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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

November 16, 2001

Office of the Secretary
Federal Communications Commission
445 12th Street S.W., Room TW-A225
Washington DC 20554

Re: Initiation of Cost Review Proceeding for Residential and Single-Line Business Subscriber Line Charge (SLC) Caps, CC Docket Nos. 96-262, 94-1.

Dear Secretary:

SBC Communications Inc. (SBC), on behalf of its price cap local exchange carrier (LEC) subsidiaries, hereby submits its subscriber line charge cost submission in response to the Commission's September 17th Public Notice in this proceeding.

We are submitting an original and four copies of the filing to the Secretary, one copy to the Commission's duplication contractor, and one copy with the Chief of the FCC's Competitive Pricing Division.

Please contact me at (202) 326-8111 if you have any questions.

Sincerely,

David Hostetter

SBC Subscriber Line Charge Cost Submission
Executive Summary

November 16, 2001

SBC Communications Inc. (SBC), on behalf of its price cap local exchange carrier (LEC) subsidiaries, hereby submits its subscriber line charge (SLC) cost submission in response to the Commission's September 17, 2001 Public Notice.[1] This executive summary consists of three sections: (i) a brief discussion of the background and purpose of the cost submission; (ii) an overview of SBC's cost model and the methodology used by SBC to determine the inputs for the cost model; and (iii) a summary of results. SBC's cost submission demonstrates that there is no basis for revising or reconsidering the scheduled increases in the SLC caps.[2]

1. The Purpose of the Cost Submission

On May 31, 2000, the Commission adopted the integrated interstate access reform and universal service reform plan submitted by the Coalition for Affordable Local and Long Distance Service (CALLS).[3] One of the primary benefits of the CALLS plan is that it removes implicit subsidies from the interstate access charge system and replaces them with explicit end user recovery and a new interstate access universal service support

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[1] *Initiation of Cost Review Proceeding for Residential and Single-Line Business Subscriber Line Charge (SLC) Caps*, CC Docket Nos. 96-262, 94-1, Public Notice, DA 01-2163 (rel. Sept. 17, 2001).

[2] 47 C.F.R. § 69.152(d)(ii). The SLC recovers the interstate allocation of the loop and port elements.

[3] *Access Charge Reform et al.*, Sixth Report and Order in CC Docket Nos. 96-262 and 94-1, Report and Order in CC Docket No. 99-249 and Eleventh Report and Order in CC Docket No. 96-45, 12 FCC Rcd 15982 (1997) (*CALLS Order*).

mechanism.[4] Of particular relevance to this proceeding, the plan immediately eliminated residential and single-line business PICC and established a schedule for gradually increasing the primary residential and single-line business SLC cap to $6.50 on July 1, 2003. The Commission concluded that the rate restructuring provided for in the CALLS plan serves the public interest "because it simplifies the current rate structure, moves toward cost-based rates, reduces consumers' overall rates, and simplifies long distance bills, thereby resulting in less consumer confusion."[5]

In response to concerns of consumer groups and state commissions, the CALLS plan provided for Commission verification that the progressive increase in the primary residential and single-line business SLC above $5.00 is appropriate in the UNE zone or zones where they would apply.[6] To facilitate this verification, SBC and other CALLS members agreed to provide the Commission with "economic data, including data identifying the forward-looking costs associated with the provision of retail voice grade access to the public switched telephone network for those areas."[7] In the *CALLS Order*, the Commission decided that it would examine this forward-looking cost information prior to the scheduled increase of the SLC cap above $5.00 on July 1, 2002.[8] The Commission rejected proposals to require a cost study prior to adopting the CALLS plan

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[4] *Id.* at ¶¶ 2-3.

[5] *Id.* at ¶ 81.

[6] Memorandum in Support of the Revised Plan of the Coalition for Affordable Local and Long Distance Service, at 10 (filed Mar. 8, 2000).

