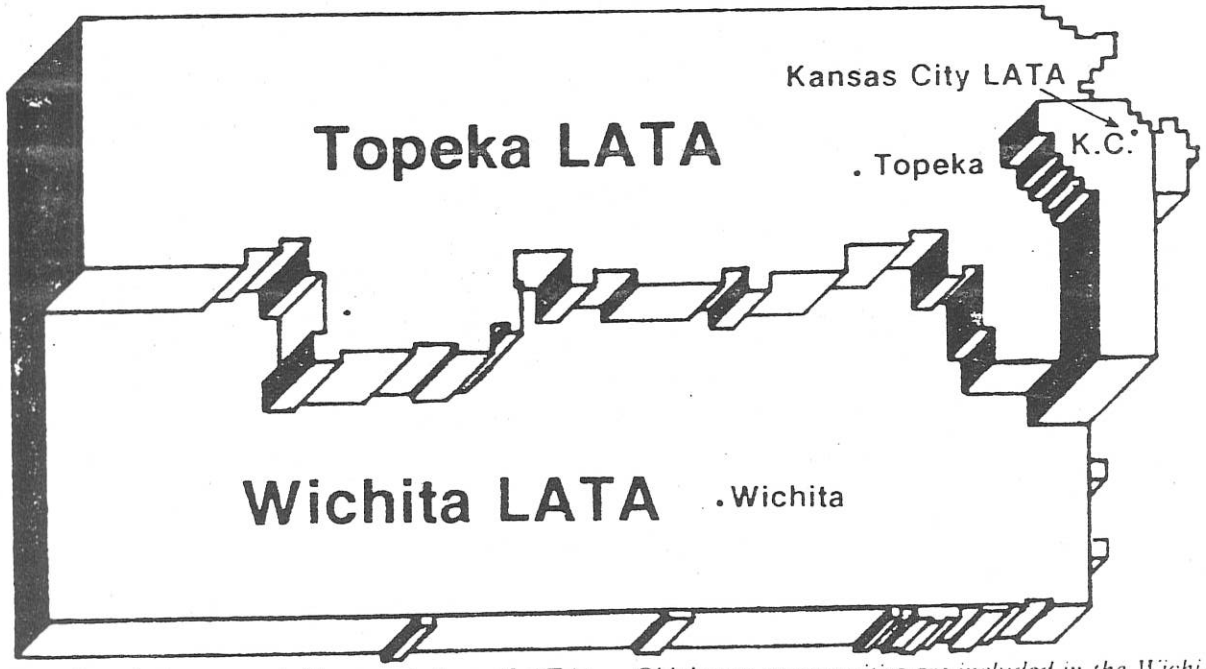
The LATA filing, which calls for 161 LATAs throughout the Bell System, is a forerunner to the full AT&T reorganization plan which must be submitted for Justice Department and court approval within six months of the Aug. 24 approval of the Consent Decree. AT&T plans to submit its reorganization plan for court approval well ahead of the late February deadline.

Final approval of the LATAs will not affect authority of any regulatory agency over local and long distance calls, Ellis noted. The LATA plan will preserve existing local calling and non-optional extended area service arrangements, he said.

"Each LATA includes within its boundaries a number of communities and local telephone exchanges," Ellis said. "The boundaries of these local exchanges would not be altered under the plan, so its approval by the court would not disrupt the provision of basic telephone service.

"What is considered a local call today will remain local," Ellis continued. "What is long distance will remain long distance." For that reason, six Oklahoma and three Missouri communities are included in the Wichita LATA where local calling scopes cross state lines, Ellis said.

Court procedures allow intervenors 30 days to comment on AT&T's Oct. 4 filing. AT&T and the DOJ have 20 days following that in which to respond. U.S. District Court Judge Harold Greene recently added another step to the process which will allow intervenors a 15 day period for comment on the responses that AT&T will make to the initial round of intervenor comments now under way. After that, the court will begin its deliberation. There are 109 intervenors in the case and Judge Greene said no more will be allowed.



The Local Access and Transport Area (LATA) plan filed recently defines the areas in which local companies, such as Southwestern Bell, will operate after divestiture. Because the LATA plan preserves existing local calling and non-optional extended area service arrangements, three Missouri and six Oklahoma communities are included in the Wichita LATA, as shown on the map, where local calling scopes cross state lines. In one instance, an Oklahoma LATA will extend into Kansas. Metropolitan Kansas City will make up a separate LATA that includes communities on both sides of the state line.

TELPAK COST COMPARED TO IXC COSTS

TELPAK WILL NO LONGER BE AVAILABLE AFTER 1 JANUARY 1986. IXC IS THE ONLY TARIFFED PRIVATE LINE AVAILABLE TO REPLACE THE TELPAK CIRCUITS IN THE STATES VOICE AND DATA NETWORKS.

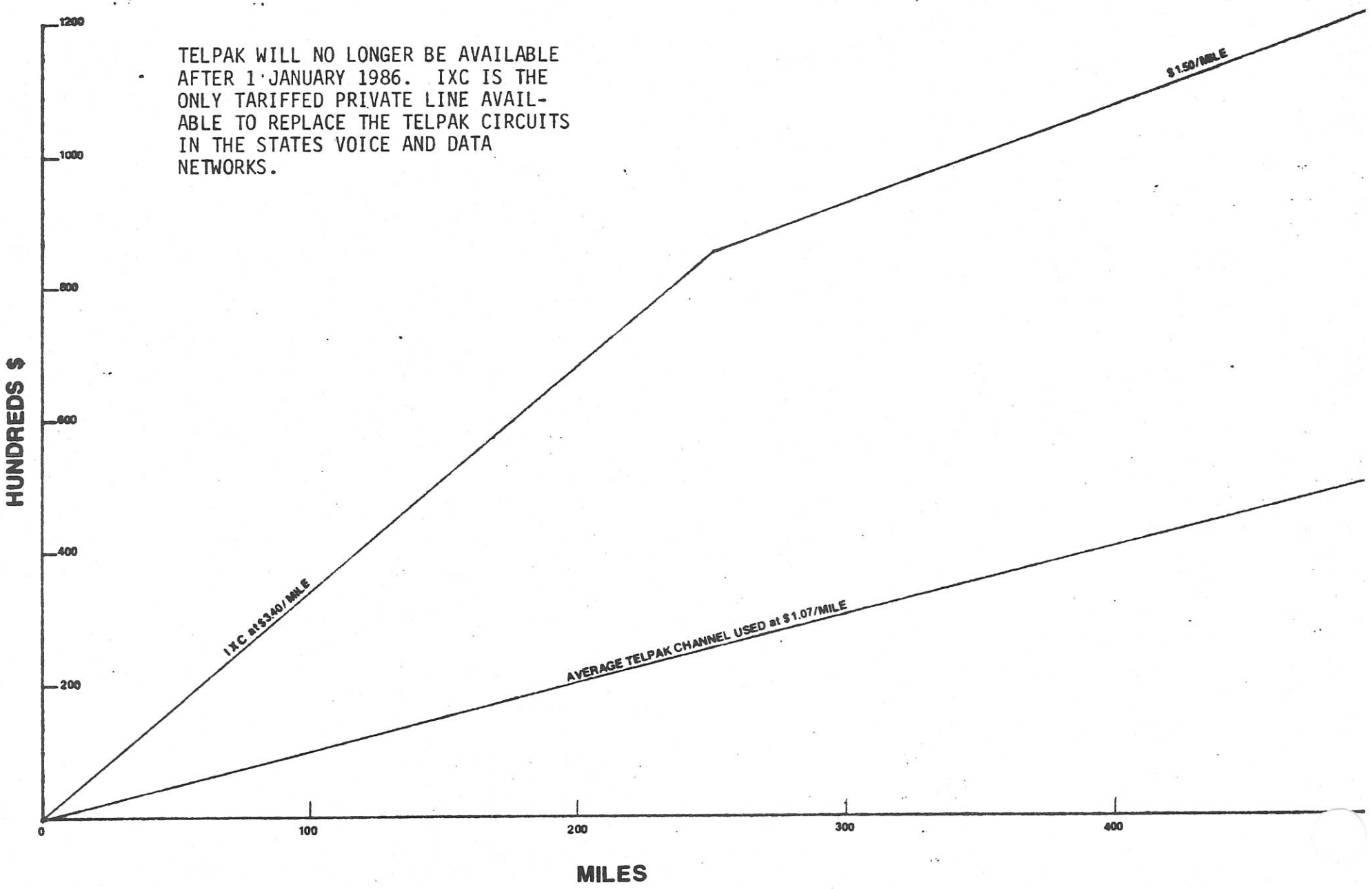


Figure 2
Page T-1b

5. AT&T Information Systems.

   a. AT&T Information Systems is a fully separated AT&T subsidiary having no relationship to AT&T Communications other than at the corporate level in New York. The function of AT&T-IS is to sell, install, and service CPE. It too, occupies a position similar to that of an appliance distributor. It is in a fully competitive relationship with Southwestern Bell Telecom (SBT) and it is also in competition with AT&T Comm in that it can and will construct private intercity telecommunications systems and facilities.

   b. As of 1 January 1984, AT&T-IS owns all of the embedded CPE (that which was in place on customers' premises on 31 December) and collects monthly rental in accordance with an F.C.C. directed and controlled pricing schedule. AT&T-IS is required to maintain this equipment. This situation will remain firm through calendar year 1986, after which all CPE is expected to become fully deregulated and its further support uncontrolled. With the exception of single line "Touchtone" telephones, Com Key, Horizon, and Dimension multi-line telephone systems, all the remaining CPE is obsolete, costly to maintain, and its support is becoming increasingly difficult because of the scarcity of spare parts and lack of trained technicians to service it. More than 90% of the CPE used by state agencies falls in this category. AT&T-IS is expected to discontinue support for this CPE after 1986 and in effect, abandon it in place. As an alternate approach, migratory pricing policies featuring increasing costs for maintenance would provide incentives to users to replace the old equipment. Under these circumstances the state will have no alternative but to replace all the existing CPE with new CPE. The state's total involvement, if all CPE to include Centrex switched service is replaced with state owned equipment, is estimated at $35,000,000. See figure 3.

6. Other than the four entities listed above, potential telecommunications equipment and service providers consist of several large operating telephone companies such as General Telephone and Electronics (GTE), United Telecommunications, Continental Telephone Company, Centel, and other smaller vendors. Another large company is Southern New England Tel (SNET), which is actively engaged in this kind of undertaking. Some potential intercity service providers would be MCI, Sprint, or Satellite Business Services (SBS) but their presence in Kansas either does not exist at this time or is very limited.

TOTAL STATE INVOLVEMENT
TELECOMMUNICATIONS EQUIPMENT AND FACILITIES
REPLACEMENT COSTS
January 1984

Large Centrex Systems	
1. Topeka Capitol Complex 7,500 ports	$ 7,130,000
2. Kansas University Medical Center 4,500 ports	4,200,000
3. Kansas University 7,000 ports	7,400,000
4. Kansas State University 5,900 ports	6,230,000
5. Wichita State University and Wichita Complex 3,025 ports	2,932,000
6. Fort Hays State University 2,000 ports	1,655,000
Sub-Total	$29,547,000
Central System Control Facility	$ 1,000,000
Small PBX's	
37 systems, 4,100 lines	$ 3,700,000
Multi-line Key Systems	
188 systems, 1,646 stations	$ 905,000
Single Business Line Stations	
539 stations	$ 54,000
Sub-Total Local Telephone Plant	$35,176,000
Intercity Transmission Facility	
Kansas City, Salina-Wichita	$ 5,200,000
Salina-Hays	1,397,000
Topeka, Emporia, Pittsburg	2,600,000
Hays-Colby	1,516,000
Oakley-Garden City	1,282,000
Salina-Beloit	1,052,000
Sub-Total Transmission Facility	$13,047,000
TOTAL INVOLVEMENT	$48,263,000

IMPACTS OF DEREGULATION AND DIVESTITURE

The purpose of deregulation was to bring about competition in the telecommunications industry, and the purpose of divestiture was to assure that competition would result.

As we can see from the preceding discussion, a competitive situation does exist in the provision of CPE, but in the area of transmission and switching services a truly competitive environment does not and may never exist.

A Bell operating company still has a monopoly over local exchange service and only slightly less so over intraLATA intercity service. No one has the capital or the inclination to start a rival local telephone company and realistically could not develop a customer base of sufficient size to displace any existing independent company, let alone one as large as a Bell company.

Similarly, AT&T now serves 95% of the interstate intercity market. Even though the Other Common Carriers (O.C.C.) such as MCI, Sprint, etc. are providing some competition, they are still very limited in their coverage and the quality of their service suffers frequently because of poor transmission characteristics. Intercity service also requires large outlays of capital, as well as an identifiable and realizable customer base. Under these circumstances, competition is not too effective, and costs are not going to come down until demand and greater competition dictate.

Thus, divestiture and deregulation have had a major impact on the provision of CPE, even to the extent that private ownership at all levels of individual and business usage is the only viable option to be exercised. However, the provision of transmission and switching services has not been severely impacted and will continue under regulation at present cost and service levels.

THE TECHNOLOGY

While there was never any doubt about the need for converting to digital technology, there were many who were fearful of converting and then being faced with technological obsolescence.

However, the basic underlying technology applicable to the telecommunications industry has been established and standardized. That standard is the digital format identified as T-1, PCM, TDM using either the 1.544 or 2.038 megabit transmission rate. PCM means Pulse Code Modulation, and TDM stands for Time Division Multiplexing. The 1.544 megabit rate is the American CCITT standard and 2.038 rate is the European CCITT standard. Both are readily compatible with each other and the standards established will remain unchanged far into the future simply because of the elemental nature of the digit. All manufacturers, vendors, and operating companies have adopted this standard and are now phasing out analog facilities on a time schedule amenable to their situations.

The companion to the T-1 standard is the fiber optic transmission system. This high capacity, high speed media is now capable of transmitting 565 megabits of information per second which is equivalent to more than 8,000 telephone conservations over one hair thin glass fiber. AT&T has built over 1,000 route miles of this system on the east and west coasts. A combine formed between the Chesapeake and Ohio Railroad and the Southern New England Telephone Company is building a 5,000 route mile system east of the Mississippi. The "Katy" railroad is building a system in Texas and both Southwestern Bell and United Telecom have installed some fiber optics in Kansas. Both Southern Bell Telephone Company and Southwestern Bell have announced that they plan to start installing fiber optics for local exchange plant and this is the first step necessary to bring the full power of the computer to the home and the business office. Conversion to high speed transmission facilities is essential since it is the "transmission system" that will fuel and drive the "Information Age" which we are now entering.

Since a fiber optic system transmits light waves, a new term has been introduced to identify the technology. It is "photonics".

Technological obsolescence need not be a fear if these two technologies and the established standards are adopted. While there will be many new digital applications and end items developed, they can all be accommodated on a system using these standard technologies. The advances that technology does make will only result in smaller size, more versatility and power, and less cost for the application end item.

COSTS OF REGULATED SERVICES

It was widely and generally assumed that the effects of deregulation and divestiture would be to bring about an immediate reduction in regulated service costs. However, costs of regulated services have increased and are not likely to decrease for some time to come. Why?

The reasons are that both AT&T and the operating companies are burdened by a huge inventory of costly to maintain, obsolescent local exchange plant and intercity switching and transmission facilities. While these are still usable, they are expensive to operate and cannot be written off or depreciated at an increased rate without adversely impacting either the rate structure or the financial standing of the companies. Accelerated depreciation has been approved by the F.C.C. Additionally, the operating companies must upgrade present long distance service access facilities provided to the O.C.C. so that they can enjoy access transmission facilities equal in quality to those of AT&T, and so that the end users can select the intercity carrier of their choice. This will cost about $2 billion dollars and take two to three years to accomplish.

Furthermore, the AT&T network which is predominantly "analog", must be converted to a "digital" system. The onset of the "Information Age" demands this because high speed transmission facilities are needed to extend or make available the power of the computer to off premise or remote users. Without an adequate transmission facility the power of the computer is limited to the room, or the building, or at best, the campus on which it is located. Thus, it is the "transmission system" that will fuel and drive the "Information Age" and it will cost AT&T a considerable amount to upgrade their system.