[7] *Id.*

[8] *CALLS Order* at ¶ 83.

because it did not want to delay the immediate savings end users would realize from implementation of the plan.[9]

In reviewing SBC's cost submission, it is important for the Commission to remember that *this is not a ratemaking proceeding*. The purpose of the Commission's cost review proceeding is simply to verify that the scheduled increases in the SLC cap are warranted. Given the billions of dollars of upfront reductions mandated by the CALLS plan, it is reasonable and appropriate for price cap LECs to recover at least some of these reductions through gradual SLC increases. Moreover, the maximum primary residential and single-line business SLC in any UNE zone will continue to be the *lower* of the SLC cap or the average price cap common line, marketing and transport interconnection charge (CMT) revenue per line for the highest cost UNE zone in a study area.[10] Therefore, an increase in the SLC cap will not necessarily result in an increase in the actual SLC being assessed by a price cap LEC in a given UNE zone.

The Commission also should consider the fact that the CALLS plan permits (indeed encourages) deaveraging of the SLC in different UNE zones. The Commission has recognized that deaveraged rates more closely reflect the actual costs of providing service, which promotes competition and efficiency by removing implicit subsidies.[11] In analyzing whether the scheduled increases in the SLC cap are warranted, the Commission must consider the extent to which the existing cap level prevents price cap LECs from

[9] *Id.* at ¶ 84.

[10] 47 C.F.R. § 69.152(d)(ii).

[11] *CALLS Order* at ¶ 114.

deaveraging the SLC as intended. As demonstrated below, maintaining a $5.00 cap would significantly impede SBC's ability to implement deaveraged SLCs in different UNE zones.

2. SBC's Forward-Looking Cost Study

SBC is submitting a number of technical documents that explain its forward-looking cost model and the methodology used to determine inputs to the cost model. Once again, SBC's cost study is not designed to establish the correct price for residential voice grade local telephone service, but rather to document the costs of provisioning such service. SBC utilized a computer model to calculate the forward-looking cost of the loops and ports that comprise residential voice grade telephone service. SBC then applied a percentage of shared and common costs to arrive at a total cost per line. This total, in turn, was divided by four to derive the appropriate interstate allocation for each line.

Attachment 1 is an overview of SBC's forward-looking cost study, including the methodology used to determine cost inputs and the computer models that were used to derive forward-looking loop and port costs. SBC has used a long run incremental costing methodology to determine the direct costs of provisioning residential voice grade telephone service. This study process reflects relevant aspects of the existing network (*e.g.*, locations of central offices), as well as cost data reflective of forward-looking technologies. The numbers reflected in the attached documents are illustrative only. SBC is not providing the actual inputs for the cost models, which are proprietary and competitively sensitive. SBC's overview describes the assumptions and factors that were used to calculate an annual cost per line.

Attachments 2 and 3 provide a textual description of the computer models that SBC used to determine loop and port costs, respectively. The SBC Loop Costing System calculates the forward-looking costs of a local loop in the SBC networks, including investment, monthly recurring capital costs and operating expenses associated with this plant investment. It does not measure historical or embedded loop costs. Similarly, the SBC Switching Information Cost Analysis Tool Documentation calculates the forward-looking cost of switching in the SBC networks. The only switching costs that have been included in this cost study are investment per analog line and investment per digital line, which correspond to port costs.

Attachment 4 describes the methodology used to allocate shared and common costs. SBC's methodology assumes an 11.25% authorized rate of return and includes common costs such as uncollectibles, marketing expenses, call completion, customer services, general administrative expenses and operating taxes.

3. Summary of Results

SBC calculated the total forward-looking cost per line for each study area (*i.e.*, each state) by adding the interstate allocation of the loop and port costs and applying the appropriate shared and common cost percentage. SBC then calculated the forward-looking cost per line for each UNE zone within each study area. Rather than using state-specific UNE zone categorizations, SBC has uniformly categorized UNE zones from the lowest-cost zone (Zone 1) to the highest-cost zone (Zone 3 or 4). Attachment 5 is a table showing the results for each study area and each UNE zone within SBC's territory.

The results of SBC's forward-looking cost analysis provide strong support for allowing the SLC to gradually increase to $6.50 as provided for in the Commission's rules. In particular, the average forward-looking cost per line is above $6.50 in more than half of SBC's states and it is more than $7.00 in five states. The deaveraged forward-looking per line cost varies widely from a low of $3.43 in Illinois Zone 1 to a high of $14.95 in Kansas Zone 3. This variation provides further support for raising the SLC cap so that the SLC can be deaveraged to reflect cost differences in UNE zones.