Another item mitigating against cost reduction is the controversial "access charge". Although its application has been suspended for residential and single line business users, it is scheduled for implementation in April for all business multi-line and Centrex users. These charges will add $540,000 to our state telephone bill in FY 85 and will increase each year until they level off at $1,200,000in FY 89.

Another argument the operating companies make is that in losing CPE to AT&T they lost a disproportionate amount of income producing rate base so that a greater return must now be made by a smaller and less profitable income producing rate base.

In all fairness to AT&T and the operating companies, they warned that local telephone service rates would not come down because of divestiture and that intercity service rates would be slow to exhibit any significant decreases.

OUTLOOK FOR STATE TELECOMMUNICATIONS COSTS

We have already alluded to the effects of the discontinuance of "Telpak" and the imposition of the "access" charge. In addition, we will have no option but to replace obsolete CPE because of the withdrawal of support by AT&T. This will require a one-time outlay of $9,000,000 or as an alternative, the CPE may be purchased on an installment basis over a five year period at $2,268,000 a year which is roughly equivalent to the annual rental cost in FY 87.

Assuming the above added costs and applying a modest annual 8% escalation factor for inflation, normal rate increases, and usage growth, the following annual total costs of retaining the "status quo" existing in FY 85 (use only SBC and AT&T service) will be as follows:

FY 85	$17,015,000
FY 87	$20,695,000
FY 92	$29,100,000

SUMMARY AND CONCLUSIONS

1. A competitive environment exists for the acquisition of CPE.

2. There is no competition for local wire and switched services.

3. There is virtually no competition for intercity services.

4. Both local wire and switched services and intercity services will remain regulated and no decreases in price are anticipated. The cost of regulated service will continue to increase in accordance with telephone company income requirements.

5. If the "status quo" regulated telephone services are used exclusively, annual state costs will double in about seven or eight years.

6. Digital and fiber optic technologies which underly the telecommunications industry are established and standardized and technological obsolescence need not be feared.

7. The state has no option but to acquire its own CPE, and since all regulated costs will certainly continue to rise, acquisition of the proposed state sytem should be undertaken as a means not only of cost control but to permit improvements in state government operations.

8. Because there is no longer one source of supply for the many classes and items of telecommunications equipment and services used by the state; because of the increasing complexity of the telecommunications industry; because of the growing numbers of suppliers, each contending for the state dollar; and because of the increasing use of telecommunications to bring about efficiency and economy in state government operations, it is more essential than ever that a staff of professional telecommunications personnel be supported to provide technical and management expertise for the state's telecommunications needs.

SECTION II. SYSTEM DESCRIPTION

BACKGROUND

Starting in FY 80, and every year thereafter, the state has been subjected to ever increasing telephone company service rate increases. Concurrently, Federal Communications Commission (F.C.C.) directed deregulation of Customer Premises Equipment (CPE), along with the Federal Court directed divestiture of AT&T, are causing fundamental changes in the way telephone service has been traditionally provided with further cost increase impacts. Additionally, technological advances and increasingly powerful and user friendly telecommunications systems are catapulting our society into the "Information Age" by permitting us, through the application of the latest telecommunications techniques, to take maximum advantage of computers and video services at all levels of government operations and administration.

The administration, perceiving the impacts of the preceding circumstances initiated action to determine the best approach to take to the situation and to proceed on the basis of the conclusions reached. It was concluded that in order to achieve an adequate level of service at an acceptable cost, the best course of action for state government was to acquire, own, and manage its own private statewide telecommunications system.

The telecommunications Office was directed to develop a concept for a system and perform a feasibility study. This was then submitted to a nationally known communications consulting firm, Booz-Allen & Hamilton, for evaluation. Their conclusion was that the system proposed was technically and operationally sound and was the best system to meet the known and stated requirements. Subsequently, Booz-Allen was selected to prepare an implementation plan and this was presented to the legislature in the FY 82 session.

This document is an update of that plan performed by the Telecommunications Office staff. It makes certain configuration changes resulting from the need to take prompt action to reduce costs and to secure maximum cost and savings advantages through a volume buy, considering the current competitive environment and the down stream advantages of commonality and standardization.

SYSTEM DESCRIPTION

The state telecommunications system will employ the most advanced, proven and in use digital technology in conjunction with lightwave technology (fiber optic cable). This system will provide services not currently technologically feasible or otherwise immediately available using leased facilities. It will provide a capability for addition, at very nominal cost, of enhanced services which are possible and available now, as well as any that are foreseen or under developmnent, either as to type, variety, or quantity. It will provide all the telecommunications services needed by the state well past the year 2000.

The system consists of a transmission facility serving the major population centers in the state and six large switching centers. The Central Control switch is to be located in Topeka and will provide all the switching and central system control facilities necessary for intercity service, as well as serving most state agencies located in Topeka. Nodal switches are to be located at Kansas University Medical Center in Kansas City, serving the Kansas City area, and at Wichita State University to serve the Wichita area. Switches at major population centers, such as Kansas University at Lawrence, Kansas State University at Manhattan, and Fort Hays State University at Hays, will serve those campuses. Private Branch Exchange (PBX) switches are planned for later installation at other state agency population centers. These will be served by the transmission system as well, when economy and operational needs are evident.

For maximum economy, reliability, and efficiency, the system is to be digital throughout, including the switches. The switches are to feature integrated voice/data service and employ the single line per instrument concept. This will result in optimum communications capability, system simplicity, and economy of maintenance.

The transmission system is primarily a fiber optical cable system in combination with short links of microwave for city entry purposes. It is planned to bury a 6 strand tape armored fiber optical cable along the edge of the right of way of state highways. This will make use of an existing state asset and avoid the high costs of acquiring right of way. Figure 4 is a map showing the configuration and composition of the system. Leased facilities would still be used on links not ecomonically feasible at this time. At a later date, when economically feasible, satellite service to remote outstate areas or for interstate service can be added.

This facility will provide all necessary telecommunications services to the points shown on the map past the year 2000. The life of the cable itself is estimated conservatively at 40 years. It is impervious and insensitive to electromagnetic induction, lightning, water infiltration, weather, and when buried, vandalism as well. Electromagnetic pulse (EMP) from distant nuclear blasts will cause only temporary short term deterioration of service.

Services to be provided through the transmission system are, standard voice, data of any speed up to 56 Kb (kilobits) on a dedicated or on a digitally switched basis when feasible, or up to 45, 90, 135, or up to 565 mb (megabits) on a point to point, computer to computer dedicated circuit basis using the total capacity of one strand under current technology. Other services, such as facsimile, telemetry, electronic mail, "Picturephone", or any specialized service based on voice or data can be accommodated. Video services (television), either public, instructional, or for teleconferencing, can be provided in a variety of qualities from black and white slow scan through commercial grade color television.

PROPOSED STATE TELECOMMUNICATION SYSTEM

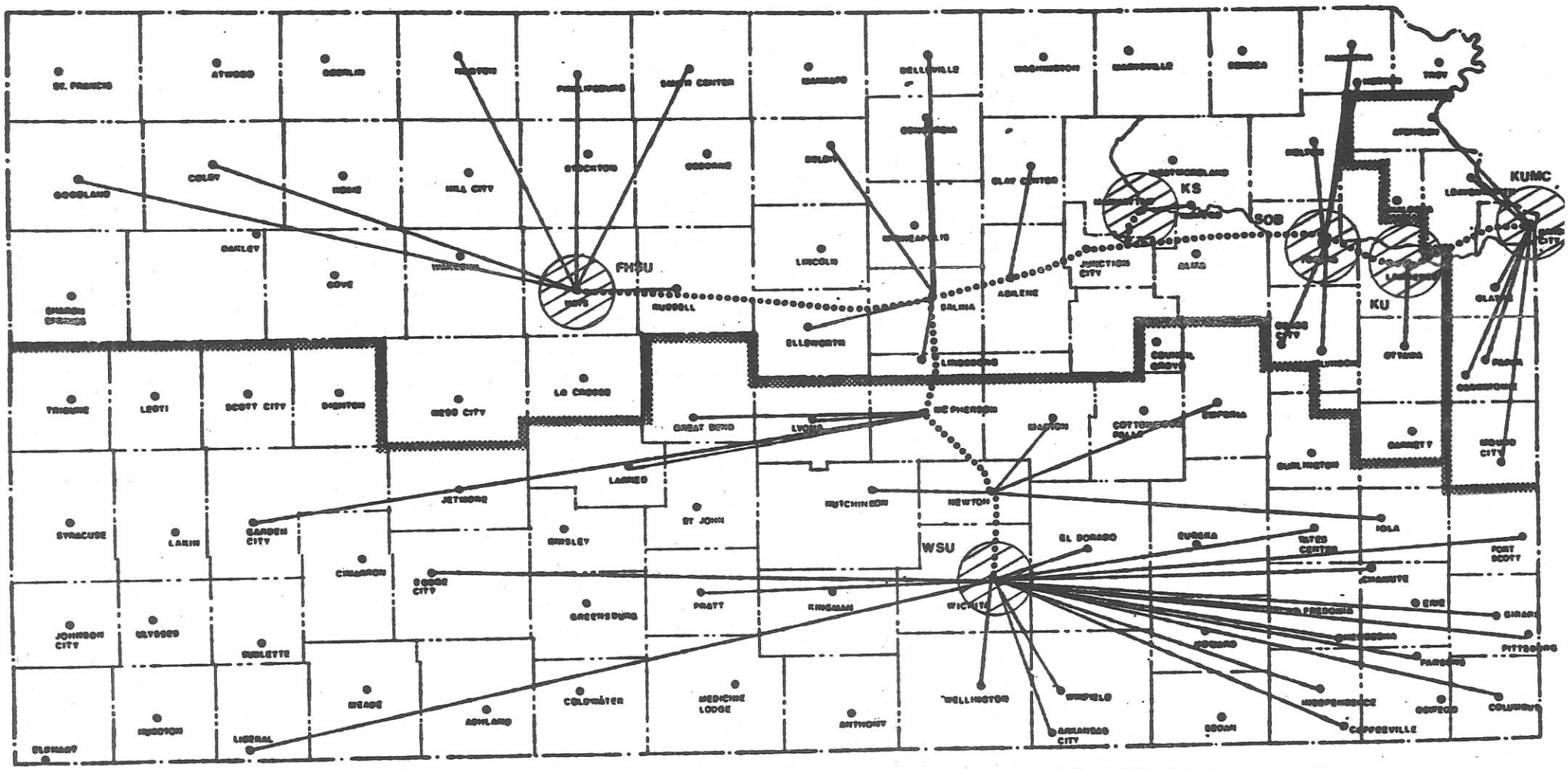


Figure 4
Page II-2

SPECIAL PURPOSE OR DEDICATED SEPARATE SUBSYSTEMS POSSIBLE WITHIN THE SYSTEM

a. Data Communications Networks
b. Law Enforcement Nets
c. Highway Maintenance, Safety, and Administrative nets
c. Regents Network
e. Other Instructional TV or Voice Networks
f. Public TV
g. NOAA Weather Warning Nets
h. Geodetic Survey Seismology Nets
i. Satellite Communications Subsystems
j. Radio Paging and others

HIGHWAY MAINTENANCE, SAFETY, AND ADMINISTRATIVE NETS

Particular mention is made of these subsystems, because of the intent to use state highway right of way. In consultation with the KDOT we have identified 11 separate subsystems or functions which can be provided as a result of and along with the fiber optic cable. At a nominal cost of about $150,000, two pairs of copper wire can be included in a special compartment of the fiber cable. These copper pairs can be made available at splice points and used not only for emergency telephone service, but for a number of sensory, traffic control, and traveler information and assistance purposes. See Figure 5.

INTANGIBLE BENEFITS

Over and above cost avoidance to the taxpayer, this system provides intangible or unquantifiable benefits through provision of larger quantities of service, as well as more varieties of service than are presently physically or technologically possible under current commercial systems. Some of these intangible and unqantifiable benefits are:

a. Increased personnel productivity
b. Improved information generation, retrieval, and transfer.
c. Savings in personnel travel and visitation time by increased use of telecommunications services.
d. Savings in energy consumption through substituting telecommunications for travel - "Telecommunications is the energy of the future".
e. Increasing educational and cultural enhancement opportunities and exchanges for the general public through establishment and operation of Public TV and "Instructional Television" programs.
f. Improved efficiency in state agency operations overall.

KANSAS DEPARTMENT OF TRANSPORTATION APPLICATIONS

+ Traffic counts can be made completely automatic and field work dimished greatly.

+ Variable messge signage can be installed for traffic control, such as that needed when winter storms cause road closure, accidents block roadways, notice of construction zones is required.

+ Sensing devices can be installed to monitor and/or automatically trigger remedial actions at hazardous locations such as icing on bridges, water flowing over the roadway, deteriorating structures, falling slopes, etc.

+ Speed monitoring can be expanded and made more effective for both planning purposes and enforcement purposes.

+ Weigh-in-motion installations can be connected to the system to provide planning data and to aid enforcement efforts on a more timely or continuous basis.

+ Overall transportation communication and management systems can be enhanced for maintenance, operation, and design purposes through direct access with and between district and headquarters offices for voice and visual communication, retrieval and transmittal of recorded messages, use of centrally managed computer data bases and systems.

+ High frequency accident locations can be monitored to establish causal factors and appropriate remedial measures.

+ Vehicle classification studies may be made less labor intensive through use of video or other devices connected to the System.

+ Traffic law enforcement could benefit from more direct communication between district and headquarters Highway Patrol units, along with truck weight and speed enhancements.

+ Safety Rest Area facilities can be made more functional through use as information centers or as low powered transmission stations broadcasting travel messages to passing vehicles - weather, road conditions, etc.

+ Provision for emergency motorist services will be more economically feasible through voice or other type of transmission devices connected to the System at appropriate distance intervals or at special locations easily recognized by motorists such as bridges and/or rest areas.

SECTION III. - SYSTEM OPERATION, MANAGEMENT, ADMINISTRATION, AND CONTROL

UNDERLYING CONCEPTS AND CONSIDERATIONS

The Integrated and Unified Nature of a Telecommunications System.

Traditionally, comunications services are thought of as either local or long distance. This is due not only to evolutionary processes but also to differing technologies, equipment, and managerial and operational concepts relevant to each service.

Communications systems evolved from isolated local area facilities into an integrated network and system when interarea/intercity communications facilities were made possible by advancing technologies. The elements of a local system are terminal instruments for generating and receiving communications signals (Customer Premise Equipment - CPE), a local wire transmission facility, and a local area switch which permits interconnection of local users. To this are added specialized long distance (interexchange/intercity) switches and transmission facilities, such as multiplexed copper and coaxial cable, wideband microwave radio and satellite systems, and fiber optical cable employing lightwave transmission techniques.

Telecommunications systems by their nature are "area" type systems, i.e. they extend over varying quantities of terrain from a suite of offices to citywide, statewide, countrywide, and worldwide. Every communications facility consists of three elements, a terminal device to convert voice or other inputs into electrical wave forms or impulses, a transmission system that must faithfully deliver the electrical signal to an endpoint, and another terminal device to reconvert the electrical signal into a faithful reproduction of the original input. The communications system does not function or fulfill its purpose if one of these elements does not exist or work properly. A telephone instrument not connected by wires and a functional switch/transmission system to another telephone instrument, is just a good paper weight. This is in contrast to a "spot" system, which is wholly self contained and self sufficient in one place without requiring some external interconnection or communications link. A copying machine is a good example, as is a stand-along non-communicating word processor, or even a computer, which, even it it occupies a whole floor or a whole building, can accomplish its computing function whether or not communications facilities are employed with it.

In our nationwide and wordwide networks any telephone can be connected to any other telephone (albeit occasionally, with less than satisfactory results). Network operations and interrelationships are governed by regulatory bodies and intergovernmental agreements. Technical interfaces and operational procedures are governed by very specific and agreed on standards and protocols. Each separately owned segment of the system is centrally managed and controlled within its geographical boundaries, and central management is held responsible to all users for the quality, availability, and reliability of its services. So too, for our planned state owned/leased private system. Our system will become a part of the worldwide network and must be compatible and in harmony with it in all respects. It is apparent then, that our telecommunications system must be viewed as an end to end integrated entity.

The Scope of the State System.

Our planned state system will ultimately include six large telephone switches of 2,000 to 10,000 line capacity, 35 or more smaller switches of up to 1,000 line capacity, some 30,000 telephones, and large quantities of ancillary telephone, video, and data communication equipment. The initial interconnecting transmission system will exceed 350 route miles and could ultimately reach 800 route miles. The capital outlay for this total system will be between $45 million and $50 million dollars.

The Need for Centralized Management.

It follows that a system of this size, complexity, and cost cannot be built and then left unattended, or managed haphazardly, or managed on a decentralized basis with each agency reacting to its own internal problems, having other priorities, divergent goals, and employing different management styles.

It is imperative that the system be managed and controlled on a centralized basis with either a single head, such as the Secretary of Administraton alone, or, the Secretary in conjunction with an overseeing or advisory body.

A General Concept and Philosophy for the State System.

A telecommunications system for state operations and administration consists of the following elements.

1. Hardware.
   a. An inercity transmission system with control and test facilities,
   b. switches (CPE),
   c. user terminal equipment(CPE).
2. An operating, maintenance, and general support organization.
3. A management and administrative organization.

All leased telecommunications facilities currently connected directly to the existing KANS-A-N system will be considered for replacement by any state system to be developed and those retained under lease will be treated as part of the state system.

An end to end integrated systems approach will be taken in the design and operation of the system. No state agency facility will be viewed in isolation, but all must be considered as part of the whole system.

Agency offices/installation will be served directly by the transmission system under the following criteria:

1. Directed requirements;
2. operational necessity; or,
3. when economically feasible and advantageous.

Agency offices/installations not meeting the above criteria will be served directly as part of the system but through use of connecting commercial facilites when economically advantageous.

The Secretary of Administration, or his designated representative will be in operational control of all state agency telecommunications facilities.

Centralized control will be exercised through an overall organization consisting of elements for management, administration, operation, maintenance, and general support.

Financing will be as for KANS-A-N. State agencies will pay for services on a pro-rata or approved schedule or tariff basis to the State Telecommunications Services Funds from which operating expenses will be paid.

Capital recovery costs will be paid as part of the service fees above into a special fund established for that purpose.

FUNCTIONAL CONCEPTS

Technological advances permit many changes in the way we traditionally viewed telephone service, designed telephone configurations, made moves and changes, and managed and administered telecomunicaitons services overall. The companion piece to the above observation is that deregulation and divestitute, which results in unbundling service from equipment charges, will cause service costs to become so burdensome that we will be forced to change our ways. As an example, it costs about $100 today to move a telephone across the room or just a few feet for that matter. Similarly, moving or installing a remote computer terminal can cost up to $500 and require yet another coax cable run.

In addition, since all such services in the past have been provided by one regulated vendor who performed all the necessary system design and technical management functions, it was appropriate and has been the custom to assign management and administation of the telecommunications function to non-technically knowledgeable administrators who also had many other responsibilities. Now, with the emergence of numerous service providers, both regulated and unregulated, with the great variety and increasing complexity of equipment and services available, it is essential to have technically knowledgeable professional telecommunications managers and administrators to perform this function.

The new established and standardized technology permits us to adapt to this new environment, to not only reduce costs, but also, to optimize service. Ways in which this may be accomplished are discussed below.

Telephone Stations and Computer Terminals

The Single Line Per Instrument Concept.

One of the major advantages of the new technology is that it eliminates the need for expensive, technically complex, costly to install and maintain, multi-line (button and light) key system telephones. The multi-line key system came into existence 40 years ago because neither Private Branch Exchanges nor telephone company Central Offices could provide the custom services needed for an intergrated office configuration. Small to medium sized offices and organizational elements of larger businesses, needed centralized answering for incoming calls, ability to transfer calls to the actual called party, ability to put a call on hold,

or pickup a call, or to call another station in the same office or organizational element on an "intercom" basis. The multi-line key system provided all these services and has become such an institution that old operating habits are now difficult to change.

But the change must be made because the costs to install a multi-line station today are about five times as much as a single line telephone and the costs to move or maintain a multi-line telephone are several times that of a single line instrument. Additionally, all the new PBX switches now provide for all the flexibility and services of the old key system telephones, and much more. To continue adding key systems to PBX's is simply to increase costs and negate or duplicate the services that can be provided by a modern PBX.

Consequently, it is prudent to adopt the single line per instrument policy. It means just what it says, one line, one telephone. This is the simplest arrangement possible. It gives each individual his own telephone and switch access which is not shared with anyone else. This optimizes service and facilitates use of the system when it is needed without having to wait for an open line as frequently occurs with key systems. It avoids cut-offs or interference when some other user on the system unthinkingly depresses the button for a line which is in use. It gives the user access to all the service features of the PBX switch and more than were possible with multi-line key systems. Installation, maintenance, moves, and changes of telephone stations and computer terminals are so simplified that those costs become negligible. This latter advantage is discussed below.

Universal House Wiring

When a home or an office is built it is wired with electrical outlets at appropriate intervals. When power is required the appliance is simply plugged into the outlet. If the outlet is not conveniently located to the place where the appliance or equipment is to operate, an extension cord is used. Seldom do we rewire an office with electrical outlets when its occupants or uses change over time. If we want to relocate an appliance we normally just move it and plug it into another outlet.

Just the opposite is true of telephone service which up until now has always been hardwired and its use restricted to a very small operating area. Moves and changes had to be performed by costly technicians and new wires and outlets frequently had to be installed in the new location with every change of configuration, shifting of office furniture, or even changes due to an individual user's desires. Now with modular wiring and single line telephones, moves and changes can become as simple as unplugging the telephone from one outlet and replugging it into another. Similarly, longer extension cords can be plugged into the line if needed. Expensive technicians are no longer required and each user can now move his own telephone. That is, if there is a universal wiring plan in effect along with a record keeping system to support it.

A universal house wiring plan visualizes, integrated simultaneous voice and data usage at the same terminal, or either voice, or data separately as needed. To provide this service and alternatives, each outlet will be modularized and will be provided with three pairs of wires, two for high speed data and one for voice. A brief but more detailed description follows.

"Our planned network, including the six Centrex locations, will have all the elements of a true Integrated Service Digital Network. In addition to being able to handle existing plain old telephone service it will be able to pass data on a dial up basis at 50 times the speed of the existing network. On a dedicated (non-dial) basis it will be able to pass data from any telephone jack to any other telephone jack at speeds of 500 times our existing leased facilities. However, to keep the system free of contamination such as noise, crosstalk, and even catastrophic failure, we must exercise rigid end to end assignment control. This means that we must insist on specific transmisison rules for assignment from every telephone jack in every building, room, and office for all services directly connected to the system. To do otherwise would guarantee failures of signal coordination.

For example, high speed digital service (1.5 mb) must have its input assigned to a specific building terminal and its output must be assigned to another specific building terminal to make sure that the two are always properly segregated. To allow the two directions of a high speed bit stream to be near each other invites failure.

To exercise the necessary assignment control is not at all difficult with a brand new system installed and wired to our specification. Every 3 pair lead from each room or office will carry a plastic identification clip. The distribution terminal strips on each floor will carry an identification number with an A & B segregation denoting direction of transmission. Each building terminal will have dedicated cables that will appear on an assigned location at the MDF (main distributing frame) at its serving wire center.

One individual equipped with a mini-computer at a centralized location such as Topeka could take care of the assignment chore for the entire system. Requests for service, changes, or rearrangements could flow in via teletype or facsimile from the telephone representative at each location and out to the service contractor via the same means. By having these records stored on floppy disk with mini-computer capabilities of sorting and displaying, we would be able to utilize the network facilities efficiently."

Telephone Moves and Changes

With a universal house wiring system as described above, when an individual or a whole office is moved to a new location each user has only to unplug the telephone from the receptacle, go to the new location and plug it into a receptacle convenient to his work station and place a call to the Move and Change clerk at the PBX switch center. The clerk will ask for the telephone number on the telephone, the room number, and if there is more than one receptacle in the room, the number on the receptacle. Upon entering this data into the computer, the move and record update is complete. No cost was involved but the time of the user and the clerk.

Data Terminal Moves and Changes

Data terminals can be moved in a manner similar to telephones. In fact, the need for installing expensive coaxial cable is avoided, and overcrowded ducts or crammed cable trays and false ceilings sagging under the weight of coax can be eliminated. Similarly, the cost of up to $500 per move of a computer terminal is virtually eliminated because the universal house wiring plan using twisted pairs in separate twin cables permits transmission of data at the 1.54 megabit rate over normal campus or building complex distances amd/or connection to an intercity facility at the same rate.

Centralization of Management and Administrative Functions

General

A complex telecommunications system is more than the installation of switching and transmission elements; it is the integrated assembly of station apparatus, switching equipment, transmission equipment, monitoring and control equipment, and operating and management personnel into an efficient operational system.

Established standard state of the art digital transmissin systems, in combination with process control computers, permits continuous automatic remote sensing of system conditions as well as reporting and recording all relevant information required to manage the system. This control function will be accomplished in a System Control Center (SCC) which will be co-located with the hub switch in Topeka. It will provide for and permit the following system functions.

a. Technical monitoring and control of all aspects of system voice, data, and video hardware as well as auxilliary leased system facilities.

b. Timely management coordination of system operations, both routine and emergency, and it will include centralized acquisition of operational performance, trouble reports and maintenance, and administrative information.

Technical Control of the System

The SCC will provide network performance monitoring and centralized maintenance dispatching to ensure maximum availability of network facilities. Each switch in the network will send maintenance information to the SCC where the information will be compared with predetermined alarm conditions. If an alarm level is reached an audio and visual alarm will alert the operator. A graphics terminal will be available to provide the SCC operator with a constant overview of network status.

Each data communication device operating on a dedicated circuit in the network will also be monitored for maintenance and performance information. Alarm levels will be established to alert the SCC operator of degrading conditions on these circuits in the same manner as the switch alarms. This will include all multiplexors, data interface devices, line drivers, and modems used to access commercial analog circuits.

All digital channels and inter-switch digital trunks will be monitored and subjected to the same alarm reporting requirements.

Spare data communication equipment will be available at each switching center to permit re-routing of circuits in order to reduce circuit down-time. Maintenance and diagnostic equipment will be available in the SCC to assist the SCC operator in making trouble diagnoses. This equipment will be able to function in a manual or automated mode.

The monitoring system will be fully transparent and non-interfering to the network it serves with continuous automated sensing of all network circuits and devices.

Centralized Management and Administration

Service support and coordination must be provided for the entire network to perform data base modification, switch, transmission system and equipment testing, fault isolation, and the tracking and clearing of user complaints.

System administration consists of order entry coordination, trouble ticket administration, equipment inventory and assignments, processing of call data to provide billing information and network analysis, the maintenance of network routing and user features data bases, and user, attendant and network administrator training.

An operator at the SCC will have all the capabilities of a local craftsperson at a switch site to modify a switch's data base. In addition to the maintenance capabilities this provides, the SCC operator will also be able to implement station rearrangements, feature changes, and administrative modifications.

All calling data from each switch in the network will be collected locally and transmitted to the SCC to create a single, uniformily formated magnetic tape convenient for off-line processing. The off-line processing will consist of generation of usage-sensitive billing information in order to provide individual users with billing data relative to their actual demand on the system.

Continuous traffic monitoring will also be a function of the SCC. The SCC will provide traffic analysis information to permit Network Operations to recognize areas of traffic congestion and institute measures to reroute traffic to maintain a projected grade of service.

The SCC will automatically store and update directory information each time a move or change is made to make central directory assistance available for all switches from a central site in Topeka and to permit telephone directories to be updated easily without resorting to the present expensive and time consuming process it is now.

Inventory information for all equipment related to each switch, the transmissin system, and data communications circuits will be maintained in the SCC. This data base will be continuously updated, both locally and remotely, for each switch in the network. This inventory information will also contain the complete cable records necessary to administer the "universal" wiring concept.

Massive amounts of data have to be collected, sorted, summarized, and stored to serve all the above purposes.

CONCLUSIONS

It can be seen that technological advances permit, but, the high cost effects of deregulation and divestiture demand changes in our traditional ways of viewing, designing, operating, acquiring, and managing and administering telecommunications facilities and services. However, using established and standardized technology, systems can be designed, implemented, and managed, that will not only be less costly but exceedingly more efficient than those in place today.

SECTION IV - ORGANIZATION FOR SYSTEM OPERATIONS AND MANAGEMENT.

INTRODUCTION

Section IV preceding, discusses the unified integrated nature of a telecommunications system, the scope of the state system, and technological developments and considerations which if implemented, permit reduced operating costs as well as great versatility, flexibility, and efficiency overall. However, in order to achieve these desirable results, strict adherence to procedural rules is required. Compliance can only result from imposition of at least minimum controls over the technical aspects of the operation. This control can only be exercised by a central organization having the technical and managerial competence to supervise system operations. This section presents and discusses such an organization.

Before proceeding further it would be desirable to review the scope of the system to be managed. The following paragraph is extracted from the preceding section.

> "Our planned state system will ultimately include six large telephone switches of 2,000 to 10,000 line capacity, 35 or more smaller switches of up to 1,000 line capacity, some 30,000 telephones, and large quantities of ancillarly telephone, video, and data communication equipment. The initital interconnecting transmission system will exceed 350 route miles and could ultimately reach 800 route miles. The capital outlay for this total system will be between $45 million and $50 million dollars."

The following paragraphs are extracted from the preceding section presentation of a general concept and philosophy relevant to a state system.

> "An end to end integrated systems approach will be taken in the design and operation of the system. No state agency facility will be viewed in isolation, but all must be considered as part of the whole system."

> "Centralized control will be exercised through an overall organization consisting of elements for management, administration, operation, maintenance, and general support."

Finally, the total state involvement in the management of a state telecommunications system, whether or not any parts of it are ever converted from commercial facilities is summarized by type, quantities, and replacement costs on Figure 6, attached.

CURRENT SYSTEM OPERATIONS AND MANAGEMENT

The Telecommunications Office, acting as executive agent for the Secretary of Administration, directly manages and administers all intercity service which is provided through KANS-A-N. However, operations, maintenance, and related functions are provided by AT&T Communications which exercises centralized control over all the technical aspects of the system.

TOTAL STATE INVOLVEMENT
TELECOMMUNICATIONS EQUIPMENT AND FACILITIES
REPLACEMENT COSTS
January 1984

Large Centrex Systems	
1. Topeka Capitol Complex 7,500 ports	$ 7,130,000
2. Kansas University Medical Center 4,500 ports	4,200,000
3. Kansas University 7,000 ports	7,400,000
4. Kansas State University 5,900 ports	6,230,000
5. Wichita State University and Wichita Complex 3,025 ports	2,932,000
6. Fort Hays State University 2,000 ports	1,655,000
Sub-Total	$29,547,000
Central System Control Facility	$ 1,000,000
Small PBX's	
37 systems, 4,100 lines	$ 3,700,000
Multi-line Key Systems	
188 systems, 1,646 stations	$ 905,000
Single Business Line Stations	
539 stations	$ 54,000
Sub-Total Local Telephone Plant	$35,176,000
Intercity Transmission Facility	
Kansas City, Salina-Wichita	$ 5,200,000
Salina-Hays	1,397,000
Topeka, Emporia, Pittsburg	2,600,000
Hays-Colby	1,516,000
Oakley-Garden City	1,282,000
Salina-Beloit	1,052,000
Sub-Total Transmission Facility	$13,047,000
TOTAL INVOLVEMENT	$48,263,000

Similarly, the Telecommunications Office directly manages and administers the local Centrex services provided in the Topeka area and provides oversight and assistance to all other state agencies for similar services on an as requested basis. Here again, Southwestern Bell exercises the central technical control that is necessary to maintain order within the system. As part of these technical control functions, both SBC and AT&T Communications maintain all the circuit and associated equipment records, dispatch maintenance crews, collect usage data for traffic analysis and billing purposes, and attend to the myriad other tasks associated with the technical aspects of the operation and management of a system.