To illustrate the practical effects of raising the SLC cap, Attachment 5 also shows the CMT revenue for each study area in SBC's territory. Because most of these CMT revenue figures are below the $6.50 cap, SBC will not be able to increase the SLC to the cap in many cases. SBC, however, will have greater flexibility to deaverage its SLCs, which is consistent with the rules adopted in the *CALLS Order*. Thus, SBC's cost information provides compelling support for the Commission to reaffirm that the scheduled increases in the SLC cap are warranted.

Attachment 1

Overview of the Cost Studies Conducted for the FCC Subscriber Line Charge Proceeding

CC Docket Numbers 96-262, 94-1, 99-249, 96-45

November 16, 2001

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1.0 **Introduction**

1.1 Purpose of this Document

The purpose of this document is to describe the studies created by SBC to determine the costs of providing the loop and switch port for a residential and business line. This document describes the study methods, models, input data and results.

1.2 Basis for Loop and Switch Port Studies

On May 31, 2000, the Federal Communications Commission adopted an integrated interstate access reform and universal service plan for price cap local exchange carriers ("LECs"). The proposal was put forth by the members of the Coalition for Affordable Local and Long Distance Service (CALLS). The CALLS plan establishes a schedule for gradually increasing the residential and single-line business subscriber line charge (SLC) cap to $5.00 as of July 1, 2001, $6.00 as of July 1, 2002, and $6.50 as of July 1, 2003. The Commission has asked for cost information prior to the increase of the SLC cap above $5.00.

The two-wire loop cost studies and the switch port cost studies were conducted in support of this effort. The two-wire loop cost studies determined the direct forward-looking average recurring Long Run Incremental Costs (LRIC) for SBC to provide the facilities between SBC central offices and the customer premises that provide telephone service for residential and single-line business customers. The switch port cost studies determined the LRIC to provide the line-side loop or ground-start signaling connection that is used primarily for analog line connection for switched voice communications.

1.2 Overview of Study Process

The SBC cost study process has evolved over many years. Its purpose has been to determine the costs of offering new and existing services in order to set tariffed rates. The cost methodology which has been used is called *long run incremental costing*. This methodology determines the *direct costs* which will be incurred by SBC in providing a service during a future planning period.

The study process includes:

- *Real Network Characteristics*. Cost studies are "forward-looking" in the sense that they calculate the cost to provide network elements using the latest plant technology for local loop facilities, switching, and other elements of the network. At the same time the studies reflect relevant aspects of the existing network, such as locations of central offices, customer premises, and others. Based on the characteristics which determine the network today and influence it in the future, the studies calculate the plant investment and operating costs which would be expected using forward-looking technologies.

- *Forward-Looking Cost Data*. Along with using forward-looking plant technologies, the studies use plant cost data (vendor prices, labor costs, etc.), capital cost factors and operating expenses which are reflective of these forward-looking technologies.

- *Quality Assurance*. Finally, an important part of the cost study process is "quality assurance." Studies are reviewed several times for accuracy, consistency in the application of costing methods and cost data, and completeness.

2.0 General Study Approach

2.1 The Cost Question

In calculating forward-looking costs, SBC cost analysts answer the following question:

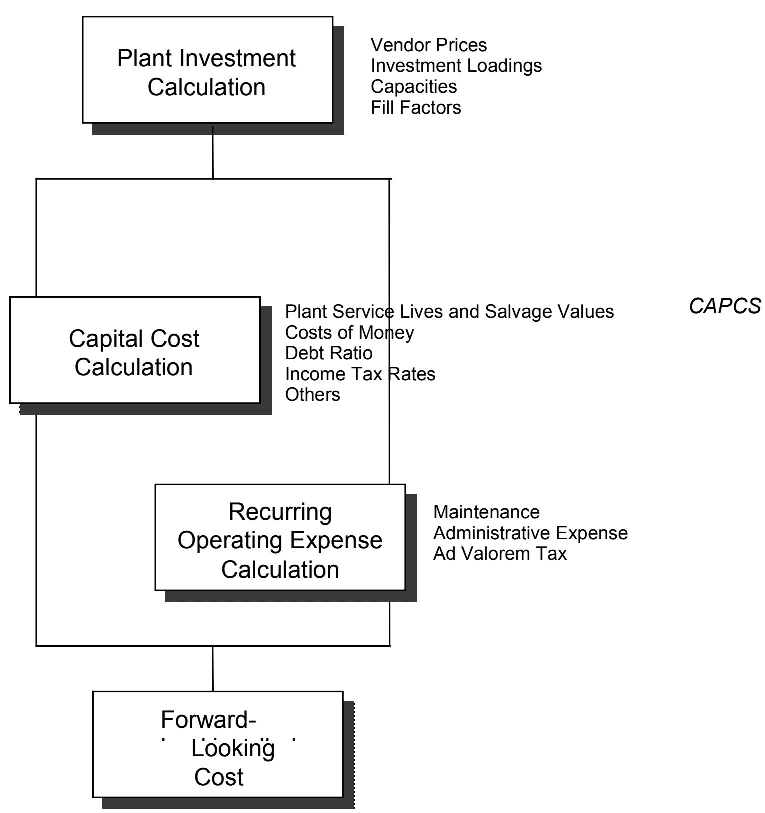
> *What are the forward-looking, long run incremental costs for a service recognizing SBC's existing network and using forward-looking, efficient technologies, with network maintenance and operations reflecting these technologies?*

The cost analyst computes these forward-looking plant costs reflecting current vendor prices and discounts for equipment, current engineering and labor costs, etc. Plant maintenance and other operations reflect systems and procedures associated with these forward-looking technologies. In summary, forward-looking costs reflect a forward-looking network operation with regard to wire center locations.

2.2 Study Flow

The general flow of the cost study is shown in Figure 2.1. The first step is to calculate the *plant investment*.

Figure 2.1



The plant investment required to provide a service consists of several (perhaps many) plant components. For example, the plant necessary for a local loop consists of parts of the main distributing frame in the central office, distribution and feeder cables, feeder-distribution interfaces, premises terminating equipment and others. Plant investments are computed for each component reflecting the mix of equipment used today to provide the component, appropriate equipment quantities, vendor prices, capitalized engineering and labor costs, support assets (such as power equipment and buildings) and others.

Plant investments per unit of a service are then computed by dividing the plant investment necessary for each component by its *expected capacity utilization*. Expected capacity utilization is simply the *physical capacity* of the plant component multiplied by its *fill factor* or *utilization*. This gives a measure of the amount of investment that would be required using forward-looking technologies to provide a service or component.

In the second step, *annual capital costs* are calculated. These include *depreciation expense* for the recovery of plant investment over its service life, a return requirement or *cost of money* associated with investor-supplied capital used to construct the plant, and an *income tax* obligation associated with the equity portion of the cost of money. SBC computes capital costs using a model called CAPCS.

Forward-looking costs also include *recurring operating expenses* associated with the maintenance of plant, network administration functions, support assets, miscellaneous other operating taxes and a commission assessment on revenues received in providing network elements to other carriers. Operating expenses are computed using various expense factors that are unique to each type of plant, recognizing different levels of maintenance and network administration necessary for different plant types. Total costs then are the sum of the recurring capital costs and operating expenses associated with the plant required to provide the network element.

2.2 Study Assumptions

The studies conducted for the FCC Subscriber Line Charge proceeding contain certain assumptions that were used to determine the company's costs for providing the network operations related to loop and switch port services

- *Planning Period.* The planning period assumed for SBC's cost studies in this proceeding includes the years 2002 through 2005.

- *Cost of Money*. The cost of money assumed within the studies reflect the company cost of capital, taking into account the company's expected rate of return on investments and the opportunities and risks the company experiences within its industry.

- *Capital Investment Depreciation Lives*. The depreciation lives assumed for the capital investments within the studies reflect the economic lives of the investments.