At present the state owns only a half dozen small PBX's and about twice that many multi-line telephone key systems. All other telephone services, both local and intercity, are rented from either Southwestern Bell (SBC) or AT&T Communications.

Acquiring state owned systems does not relieve the Telecommunications Office of any responsibility for the continued oversight of those systems, either from the technical or administrative viewpoint. We have installed large PBX's at Osawatomie State Hospital, Kansas State Penitentiary, Lansing (serving both the men's and women's facilities), Kansas State Industrial Reformatory, Hutchinson, Kansas University Medical Center Branch School in Wichita, the Social and Rehabilitation Services Gateway Center in Kansas City, and we are continuously involved to the extent of several man months per year of engineers time in solving technical problems, dealing with the supplying vendors on behalf of the using agencies,interpreting contract provisions, reviewing and approving requests for configuration changes or additional equipment, and advising and participating in contract maintenance negotiations as well as maintenance personnel selections. Thus, even if the present proposal to replace all the Centrex switches is never implemented, the state has no other option than to replace all CPE in the next few years, to include all the user terminal equipment, and all the PBX's and multi-line key systems. This factor in itself results in increased personnel requirements and increased Telecommunications Office operating costs for the reasons and purposes detailed above.

While the preceding discussion covers telephone and data transmisison services specifically, state telecommunications usage includes extensive radio operations which also require surveillance and technical suprervision by the Telecommunications Office to include design, equipment specification and selection criteria, and licensing requirements.

The organization presented will provide for the proposed system, for all the remaining CPE and radio system acquisitions, and for all technical management and administration responsibilities devolving on the Telecommunications Office.

CURRENT ORGANIZATION AND FUNCTIONS

The Telecommmunications Office is an integral element of the Office of the Secretary of Administration. It is the executive agent designated to carry out the telecommunications responsibilities assigned to the secretary by law. In general terms, those responsibilities are to coordinate and control the acquisition, retention, and use of all telecommunications facilities and services for all state agencies and to develop, review, and approve telecommunications plans.

Specifically, the Telecommunications Office directly manages KANS-A-N, the state intercity private line system, and controls the acquisition of all other non-KANS-A-N intercity facilities and services. It directly manages the local Centrex service in Topeka and advises and assists all state agencies with local service problems, whether technical or administrative. It engineers and designs state owned Private Branch Exchange (PBX) systems and multi-line key systems for state agencies. It prepares specifications and Requests for Proposal (RFP's), reviews bids, and makes recommendations regarding the low responsive and responsible bidder to the agency head and Director of Purchases. After contract award, it supervises the contractor during the installation of the system, performs quality control functions, approves progress payments, and performs final acceptance testing. Thereafter, the engineering staff follows up with periodic visits to ascertain satisfaction with the system and to investigate and solve problems. Telecommunications Office personnel respond to all requests from agencies for assistance, whether technical or administrative. The engineering staff reviews all requests for individual acquisitions of telecommunications equipment or systems. It designs radio facilities, prepares and reviews specifications for acquisitions and assists in the selection process. It maintains files on all licensed state radio stations and assists agencies in changing or acquiring new radio licenses from the Federal Communications Commission (F.C.C.). The Telecommunications staff has spent significant effort to develop the current state plan and to update it annually. The engineering staff is presently heavily engaged in performing the detail engineering preparatory to writing the specifications and Requests for Proposal for the system which are planned to be ready for issue in June of this year.

The current organizational strength of the Telecommunications Office is 11, nine professional telecommunication specialists or engineers and two clerical personnel. The total FY 84 budget for the Telecommunications Office is $363,000. These are "off budget" costs, defrayed by user contributions through assignment of costs to KANS-A-N and Topeka Centrex services.

PROPOSED ORGANIZATIONAL STRUCTURE

The organizational structure recommended in the Booz-Allen study serves as a model for the present proposal and is adapted to present conditions and concepts discussed in Section III preceding. During the installation phase it is designed to assure vendor supervision and compliance with specifications and contractural provisions. It will permit an orderly transition to a permanent professional telecommunications management and technical control organization, and it is designed to also provide statewide coverage in accordance with the Secretary of Administration's assigned responsibilities in consonance with the magnitude of the state's total involvement with telecommunications facilities and services. Figure 7 is a graphic presentation of the proposed organization.

ORGANIZATIONAL FUNCTIONS

Since we are contemplating contract maintenance, the activities to be conducted by state personnel will be general system management, administration, system operation and technical control, planning and engineering, user services and relations, and supervision of the contractor providing maintenance and support.

PROPOSED ORGANIZATION
TELECOMMUNICATIONS DIVISION

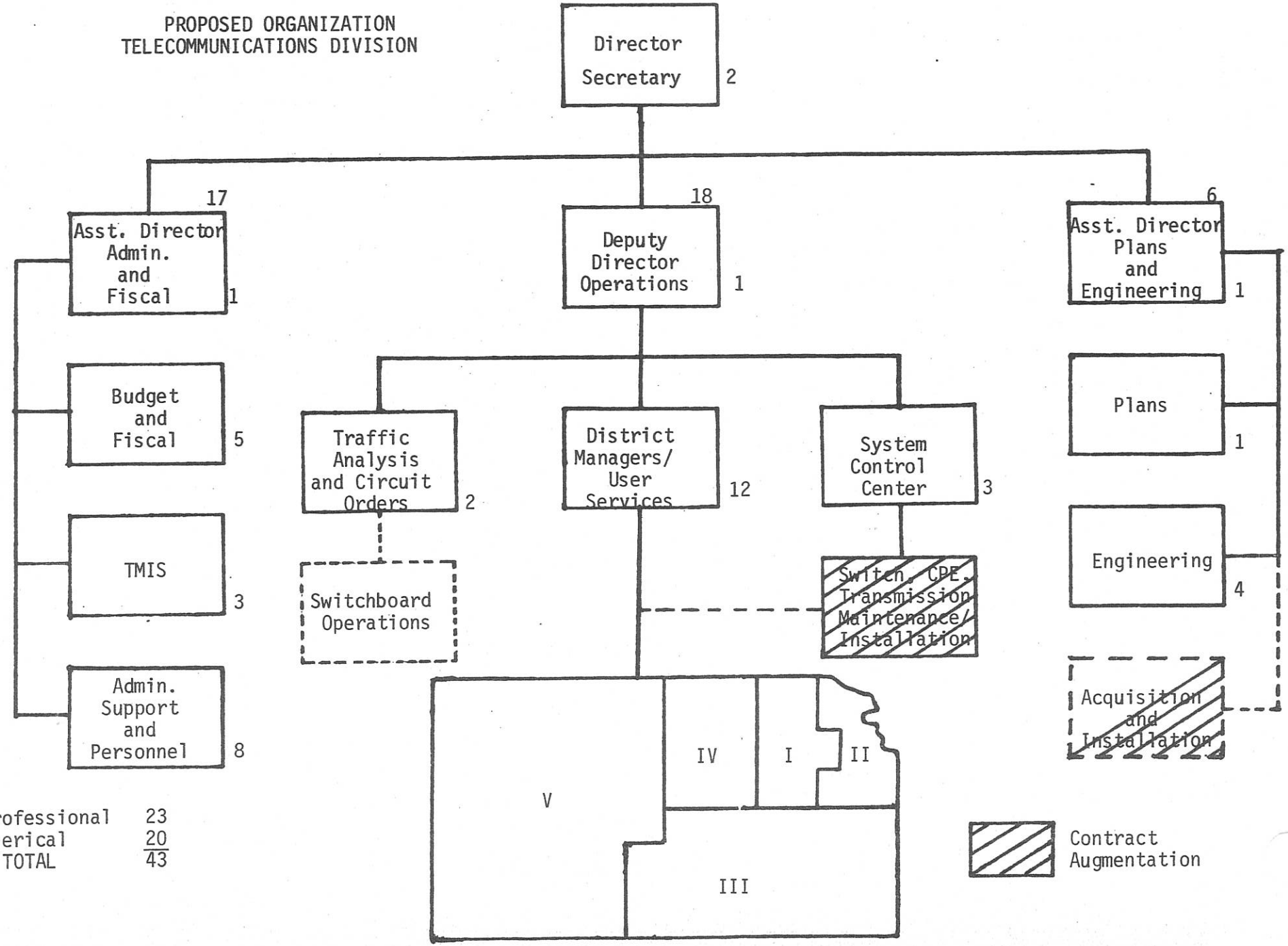


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Figure 7

The nucleus of personnel required to perform these functions already exists in the Telecommunications Office. Augmentations will be required. Our FY 85 budget provides for 5 more personnel. Others will be required in FY 86 and FY 87 during the installation period as shown on Figure 8 and Figure 9.

Division status should be accorded to the telecommunications' function because of its scope and the visibility that will result. The proposed organization observes the principles of homogenous assignment, span of control, delegation of authority, and coordination of effort. It provides for centralized general system management and technical control, supervision of contractor support operations, and user requirements and problems. It assures the necessary flow of information and collection of data for both operational and fiscal purposes. It provides for timely information necessary for management decisions, and it provides the technical and engineering capability necessary to solve problems, design new service augmentations and carry on a continuous planning effort. Most importantly, it embodies the concept of overall coordination and control by the Secretary of Administration as required by law.

Initially, during the implementation and installation phase, the Engineering Section will be augmented by an "Acquisition and Installation" unit consisting of four telecommunications specialists requested in the FY 85 and FY 86 budgets for quality control and contractor supervision and surveillance. These will be further supported by consultant engineers having expertise in very special fields for which there is only a one time or short term requirement for advice or inspection services. These latter are to be funded under "Project Management" and the costs capitalized as a legitimate charge to the cost of the system.

After the system is implemented, the telecommunications specialists in the "Acquisition" unit will become the resident "District Managers" for the switches and local networks over which they had oversight and quality control responsibilites during construction. Thus, there will be continuity and carry over of knowledge and experience between the implementation phase and subsequent operational phase. The "District Managers" will continue to oversee the maintenance contractor and be the interface between local agencies and the contractor for user services and problem resolution.

With contractor provided operating and maintenance personnel on every site, and with a "District" management organization to supervise the contractor, there is no need for served agency personnel to duplicate these functions. Agencies can appoint an individual, if they do not already have such a person, to be the focal point for all agency service requests, trouble, or problem reports, that are generated. The District Manager will be the recipient of these requests and reports and will coordinate the provision of service and clearing of troubles with the contractor. The "District" manager will be the representative of the Telecommunications Division and the Secretary of Administration for matters within his purview. Served agency personnel can concentrate on management and administration of local service, placing requirements with the District Manager and they can conduct their business the same way they have always done with the telephone company. Agencies may propose any changes or additions that they are able and willing to pay for and that do not violate system integrity or system operating and control principles. Thus, except for the provider of the service there will be no significant change from the past.

TELECOMMUNICATIONS DIVISION
PERSONNEL PHASE IN SCHEDULE

	FY 84	FY 85	FY 86				FY 87	
	ON HAND	3d QTR.	1st QTR	2d QTR	3D QTR	4TH QTR	1ST QTR	TOTAL
Director Telecomm.	1							1
Chief Engineer	1							1
Telecom. Specialist	6	3	3	2			1	15
Management Analyst	1	1						2
Accountant			1					1
Admin. Officer			1					1
Personnel Officer				1				1
Personnel Assistant						1		1
Secretary	1							1
Accountant Clerk			2		1		1	4
Data Entry Clerk			1		1			2
Word Proc. Typist		1						1
Clerk Typist	1		6	2	2	1		12
TOTALS	11	5	14	5	4	2	2	43

PROPOSED TELECOMMUNICATIONS INSTALLATION SCHEDULE

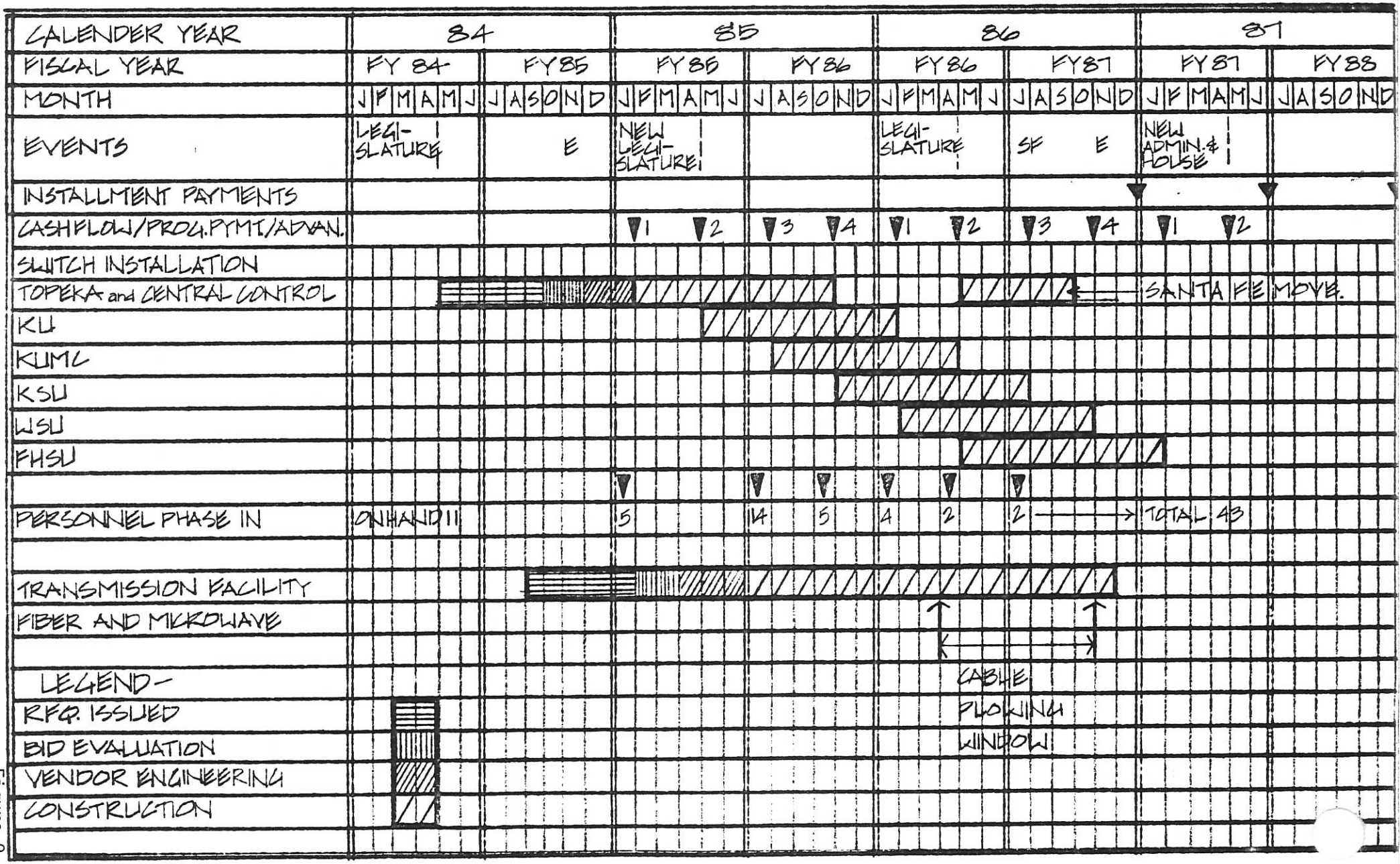

Figure 9

For management purposes, the state is divided into five districts, each having a major switching node and local area net. A district manager will be resident in each area. The Topeka and Wichita District Managers will be assigned an assistant because of agency populations and dispersion. Each District Manager will have a clerk for purpose of service order preparation, processing, and control. District Managers will also represent the Telecommunications Division in their areas for all matters referred to them, such as problems the outstate agency offices are having with their service, responding to their requests for new or upgraded services, making traffic studies and surveying operational requirements for agencies, which would then be forwarded to the Topeka office where a system would be designed, specified, and issued for bid. After contract award they would provide quality control during installation and acceptance testing after cutover.

The four Telecommunications Specialists/Engineers remaining in the Engineering Division would specialize in telephone system engineering (2 engineers) data communications (1 engineer), and radio communications (1 engineer). It is pointed out again that over and above the major installations covered in this project there are another 37 PBX's and 188 key systems that need to be replaced. Additionally, there are always new requirements that arise, old contracts to administer and renegotiate, and problems to be solved. Data Communications is a major function today and because of the onset of the "Information Age" will become even larger. Radio is the "old standby", and standard means of communication for mobile users (both vehicular and on foot), as well as all emergency and law enforcement type services. There is always a continuing requirement for this service, and paging and similar type requirements will make it even more important. Additionally, because of radio frequency spectrum crowding, channels in higher frequency shorter range radio bands may be adopted by the F.C.C. and this could result in major system redesign effort as well as an expensive changeout of radio equipment.

Planning is a continuing activity, particularly in view of the many new applications on the horizon and the burgeoning use of telecommunications as the primary means of information transfer. Not only is a "Five Year Plan" necessary to orderly development of the system, but upgrades, reinforcements, and contingencies must be foreseen and planned for. One Telecommunications Specialist will be required.

The incumbent Chief Engineer will remain in charge of the Plans and Engineering Unit.

Operations is the focal point of the whole system. The incumbent "KANS-A-N Network Manager" will assume this position.

The Systems Control Center has been discussed under "Functional Concepts" in the preceding section. It will be in Topeka, co-located with the local switch where it will continuously monitor switch and transmission system functioning. Trouble clearing and maintenance dispatching will be controlled from this location. Contractor personnel will perform operations, maintenance, and installation functions in Topeka and at all remote locations. In Topeka, contractor personnel presence in the Control Center will be required on a "round the clock" basis. In remote areas, contractor personnel will be" on call" in the event of major outages.

The District Managers and their functions have been discussed previously.

Traffic Analysis and Circuit Orders represents the current KANS-A-N functions of commercial service ordering and discontinuing, traffic analysis, intercity user service requests, and state system voice and data circuit design, layout, routing, and implementation.

Switchboard Operations is an integral function of a telecommunications system. At present the regular KANS-A-N Operators are located organizationally in the General Services Division of the Department of Administration, and special nighttime and weekend operators are located organizationally at Kansas University Medical Center where they function as both KANS-A-N and KUMC local operators. However, because of their close relationship to the operating system they all respond to technical and procedural direction from the Telecommunications Division. This will continue to be the case. However, when our system is implemented, the technology will permit "forced entry dialing" which means that KANS-A-N calls originating "OFF NET" will no longer require operator intervention and assistance in the vast majority of cases. We plan to discontinue the operator function at KUMC and spread the existing operator force over a 24 hour a day, 7 day per week operation in Topeka.

The Administration and Fiscal unit assumes a large share of the workload and responsibility. In addition to providing Office Services, to include a typing/word processing/clerical pool it will assume a major responsibility for billing for services, or as an alternative providing all the information for billing purposes in the event Accounts and Reports retains that responsibility. It will have to supervise and oversee collections into the various funds for capital recovery and recurring operating expenses, as well as payments out of those funds. It is assumed that Accounts and Reports will be the repository for all funds collected and disperse all payments authorized, but Telecommunications Administration and Fiscal will have to be in the verification and approval chain and this will require extensive auditing of billings received. The incumbent Management Analyst will be in charge of this unit.

Finally, a Telecommunications Management Information System encompassing all operational, fiscal, planning, engineering, property accounting, and administrative functions is absolutely essential. Without such a system, a state of chaos will soon result. This system must be developed and in place as the system is installed. No other implementation sequence or progression is feasible.

When fully implemented in FY 87, total staffing for the Telecommunications Division will be 43 personnel, including the 11 incumbents, for an increase of 32 overall. The responsibilities of the organization will be increased and the capabilities vastly expanded to full statewide agency support in consonance with the Secretary of Administration's assigned responsibilities. When fully implemented in FY 87, personnel costs for this organization will be approximately $1,250,000 annually, all of which will be "off budget" amd collected as part of state overhead charges for system management. All relevant costs are included in system operating cost projections presented in Section V following.

SECTION V. FINANCIAL AND IMPLEMENTATION DATA

CAPITAL COST

Capital Costs are detailed in Figure 10 and summarized below:

Local Cable Plant, PBX's, and CPE	$29,547,000
Intercity Transmission Facility	6,597,000
Central System Control Facility	1,000,000
Project Management Costs	1,170,000
TOTAL CAPITAL COST OF SYSTEM	$38,314,000

ACQUISITION

It is intended to issue two RFQ's. One for the six PBX's and the Central System Control Facility and the other for the Intercity Transmission System. The purpose of having two RFQ's is to give the opportunity to all potential vendors to bid within their capabilities and legal limitations. Additionally, the transmission system RFQ will provide options of either quoting existing digital transmission facilities on a special assembly leased basis, or of constructing a fiber optic system. The most cost effective system will be selected.

IMPLEMENTATION SCHEDULE

Figure 11 is the Installation Schedule. The Telecommunications Office staff is presently performing the detailed engineering tasks necessary before specifications and RFQ's can be written. We hope to issue the RFQ for the switches in June or July of this year and be under contract by 1 January 1985. The system can be completely installed and cutover by January 1987, at which time installment payments will begin. The RFQ for the transmission system will be issued in September or October. It will be installed and activated to coincide with the phased cutover of the switches.

FINANCING

It is planned to acquire the system on a 10 year installment purchase basis. Several investment banking firms are interested in financing the project on a tax free municipal funding basis. They are willing to provide up-front funding of project management costs and to capitalize interest payments for the two year construction phase. Repayment from state agency communications operating funds would start after the system has been cutover, approximately two years from contract date. Similarly, all of the large vendors have financing arrangements with investment banks or municipal leasing companies. Cost projections and cost avoidance data provided in the following figures use a repayment schedule prepared by one of the investment banking firms. A rate of 9 1/2% for interest is used and it is considered pessimistic, but appropriate for planning purposes. The project will be centrally funded and managed by the Secretary of Administration.

STATE PLAN
TELECOMMUNICATIONS FACILITIES PROJECT
CAPITAL COSTS
January 1984

Telephone Switch, Microwave, and Cable Plant		
1.	Topeka Capitol Complex 7,500 ports	$ 7,130,000
2.	Kansas University Medical Center 4,500 ports	4,200,000
3.	Kansas University 7,000 ports	7,400,000
4.	Kansas State University 5,900 ports	6,230,000
5.	Wichita State University and Wichita Complex 3,025 ports	2,932,000
6.	Fort Hays State University 2,000 ports	1,655,000
	Sub-Total	$29,547,000
Intercity Transmission Facility		
1.	Kansas City, Topeka, Salina, Wichita	$ 5,200,000
2.	Salina, Hays	1,397,000
	Sub-Total	$ 6,597,000
Central System Control Facility		$ 1,000,000
Project Management Costs (Capitalized)		$ 1,170,000
	Total Capital Cost of Project	$38,314,000

Figure 10

PROPOSED TELECOMMUNICATIONS INSTALLATION SCHEDULE

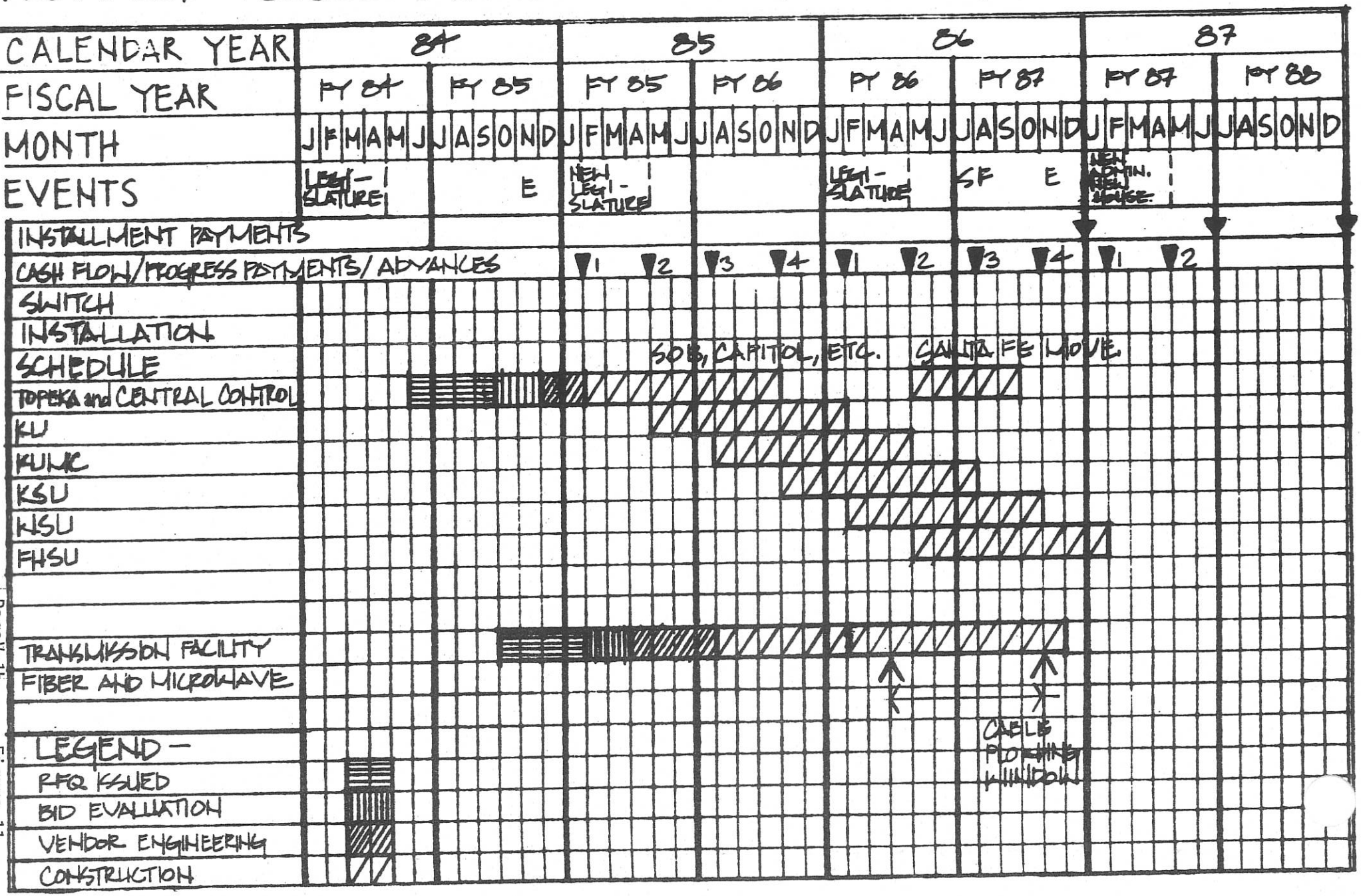

Figure 11

FUNDING METHODOLOGY

Investment bank municipal securities departments have developed an increasingly popular instrument for financing state, municipal, and educational institution projects of all types. This instrument is titled "Certificate of Participation". It has been used to fund the New Mexico state telecommunications system, the State of Montana telephone system, the State of Ohio microwave system, and telecommunications systems for regents institutions in Colorado, California, and other states.

The "Certificate of Participation" is issued with a face value of $5,000 as a rule and bears tax free interest. They are sold to the general public by the investment bankers. These certificates are essentially notes secured by a mortgage on the telecommunications plant acquired and the revenue stream associated with it. The provisions of the state procurement and funding law as formalized by the DA-146a, "Contractual Provisions Attachment", are acceptable to the mortgagee and made part of the agreement. The mortgagee is normally a leasing company which acts as an intermediary and surrenders all rights to a trustee, who then administers the disbursements and repayments. The trustee may be any bank, including any bank in Kansas.

REPAYMENT

Capital outlays are readily determinable through the bid process. Bidders will be required to furnish total costs for each major element of the system. Project Management Costs will be apportioned to each major element in the proportion to the capital cost each element bears to the total. The apportioned amounts can be amortized over the period of the loan at the specified carrying charge, and monthly payments made to the State Telecommunications Services Fund from which repayments would be made. The Department of Administration now administers this fund and would continue to do so.

COST AND VALUE COMPARISONS

The proposed system, over the two year construction period and 10 year payback period, FY 85 through FY 97, permits cost avoidance on the order of $50,000,000 as a conservative estimate. The proposed system provides the state with established standard, state of the art facilities of great capacity, versatility, and flexibility, as well as optimum economies in operations and maintenance. It permits expansion due to usage or new applications at only the incremental costs of channelizing and terminal equipment. The life of the system is well over 30 years.

Continued reliance on the regulated commercial providers, in whole or in part, subjects the state to increased costs and reliance on low capacity or obsolescent facilities. The state will have to replace all CPE in any event after 1986 since AT&T is expected to withdraw support or increase maintenance prices to unacceptable levels. The state will be required to support its own CPE with maintenance and pay for telephone moves and rearrangements as well. Increased usage will require addition of intercity circuitry on a total circuit by circuit cost basis rather than on just an incremental cost basis. While SBC has digital circuitry throughout the state that might support new or very high speed applications, it cannot

PROJECTED ANNUAL COSTS (000's)

STATE SYSTEM PLUS RESIDUAL COMMERCIAL SERVICE

Cost Elements	FY 85	FY 86	FY 87	FY 88	FY 89	. . .	FY 95	FY 96	FY 97	FY 98	TOTAL
Fixed Costs: Capital Repayment	- -	- -	2,330	6,425	6,415	. . .	6,305	6,290	5,915	- -	65,515
Variable Recurring Costs											
Intercity Servcie (Residual)	7,562	9,579	9,728	8,194	8,849	. . .	14,043	15,166	16,379	17,690	163,259
Local Exchange Service	6,864	7,610	1,087	1,166	1,252	. . .	1,929	2,076	2,234	2,405	34,425
Total Variable Recurring Costs	14,426	17,189	10,815	9,360	10,101	. . .	22,277	23,532	24,528	20,095	197,684
State Costs	604	641	3,330	3,596	3,884	. . .	6,163	6,656	7,189	7,764	64,433
Tax Revenue Lost	- -	- -	626	895	969	. . .	1,485	1,597	1,718	1,848	15,158
Total State System Projected Costs	15,030	17,830	17,101	20,276	21,369	. . .	29,925	31,785	33,435	29,707	342,790

PROJECTED ANNUAL COSTS (000's)

CONTINUE SBC AND AT&T SERVICES

Cost Elements	FY 85	FY 86	FY 87	FY 88	FY 89	. . .	FY 95	FY 96	FY 97	FY 98	TOTAL
Fixed Costs: Capital Repayment(CPE)			2,268	2,268	2,268	. . .					11,341
Variable Recurring Costs											
Intercity Service	7,562	9,579	11,786	12,729	13,747	. . .	21,815	23,560	25,445	27,480	240,801
Local Exchange Service	6,864	7,610	5,987	6,579	7,116	. . .	10,661	11,428	12,257	13,152	125,304
Total Variable Recurring Costs	14,426	17,189	17,773	19,308	20,863	. . .	32,476	34,988	37,702	40,632	366,105
State Costs	584	534	1,537	1,660	1,792	. . .	2,844	3,072	3,317	3,583	30,283
Total Telco Projected Costs	15,010	17,723	21,578	23,236	24,923	. . .	35,320	38,060	41,019	44,215	407,729
Total State System Projected Costs	15,030	17,830	17,101	20,276	21,369	. . .	29,925	31,785	33,435	29,707	342,790
Cost Avoidance (000's)	- -	- -	4,477	2,960	3,554	. . .	5,395	6,275	7,584	14,508	64,93.
Cumulative Cost Avoidance (000's)			4,351	7,311	10,866	. . .	36,572	42,847	50,431	64,939	64,939