- *Use of Proxy Information.* There were instances in which detailed state specific information necessary to complete the cost studies could not be gathered within the time constraints of the proceeding. In order to complete the studies, information from states with similar characteristics were used. In particular, Texas in-place cost information for installed cable and other outside plant components was used in the California study; Missouri in-place cost information for cable and outside plant was used in the Connecticut, Illinois, Indiana, Michigan, Nevada, Ohio, and Wisconsin studies. Also, annual charge factors from Indiana were used within the studies for Illinois, Michigan, Ohio and Wisconsin.

3.0 Loop Cost Studies

3.1 Study Purpose

The Loop Cost Study calculates the cost to SBC to provide a loop assuming a local network based on forward-looking plant technologies and costs of plant construction. A loop consists of the telephone plant from the *network interface device* at a customer's premises to the serving central office of SBC.

For each loop, costs are computed for three geographic zones corresponding with rural, mid-size and large, urban wire centers. Loop costs vary among the geographic zones due to differences in loop length, cable mixes and sizes, and other factors which vary among the zones.

Loop costs are expressed as a *recurring monthly cost* which includes capital costs (depreciation, the cost of money and income taxes) and operating expenses for ongoing plant maintenance, network administration and other activities. Figure 3.1 illustrates the costs calculated in the loop cost study.

Figure 3.1

Unbundled Loop Cost Study Results

Loop Recurring and Non-Recurring Costs

Type of Loop	Geographic Zone	Recurring Cost	Non-Recurring Cost Initial	Non-Recurring Cost Additional
8db Loop	1	$XX.XX	$XX.XX	$XX.XX
	2	$XX.XX	$XX.XX	$XX.XX
	3	$XX.XX	$XX.XX	$XX.XX
BRI Loop	1	$XX.XX	$XX.XX	$XX.XX
	2	$XX.XX	$XX.XX	$XX.XX
	3	$XX.XX	$XX.XX	$XX.XX
DS1 Loop	1	$XX.XX	$XX.XX	$XX.XX
	2	$XX.XX	$XX.XX	$XX.XX
	3	$XX.XX	$XX.XX	$XX.XX

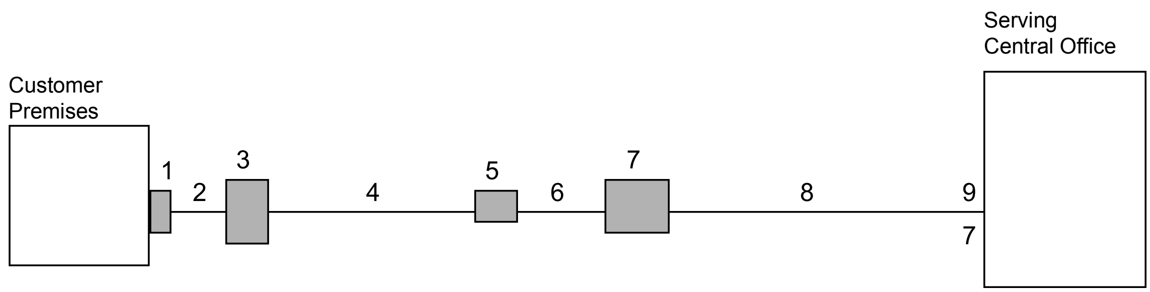
3.2 Loop Components

An 8db loop includes SBC plant from the customer premises, through distribution and feeder cable facilities, to the main distributing frame in the serving central office. Figure 3.2 illustrates the components of an 8db loop.

- *NID and Drop Cable*. The network interface device (NID) and drop cable are referred to as *premises termination equipment* in the loop cost study. They provide the transmission path from the last cable spice in the outside plant network to the customer's premises. The 8db loop cost study recognizes two possible configurations of premises termination - one involving a singe pair of wires to the customer premises, and the other two pairs. A weighted average of costs for the two configurations is used in the study.

- *Distribution Cable*. The copper cable which runs from the feeder-distribution interface to the terminal located near the customers premises. *The feeder-distribution interface* is the "cross-connection" point between the feeder cable from the serving central office and the distribution cable. A mix of aerial, buried and underground cables is used in the study. The cable mix varies by geographic zone. Pole and conduit investment to support distribution cable also are included in the loop cost calculation.