Figure 12

PROJECTED ANNUAL COSTS
STATE SYSTEM PLUS RESIDUAL COMMERCIAL SERVICE VS CONTINUED SBC & AT&T SERVICE

SUMMARY	85	86	87	88	89	90	91	92	93	94	95	96	97	98	TOTAL
Annual Budget Telco System (000's)	$15,011	$17,723	$21,578	$23,236	$24,923	$26,650	$28,514	$28,260	$30,435	$32,784	$35,321	$38,060	$41,019	$44,215	$407,729
Annual Budget State System (000's)	$15,030	$17,830	$17,101	$20,276	$21,368	$22,530	$23,796	$25,159	$26,627	$28,220	$29,926	$31,785	$33,435	$29,707	$342,790
Cost Avoidance due State System (000's)	$ (19)	$ (107)	$ 4,477	$ 2,960	$ 3,555	$ 4,120	$ 4,718	$ 3,101	$ 3,808	$ 4,564	$ 5,395	$ 6,275	$ 7,584	$14,508	$ 64,939
Cost Avoidance, Cumulative	$ (19)	$ (126)	$ 4,351	$ 7,311	$10,866	$14,986	$19,704	$22,805	$26,613	$31,177	$36,572	$42,847	$50,431	$64,939	$ 64,939

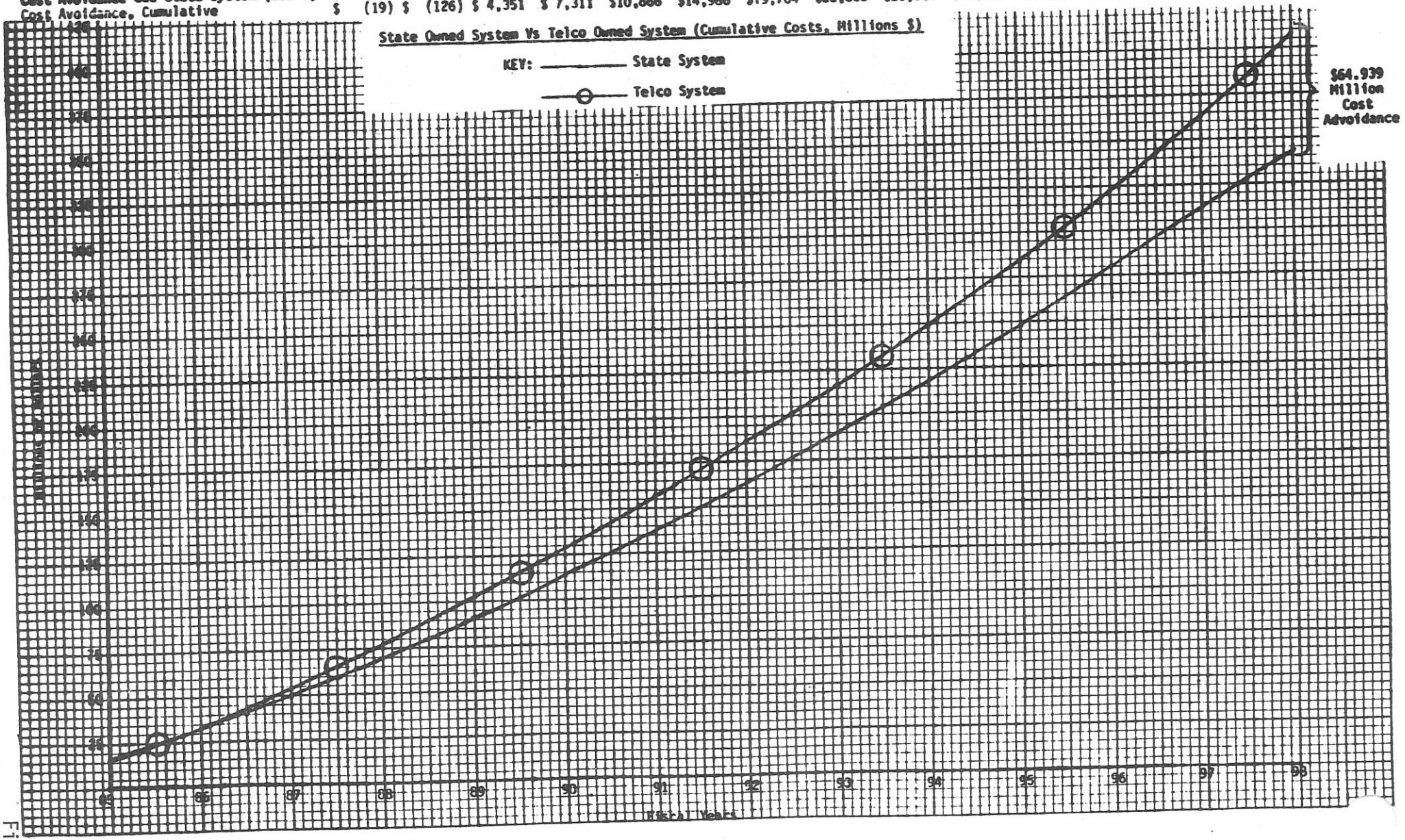

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Figure 13

provide interLATA service which is predominantly what the state uses. AT&T from whom we must buy all present KANS-A-N and interLATA service, has few or no digital facilities and it will be years before they do. Use of AT&T analog facilites will negate any advantage that would accrue from using SBC facilites for intraLATA services.

Figures 12 and 13 provide cost comparison cost avoidance data. Both include FY 98, the year after payback ends, in order to show how costs avoidance increases after that period. A further analysis of cost avoidance shows that the transmission system provides two-thirds and the switches one-third of the cost avoidance through FY 97 as follows:

Transmission System	$34,101,000
Switch System	16,328,000
TOTAL	$50,429,000

Comparison of cost elements, details, methodology, and rationale are provided in Appendix A. "Cost Calculations, Methodology and Rationale" and enclosures thereto.

SECTION VI - CONCLUSIONS AND RECOMMENDATIONS

The ways in which we traditionally viewed acquisition, uses, and management of our telecommunications services and facilities, are no longer relevant to the environment that exists in the telecommunication industry today or that can be foreseen in the distant future. No longer is it possible to secure those services from a single provider and it is no longer a viable option to rent Customer Premises Equipment (CPE) on a continuous permanent basis. It is inevitable that sooner or later we will have to buy and own all CPE and pay to have it installed, maintained, and moved. Neither is it possible to secure all the intercity services we use from one vendor as in the past. Additionally, the cost of intercity services are such that the digital facilities we now need for operational purposes are prohibitively expensive, if they can be secured at all.

In anticipation of these circumstances and to cope with the consequences, the Department of Administration Telecommunications Office has over the past four years developed a telecommunications system plan. The state plan calls for replacement of major portions of rented CPE with state owned CPE. It provides for an intercity/interLATA transmission system that will provide for a major portion of the digital circuitry needed, now and far into the future, at a cost that is reasonable and acceptable.

Furthermore, the development stages of digital and fiber optic technology are over. Standards have been established, and acquisition costs are at their low point in the development/production curve. From now on costs will respond to normal inflationary pressures and gradually increase each year.

In addition, major producers and vendors are competing intensely for a share of the telecommunications equipment market.

Consequently, the state is in the best possible position to acquire the system designed, and there will never be a better time. It will be cost effective immediately at cutover and continue to serve state agencies for many years to come. It will continue to increase in cost effectiveness each year while accepting increased volume demands or new applications with only incremental costs for transmission and user terminal equipment.

It is recommended that the state proceed to acquire the designed system without further delay.

APPENDIX A
COST CALCULATIONS
METHODOLOGY AND RATIONALE

The following information regarding cost and cost avoidance data is provided:

1. State System, Plus Residual Commercial Service.

The state system does not represent a total displacement of either SBC or AT&T service. Total displacement is neither financially nor operationally feasible since both SBC and AT&T facilities are needed to provide access to local exchange service, intercity service, interstate service, and international service. The state system replaces only the most costly and economically viable services.

a. Fixed Costs - Capital Repayment

The estimated capital costs of $38,314,000 which includes up front project management costs, along with a draw down schedule, Enclosure 1, were provided to an investment banker in order to secure authentic loan and repayment data. An interest rate of 9.5% was applied. A computer calculated up front interest to be capitalized and added a one year debt service reserve, as well as the investment banker's fee. Legal arbitrage on the funds was applied as a reduction of overall costs. Interest is paid on the 1st of January and the 1st of July, while capital repayment is made once a year on 1 January. Since we plan to make monthly repayments to a trustee, these funds draw interest, along with the debt service reserve, which when deducted from the legal obligation result in a lower net total annual repayment. This net total annual repayment is the amount shown on Enclosures 2 and 3 for FY 87 through FY 97.

b. Variable Recurring Costs

(1) Intercity Service (Residual).

(a) KANS-A-N. KANS-A-N is the primary vehicle which provides intercity services to all state agencies. Other than routine switched dial up voice and data service, dedicated transmission facilities are provided to the ASTRA (Law enforcement net), Telenet (Regents continuing educational net), a number of multipoint data systems used by Human Resources, Social and Rehabilitation Services, and Kansas Department of Transportation, and miscellaneous point to point special service data circuits used by various state agencies.

(b) The FY 85 cost data is based on current tariffs and usage and includes a full year of "Telpak". Also included is the $25 per line private line access charge, denied by the K.C.C., but which AT&T advises us will be collected one way or another in FY 85.

(c) The FY 86 cost data takes into account the demise of "Telpak" on 31 December 1985. The remainder of the year is calculated on the basis of the Inter-exchange (IXC) tariffs on a circuit by circuit basis. It also includes an 8% escalation factor to provide for rate increases and growth. The 8% factor is an estimation based on last years 3.8% national inflation rate and a 1% growth rate normal to KANS-A-N. The additional 3.2% is added to account for anticipated increases in growth and because the 3.8% figure is deemed to be unrealistically low. This 8% per year escalation factor is used throughout the study and is viewed as being a conservative figure. Past history since FY 76 indicates an annual increase in cost in excess of 8% per year. See Enclosure 4, "Telecommunications Cost History and Trend".

(d) In mid FY 87, the proposed state system is cutover. Costs include one-half year on IXC (see Enclosure 5, "Telpak Cost Compared to IXC Costs"), and one-half year on the fiber facility. The 8% escalation factor is applied to non-fiber facilities as described above.

(e) FY 88 is the first stable year after system cutover and costs are increased only at the annual 8% estimated escalation rate for non-fiber facilities. For fiber facilities, cost escalation of 8% is applied to maintenance and operations costs covered under "State Costs" to be discussed later.

(f) FY 89 and thereafter, only the 8% escalation rate is applied as described in (e) above.

(2) Local Exchange Service - Residual

(a) See Enclosure 6 "Projected Annual Costs of Centrex Services in FY 85". This data is based on current tariffs, actual billing, and inventories. This data constitutes the starting point for all the items listed under "Cost Factors".

(b) FY 86 costs are escalated at 8% for all items except the following:

(1) CPE is priced in accordance with the F.C.C. directed rental schedule used by AT&T.
(2) Centrex line "access" charges are costed at $2.50 per line; $2.00 for the 1st half of FY 86, and $3.00 for the latter half of FY 86.
(3) The PBX trunk access charge of $6.00 remains firm throughout this study.

(c) In FY 87 all Centrex service is discontinued and replaced by state PBX's. All charges for Centrex lines, both Administration and Dormitory, all CPE, all O.C.C. (moves and changes), and Centrex "Access" Charges are discontinued. (See Enclosure 7-1 thru 7-8 for relevant details).

(1) Misc. Lines, Features, Etc., Costs.

This item covers a myriad of ancillary equipment, data circuits and arrangements, Centrex features, etc., which are replaced by "Direct in Dial" and "Touchtone Dial" service in the amount of $159,000. An additional $100,000 is provided for Off Premise extensions, Telephone Directory Listings, and other small continuing tariffed items. The 8% escalation factor is added each year.

(2) PBX Trunks. This includes charges for all the trunks required to serve the six PBX's. The 8% escalation factor is added each year.

(3) Access Charges for PBX trunks at $6 each are applied throughout the remainder of the study.

c. State Costs.

(1) Management Support

(a) This item presently covers all personnel costs of the Telecommunications Office, one billing clerk in Accounts and Reports Division, and all object code 200, 300, and 400 expenses relevant to billing and management of KANS-A-N and the Topeka Area Complex Centrex system. It also covers all engineering effort, whether telephone, data, or radio, and all management, operations, and administration advisory services provided to all agencies statewide.

(b) During the engineering and construction phase of this project, 75% of the effort of the Telecommunications Office will be applied to project management and implementation activities. Thereafter, 75% of the effort of the Telecommunications Office will be devoted to overall system management and supervision.

(c) Costs.

(1) FY 85 costs are 75% of the FY 84 total budget. Over and above 75% of the FY 84 total budget of $363,000, $200,000 is assigned to "Project Management" activities and capitalized as a legitimate expense attributable to the overall project.

(2) FY 86 costs are FY 85 costs escalated at 8%. An additional $400,000 is assigned to "Project Management" and capitalized.

(3) FY 87 costs reflects the post cutover period in which all relevant telecommunications costs are assigned to costs for management of the system and collected from system users.

(4) Costs for FY 88 and thereafter reflect the annual 8% escalation rate.

(2) Switchboard Operators

(a) Switchboard operators are an integral and essential part of any telecommunications system. They are currently assigned organizationally to the General Services Division which provides personnel administration and housekeeping support for the operators. The Telecommunications Office exercises operational control over these operators because of their almost total involvement with KANS-A-N and because of the complexity of the system and the statewide service it provides. Additionally, we presently support six operators at KUMC for nighttime and weekend KANS-A-N service. The costs for operators in Topeka are divided 90% for KANS-A-N and 10% for Centrex service based on traffic handled. Operators costs at KUMC are 100% KANS-A-N, even though they too provide local answering service at KUMC.

(b) Costs.

(1) FY 85 costs are those in the FY 85 budget.

(2) In FY 86 we plan to discontinue KUMC operations and provide round the clock seven day per week service in Topeka in order to reduce circuit transfer and transmission costs, and because the payment to KUMC is becoming excessive.

(3) In FY 87 the same operator force will continue to handle the traffic load and costs are escalated at 8%.

(4) FY 88 costs and thereafter reflect an annual 8% escalation factor.

(3) Space Rental

This provides for switchroom and other space needed by the system at all locations. A cost of $9.00 per sq. ft. per year is assigned and escalated at 8% per year.

(4) Contract O&M - Fixed, Variable, Moves and Changes (See Enclosure 3)

(a) Fixed.

These are costs for operating and maintenance personnel, as well as support costs for their activities. Such persons perform technical functions in monitoring, testing, repairing, routining, and otherwise keeping

all components of the system operational. Personnel may be engaged under a contract maintenance arrangement at some agreed upon price per unit of equipment, such as $2.50 per line per month, or on a charge per man hour basis or some combination of bases as mutually agreed upon. This same function of operation and maintenance may also be performed by state employees with all other support and material items identified and funded by cost category object codes as in current operations. These costs can be relatively stable because fixed crews would be assigned to installations or within geographical districts. Once established, levels for items such as work space, supply levels, maintenance areas, vehicular requirements and maintenance and operating schedules, would vary only occasionally, and then over long periods of time. Such costs could be negotiated in a maintenance contract, and annual cost changes for items subject to inflation levels could be tied to the CPI. Other physical changes in space or in quantities could be calculated on their actual costs and negotiated on some periodic or as required basis when triggered by specified events. But all these costs can be stabilized over a relatively long period of time and identified on an agency by agency basis.

(b) Variable

These costs are those that occur on an unscheduled basis in varying volumes as needs or emergencies arise. Costs include spare parts, tools and test equipment, in addition to personnel, and where applicable, vehicle usage and travel. The bases for estimation are industry standards for specific components and are based on a percentage of capital costs, as well as per work order or trip.

(c) Moves and Changes

These costs are customer initiated in accordance with changes in the work location or arrangement. They may be costed on a time and material basis or on event basis, such as $100 per telephone rearrangement.

(d) See Enclosure 3, this appendix, for a recapitulation and site by site detail.

d. Tax Revenue Lost

A conjectural, but possible effect of the state installing its own system is a possible tax loss to state and local entities due to reduction in telephone company revenues. This is conjectural because the plant left idle is in considerable part, reusable by other customers without requiring capital outlay, installation costs, and interest by the telephone company. However, to account for the possibility, the loss of tax revenue is treated as an expense of the state system. Review of Southwestern Bell's tariff filing documents shows that taxes paid to state and local governments is approximately 9% of gross income. Gross income is used because the state's payments to Southwestern Bell constitute gross income. The gross income lost is calculated by deducting the state system annual residual payments to SWB/AT&T from annual payments to SWB/AT&T if the state system were not installed. This quantity multiplied by 9% is the "Tax Revenue Lost" shown on the "Projected Annual Costs" exhibit.

2. Continue SBC and AT&T Service

This cost data represents the "status quo" if the state system is not installed. It covers the same sites and installations with equivalent "Cost Elements". State system costs are deducted from this data to arrive at "Cost Avoidance" data.

a. Fixed Costs - Capital Replacement

(1) CPE replacement. Because AT&T is expected to withdraw support from obsolescent CPE after 1986, or as an alternative raise maintenance rates to unacceptable levels, the state will have no option other than to replace the existing CPE i.e., office telephones and ancillary items not including the switch equipment and cable plant which will remain on SBC premises in a regulated status.

(2) The cost to replace all items on a one for one basis, to include multi-line key systems, is estimated at $9,000,000. Since an outright purchase is not likely and in order to provide reasonable comparative data, the purchase is treated as an installment buy and amortized over a five year period at 9 1/2%, the same as for the state system. The resulting payments are about $200,000 more per year than the FY 86 rental rate escalated at 8% to an FY 87 level.

b. Variable Recurring Costs

(1) Intercity Service

This includes the same component subsystems as under the state system data and the costs for FY 85 and FY 86 are idenitcal.

(a) FY 87 costs reflect the "demise" of "Telpak" and transfer to the Interexchange (IXC) tariffs for one-half year between 1 January 1986 and 30 June 1986.

(b) FY 88 is the first year of stability and complete reliance on the (IXC) tariffs.

(c) Costs for FY 89 and onward reflect the 8% annual escalation rate.

(2) Local Exchange Service

(a) FY 85 and FY 86 costs are identical to those for the state system cost comparison data.

(b) In FY 87 only the tariffed costs for Centrex lines, Misc. Services, and PBX's remain and these are escalated from FY 86 costs at 8% and continued on throughout. CPE costs are discontinued since those items are now state owned. Similarly, Move and Change costs are transferred to state costs since neither AT&T-IS nor SWB will provide that service.

(c) In FY 87 Centrex "access" charges are costed at $4.50 per month. The F.C.C. directed rate changes to $5.00 per line on 1 January 1987 so the average per fiscal year is $4.50.

(d) In FY 88 the Centrex "access" charge changes to $6.00 per line on 1 January 1988 so the average for the fiscal year is $5.50.

(e) In FY 89 the Centrex "access" charge rate stabilizes at $6.00 and remains at that rate throughout the study.

(f) Thus far the F.C.C. has specified access charge rates up to $4.00 with intent to study the matter further. However, the business line rate is $6.00 now and all new Centrex lines after 27 July 1983 cost $6.00. Furthermore, "access charges" forecasted by F.C.C. prior to the current decision visualized access charges reaching or exceeding $10 per line by 1990. Therefore, the $6 charge is considered appropriate and costs greater

than the $6 contained in this study may result.

c. State Costs

(1) Management Support and Switchboard Operators. Costs and Rationale for FY 85 and FY 86 are identical to state system cost data and are escalated at 8% per year throughout the remainder of the study.

2) Contract Maintenance and Moves and Changes. Maintenance costs are based on a percentage of capital invested in CPE. In this case, $9,000,000 x 1/2% or $540,000. This is a conservative figure and may be much more considering that there are approximately 11,000 expensive to maintain multi-line telephones and about 13,000 single line telephones involved. Move and change costs are estimated on the basis of 4,200 moves per year at $100 each (comparable to AT&T-IS charges) or $420,000. These costs are escalated at 8% per year thereafter.

PROJECT CASH FLOW - PROGRESS PAYMENTS AND ADVANCES

CALENDAR YEAR QUARTER	1/85	2/85	3/85	4/85	1/86	2/86	3/86	4/86	1/87	TOTAL
FISCAL YEAR QUARTER	3/85	4/85	1/86	2/86	3/86	4/86	1/87	2/87	3/87	
Topeka Complex & Project Mgmt, (includes overhead & consultants)	220,000	150,000	1,090,000	6,948,000	130,000	120,000	377,000	95,000		9,130,000
Kansas University		100,000	10,000	1,310,000	6,020,000					7,440,000
KU Medical Center			45,000	15,000	450,000	3,730,000				4,240,000
Kansas State Univ.				85,000	15,000	1,105,000	5,065,000			6,270,000
Wichita State Univ.					35,000	5,000	330,000	1,825,000		2,195,000
Wichita Complex (Agencies)					27,500	5,000	110,000	624,500		767,000
Fort Hays State Univ.						35,000	5,000	240,000	1,395,000	1,675,000
Transmission System					286,000	1,242,000	875,000	4,194,000		6,597,000
TOTALS	220,000	250,000	1,145,000	8,358,000	6,963,500	6,242,000	6,762,000	6,978,500	1,395,000	38,314,000

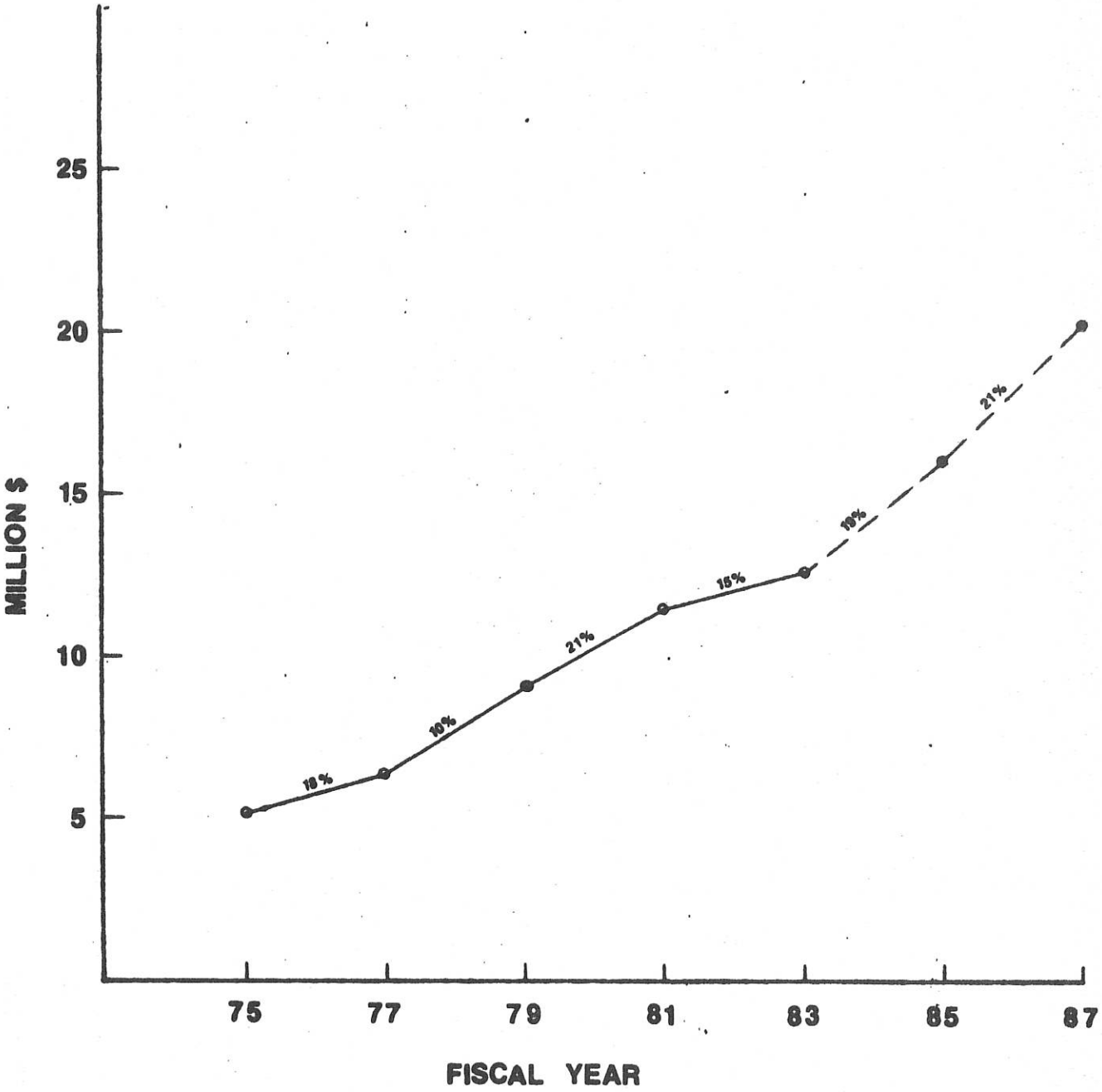
PROJECTED ANNUAL COSTS (000's)
STATE SYSTEM PLUS RESIDUAL COMMERCIAL SERVICE

Cost Elements	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	TOTALS
Fixed Costs: Capital Repayment															
Intercity Plant (19%)	$ - -	$ - -	$ 443	$ 1,221	$ 1,219	$ 1,215	$ 1,213	$ 1,210	$ 1,207	$ 1,204	$ 1,198	$ 1,159	$ 1,124	$ - -	$ 12,449
Local Service Plant (81%)	- -	- -	1,887	5,204	5,196	5,180	5,172	5,160	5,144	5,131	5,107	5,095	4,791		53,067
Sub-Total	$ - -	$ - -	$ 2,330	$ 6,425	$ 6,415	$ 6,395	$ 6,385	$ 6,370	$ 6,351	$ 6,335	$ 6,305	$ 6,290	$ 5,915	$ - -	$ 65,516
Variable Recurring Costs															
Intercity Service (Residual)															
KANS-A-N	$ 6,877	$ 8,552	$ 8,444	$ 6,953	$ 7,509	$ 8,109	$ 8,758	$ 9,459	$10,216	$11,033	$11,916	$12,869	$13,898	$15,011	$139,604
ASTRA	200	276	322	303	327	353	381	412	445	481	519	561	607	654	5,841
Telenet	49	87	122	123	133	144	155	168	181	196	211	229	247	266	2,311
Data Circuits	137	341	491	438	474	511	552	597	644	696	751	812	876	947	8,267
Miscellaneous	299	323	349	376	407	439	474	512	553	597	645	697	752	813	7,236
Sub-Total	$ 7,562	$ 9,579	$ 9,728	$ 8,193	$ 8,850	$ 9,556	$10,320	$11,148	$12,039	$13,003	$14,042	$15,168	$16,380	$17,691	$163,259
Local Exchange Service:															
Centrex Main lines	$ 2,744	$ 2,963													$ 5,707
Centrex Dorm lines	778	841													1,619
Customer Premises Equip. (CPE)	1,708	1,899													3,607
Misc. Line, Fea., Equip., Svc.	881	951	259	280	303	327	353	381	412	445	480	519	560	606	6,757
Moves & Changes (OC&C)	264	285													549
PBX Trunks	38	41	730	789	852	920	994	1,073	1,159	1,252	1,352	1,460	1,578	1,703	13,941
Access Charges Centrex	445	623													1,068
Access Charges PBX Trunks	6	6	97	97	97	97	97	97	97	97	97	97	97	97	1,176
Sub-Total	$ 6,864	$ 7,609	$ 1,086	$ 1,166	$ 1,252	$ 1,344	$ 1,444	$ 1,551	$ 1,668	$ 1,794	$ 1,929	$ 2,076	$ 2,235	$ 2,406	$ 34,424
Total Variable Costs	$14,426	$17,188	$10,814	$ 9,359	$10,102	$10,900	$11,764	$12,699	$13,707	$14,797	$15,971	$17,244	$18,615	$20,097	$197,683
State Costs															
Management Suppport	$ 272	$ 294	$ 1,229	$ 1,327	$ 1,433	$ 1,548	$ 1,674	$ 1,806	$ 1,950	$ 2,106	$ 2,275	$ 2,456	$ 2,654	$ 2,864	$ 23,888
Switchboard Operators	312	241	259	280	302	326	352	381	411	444	479	518	560	602	5,467
Space Rental			114	124	133	144	156	168	180	196	212	229	248	267	2,171
Contract Maintenance (Fixed)			874	943	1,019	1,100	1,188	1,283	1,386	1,497	1,617	1,746	1,887	2,037	16,577
Contract Maintenance (Variable)			572	618	667	721	778	841	908	980	1,059	1,143	1,236	1,334	10,857
Contract Moves and Changes	- -	- -	282	305	329	357	384	414	448	483	522	562	602	658	5,346
Sub-Total	$ 584	$ 535	$ 3,330	$ 3,597	$ 3,883	$ 4,196	$ 4,532	$ 4,893	$ 5,283	$ 5,706	$ 6,164	$ 6,654	$ 7,187	$ 7,762	$ 64,306
Tax Revenue Lost	$ - -	$ - -	$ 627	$ 895	$ 969	$ 1,039	$ 1,115	$ 1,197	$ 1,286	$ 1,382	$ 1,485	$ 1,597	$ 1,718	$ 1,848	$ 15,158
Total State System Projected Costs	$15,010	$17,723	$17,101	$20,276	$21,369	$22,530	$23,796	$25,159	$26,627	$28,220	$29,925	$31,785	$33,435	$29,707	$342,663

PROJECTED ANNUAL COSTS (000's)
CONTINUE SBC AND AT&T SERVICE

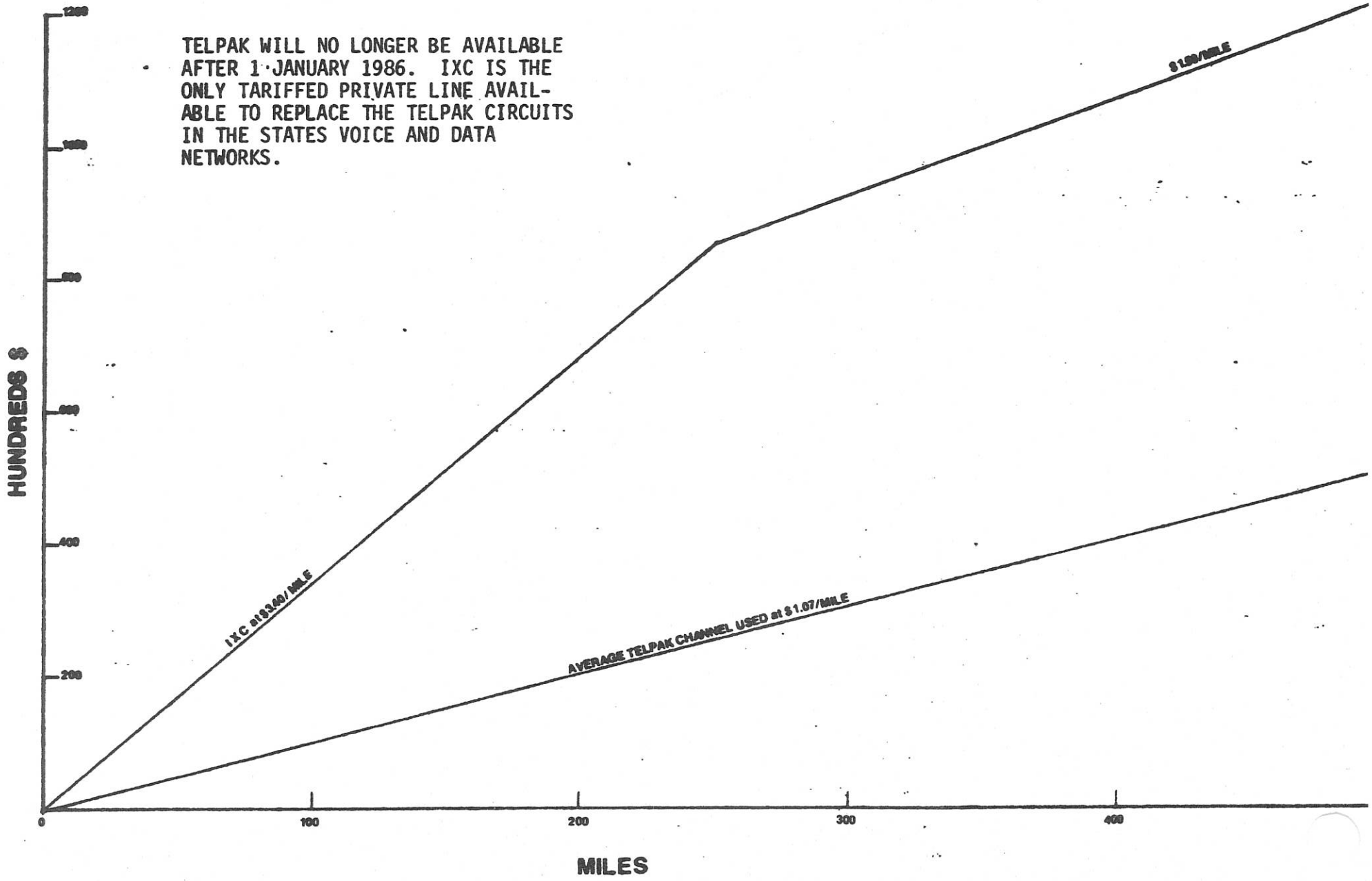
Cost Elements	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	TOTALS
Fixed Costs: Repayment															
CPE Replacement (9 1/2%)	$ - -	$ - -	$ 2,268	$ 2,268	$ 2,268	$ 2,268	$ 2,268	$ - -	$ - -	$ - -	$ - -	$ - -	$ - -	$ - -	$ 11,340
Variable Recurring Costs															
Intercity Service															
KANS-A-N	$ 6,877	$ 8,552	$10,367	$11,196	$12,092	#13,059	$14,104	$15,232	$16,451	$17,767	$19,188	$20,723	$22,381	$24,173	$212,162
ASTRA	200	276	363	392	424	458	494	534	577	623	673	726	785	848	7,373
Telenet	49	87	131	141	152	165	178	192	207	224	242	261	282	305	2,616
Data Circuits	137	341	576	622	672	726	784	847	915	988	1,067	1,152	1,244	1,344	11,415
Miscellaneous	299	323	349	376	407	439	474	512	553	597	645	697	752	812	7,235
Sub-Total	$ 7,562	$ 9,579	$11,786	$12,727	$13,747	$14,847	$16,034	$17,317	$18,703	$20,199	$21,815	$23,559	$25,444	$27,482	$240,801
Local Exchange Service															
Centrex Main lines	$ 2,744	$ 2,963	$ 3,200	$ 3,456	$ 3,733	$ 4,031	$ 4,354	$ 4,702	$ 5,078	$ 5,484	$ 5,924	$ 6,398	$ 6,910	$ 7,463	$ 66,440
Centrex Dorm lines	778	841	908	981	1,059	1,144	1,235	1,334	1,440	1,556	1,682	1,816	1,961	2,118	18,853
Customer Premises Equip. (CPE)	1,708	1,899													3,607
Misc. Line Fea. Equip. Svc.	881	951	1,027	1,110	1,198	1,294	1,398	1,510	1,630	1,761	1,902	2,054	2,219	2,396	21,331
Moves and Changes (OC&C)	264	285													549
PBX Trunks	38	41	45	48	52	56	61	65	71	76	82	89	97	105	926
Access Charges Centrex	445	623	800	978	1,067	1,067	1,067	1,067	1,067	1,067	1,067	1,067	1,067	1,067	13,516
Access Charges PBX Trunks	6	6	6	6	6	6	6	6	6	6	6	6	6	6	84
Sub-Total	$ 6,864	$ 7,609	$ 5,986	$ 6,579	$ 7,115	$ 7,598	$ 8,121	$ 8,684	$ 9,292	$ 9,950	$10,663	$11,430	$12,260	$13,155	$125,306
Total Variable Recurring Costs	$14,426	$17,188	$17,772	$19,306	$20,862	$22,445	$24,155	$26,001	$27,995	$30,149	$32,478	$34,989	$37,704	$40,637	$366,107
State Costs															
Management Support	$ 272	$ 294	$ 318	$ 344	$ 371	$ 400	$ 433	$ 467	$ 504	$ 545	$ 588	$ 635	$ 684	$ 741	$ 6,596
Switchboard Operators	312	241	259	281	302	326	352	382	411	444	479	518	558	602	5,467
Contract Maintenance (Fixed)	- -	- -	540	583	630	682	735	793	857	926	1,000	1,078	1,166	1,257	10,247
Contract Maint. (Moves & Changes)	- -	- -	421	454	490	529	571	617	668	720	775	840	907	978	7,970
Total State Costs	$ 584	$ 535	$ 1,538	$ 1,662	$ 1,793	$ 1,937	$ 2,091	$ 2,259	$ 2,440	$ 2,635	$ 2,842	$ 3,071	$ 3,315	$ 3,578	$ 30,280
Total Cost to Cont. SBC & AT&T Svc.	$15,010	$17,723	$21,578	$23,236	$24,923	$26,650	$28,514	$28,260	$30,435	$32,784	$35,320	$38,060	$41,019	$44,215	$407,727
Less Total State System Costs	$15,010	$17,723	$17,101	$20,276	$21,369	$22,530	$23,796	$25,159	$26,627	$28,220	$29,925	$31,785	$33,435	$29,707	$342,663
Cost Avoidance (Annual)	- -	- -	4,477	$ 2,960	$ 3,554	$ 4,120	$ 4,718	$ 3,101	$ 3,808	$ 4,564	$ 5,395	$ 6,275	$ 7,584	$14,508	$ 65,064
Cost Avoidance (Cumulative)	$ - -	$ - -	$ 4,477	$ 7,437	$10,991	$15,111	$19,829	$22,930	$26,738	$31,302	$36,697	$42,972	$50,556	$65,064	$ 65,064

TELECOMMUNICATION COST HISTORY AND TREND



TELPAK COST COMPARED TO IXC COSTS

TELPAK WILL NO LONGER BE AVAILABLE AFTER 1 JANUARY 1986. IXC IS THE ONLY TARIFFED PRIVATE LINE AVAILABLE TO REPLACE THE TELPAK CIRCUITS IN THE STATES VOICE AND DATA NETWORKS.



PROJECTED ANNUAL COSTS OF CENTREX SERVICES IN FY85
(July 85 - June 86)

Cost Factors	CENTREX LOCATIONS						
	KU Lawrence	KUMC Kansas Cy	KSU Manhattan	WSU Wichita	FHSU Fort Hays	Cap. Complex Topeka	Totals
# of Centrex Main Lines	1,648	2,934	1,345	523	504	3,465	10,419
Charges	$ 423,600	$ 780,030	$ 345,714	$ 139,044	$ 133,992	$ 921,210	$2,743,590
# of Centrex Dorm. Lines	2,401	28	1,841	157	657	0	5,084
Charges	$ 367,638	$ 4,284	$ 281,892	$ 24,042	$ 100,602	$ ---	$ 778,458
Cost of CPE	424,068	266,316	398,448	167,580	25,992	425,892	$1,708,296
Misc. Charges: Mileage, Business Lines, Consoles, etc.	$ 156,896	$ 135,636	$ 198,234	$ 9,332	$ 21,186	$ 359,541	$ 880,825
Sub-Total	$1,372,202	$1,186,266	$1,224,288	$ 339,998	$ 281,772	$1,706,643	$6,111,169
Access Charges Centrex	$ 121,470	$ 88,860	$ 95,580		$ 34,830	$ 103,950	$ 444,690
Access Charges PBX				$ 6,480			6,480
PBX Trunk Charges				38,178			38,178
Sub-Total	$ 121,470	$ 88,860	$ 95,580	$ 44,658	$ 34,830	$ 103,950	$ 489,348
Other Charges & Credits	59,747	51,005	52,794	15,386	12,664	72,424	264,020
Total Centrex Charges	$1,553,419	$1,326,131	$1,372,662	$ 400,042	$ 329,266	$1,883,017	$6,864,537

ESTIMATED CONTRACT MAINTENANCE (Annual)
RECAPITULATION

Location	Switch	Micro-wave	Moves & Changes	Total
Topeka	$225,000	$ 32,000	$ 60,000	$ 317,000
KU	210,000	- -	60,000	270,000
KUMC	135,000	- -	60,000	195,000
KSU	177,000	- -	60,000	237,000
WSU & etc.	66,000	10,500	24,000	100,500
FHSU	50,000		18,000	68,000
Total Local Exchange	$863,000	$42,000	$282,000	$1,187,500
Transmission system	- -	- -	- -	540,000
TOTAL ANNUAL CONTRACT MAINTENANCE				$1,727,500

ANNUAL RECURRING OPERATING COSTS
STATE OWNED SYSTEM
FY 85

Topeka Switch and Local Network		
Non-Telco State Costs		
Switch Contract Maintenance 7,500 ports @ $30/port/yr	=	$225,000
Microwave Contract Maintenance 10% x $322,000 (capital)	=	32,000
Space Rental-Switch and Control Center 3,000 sq.ft.@$9 yr	=	27,000
Moves, Changes, etc. and tel instrument maintenance	=	60,000
45 moves/mo. @ $100 $54,000		
Misc. tel mtc. $ 6,000		
Sub-total, Non Telco Costs		$344,000
Residual Telco Costs		
Direct in Dial (DID) 7,000 ports @ $246/100/yr.		$ 17,000
PBX Trunks 350 @ $35.20/mo.		147,840
Touchtone Service 350 @ $4.30/mo.		18,060
Trunk Access Chgarge (FCC only) $350 x $72 yr.		25,200
Sub-total Residual Telco Costs		$208,140
TOTAL ANNUAL RECURRING COSTS		$552,140

ANNUAL RECURRING OPERATING COSTS
STATE OWNED SYSTEM
FY 85

KU Switch and Distribution Network	
Non-Telco State Costs	
Switch Contract Mtc. 7,000 ports @ $30/port/yr.	$210,000
Space Rental-Switch 3,500 sq.ft. @ $9 yr	32,000
Moves, Changes, etc. and Tel Inst. Mtc.	60,000
45 moves/mo. @$100 $54,000	
Misc. Tel. Mtc. $ 6,000	
Sub-total, Non-Telco Costs	$302,000
Residual Telco Costs	
Direct in Dial (DID) 6,500 port @ $246/100/yr.	$ 16,000
PBX Trunks 3000 @ $35.20/mo.	126,720
Touchtone Serveice 300 @ $4.30/mo.	15,480
Trunk Access Charge (FCC only) 300 @ $72/yr.	21,600
Sub-total, Residual Telco Costs	$179,800
TOTAL ANNUAL RECURRING COSTS	$481,800

ANNUAL RECURRING OPERATING COSTS
STATE OWNED SYSTEM
FY 85

KUMC SWITCH AND DISTRIBUTION NETWORK	
Non-Telco State Costs	
Switch Contract Maintenance 4,500 ports @ $30/port/yr.	$135,000
Space Rental 2,000 sq. ft. @ $9 yr.	18,000
Moves, Changes, etc. and Tel Instr. Mtc.	60,000
45 moves/mo. @ $100 $54,000	
Misc. Tel. Mtc. $ 6,000	
Sub-total, Non-Telco Costs	$213,000
Residual Telco Costs	
Direct in Dial (DID) 4,000 @ $246/100/yr.	$ 10,000
PBX Trunks 250 @ $53.35/mo.	160,050
Touchtone Service 250 @ $4.30/mo.	12,900
Trunk Access Chg. (FCC only) 250 @ $72 yr.	18,000
Sub-total, Residual Telco Costs	$200,950
TOTAL ANNUAL RECURRING COSTS	$413,950

ANNUAL RECURRING OPERATING COSTS
STATE OWNED SYSTEM
FY 85

KSU SWITCH AND DISTRIBUTION NETWORK	
Non-Telco State Costs	
Switch Contract Mtc. 5,000 ports @ $30 port/yr.	$177,000
Space Rental 2,500 sq. ft. @ $9 sq. ft.	23,000
Moves, Changes, etc. and Tel Instr. Mtc.	60,000
45 moves/mo. @ $100 $54,000	
Misc. Tel. Mtc. 6,000	
Sub-total, Non-Telco Costs	$260,000
Residual Telco Costs	
Direct in Dial (DID) 5,500 ports @ $246/100/yr.	$ 14,000
PBX Trunks 250 @$35.20/mo.	105,600
Touchtone Service 250 @ $4.30/mo.	12,900
Trunk Acccess Chg. (FCC only) 250 @ $72/yr.	18,000
Sub-total, Residual Telco Costs	$150,500
TOTAL ANNUAL RECURRING COSTS	$410,500

ANNUAL RECURRING OPERATING COSTS
STATE OWNED SYSTEM
FY 85

WSU SWITCH AND LOCAL NETWORK	
Non-Telco, State Costs	
Switch Contract Mtc. 2,200 ports @ $30/port/yr.	$ 66,000
Microwave Contract Mtc. 10% x $105,000 (capital)	10,500
Space Rental 1,000 sq.ft. @ $9 sq. ft./yr.	9,000
Moves, Changes, etc. and Tel. Instr. Mtc.	24,000
15 moves/mo. @ $100 $18,000	
Misc. Tel. Instr. Mtc. $ 6,000	
Sub-total, Non-Telco Costs	$109,500
Residual Telco Costs	
Direct In Dial (DID) 2,000 ports @$246/100/yr.	$ 5,000
PBX Trunks 100 @ $42.50/mo.	51,000
Touchtone Service 100 @ $4.30/mo.	5,160
Trunk Access Chg. (FCC only) 100 @ $72/yr.	7,200
Sub-total, Residual Telco Costs	$ 68,360
TOTAL ANNUAL RECURRING COSTS	$177,860

ANNUAL RECURRING OPERATING COSTS
STATE OWNED SYSTEM
FY 85

FHSU SWITCH AND DISTRIBUTION SYSTEM		
Non-Telco State Costs		
Switch Contract Mtc. 1,650 ports @ $30/port/yr.		$ 50,000
Space Rental 600 sq. ft. @ $9 sq. ft./yr.		5,400
Moves, Changes, and Tel. Instr. Mtc.		18,000
10 moves/mo. @ $100	$12,000	
Misc. Tel. Instr. Mtc.	$ 6,000	
Sub-total, Non-Telco Costs		$ 73,400
Residual Telco Costs		
Direct in Dial (DID) 1,500 ports @ $246/100/yr.		$ 4,000
PBX Trunks 100 @ $29.20/mo.		35,040
Touchtone Service 100 @ $4.30/mo.		5,160
Trunk Access Charge (FCC only) 100 @ $72/yr.		7,200
Sub-total, Residual Telco Costs		$ 51,400
TOTAL ANNUAL RECURRING COSTS		$124,800

TRANSMISSION SYSTEM
ANNUAL RECURRING COST (FY 85)

KUMC - KU - Topeka - KSU - Salina - WSU - FHSU

Spare Parts for Equipment 3% (1,987,000)	$ 60,000
Contract Maint. of Equipment 10% (1,987,000)	200,000
Contract Maint. of F.O. cable, etc. 5% (4,610,000)	230,000
Contract Circuit Order Work 250/yr. ($200 ea.) (Additions & Changes 250/yr.)	50,000
	$540,000