Figure 3.2



1. Network Interface Device
2. Drop Cable
3. Terminal
4. Distribution Cable
5. Feeder-Distribution Interface
6. Feeder Stub
7. Digital Loop Carrier System
8. Feeder Cable
9. Main Distributing Frame Stringer

- *Feeder Stub and Digital Loop Carrier (DLC) System*. When loop feeder cable lengths exceed a certain threshold (typically 12,000 feet), fiber feeder cable and digital loop carrier systems are used in the cost study as the most efficient loop design. In this case a feeder stub or section of cable is required to connect the feeder cable to the DLC equipment.

  The digital loop carrier system requires circuit equipment located in the field. Approximately 75% of the time circuit equipment is required at the central office as well. The DLC equipment provides multiplexing of voice channels over the fiber cable between the serving central office and the feeder-distribution interface. The study assumes three system sizes with 192, 672 and 1,344 channels of capacity. The amount of DLC investment per loop depends upon the frequency of fiber versus copper feeder, the percentage of integrated DLC systems (which do not require central office terminating equipment), system size and expected utilization of the system (fill factor).

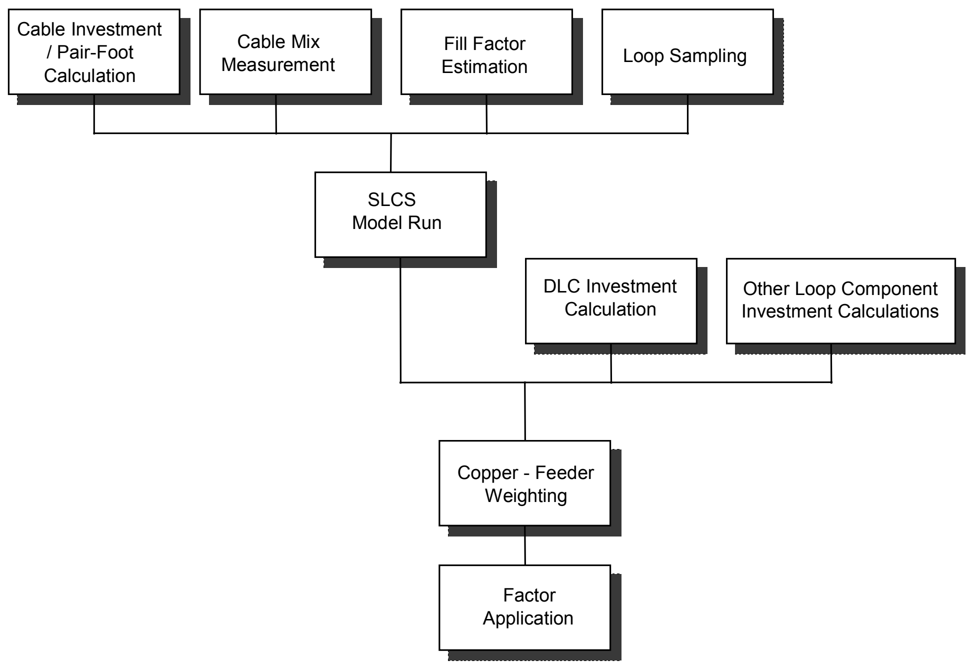
- *Feeder Cable*. Copper or fiber cable running from the serving central office to the feeder-distribution interface or remote DLC terminal. The cost study reflects a mix of aerial, buried and underground cables depending upon the geographic zone. Copper feeder is assumed for loops with feeder cable lengths less than 15,000 feet. As with distribution cable, pole and conduit plant investment is included in the loop cost calculation.

- *Frame Stringer*. Equipment connecting outside plant cables to the Main Distributing Frame. Includes a protector unit, protector block, riser cable and the labor cost to place the equipment.

3.3 Study Flow - Recurring Monthly Costs

As described earlier, loop costs include the *recurring monthly costs* Southwestern Bell incurs in providing loops and the *non-recurring costs* to provision the loop. In this section, the study flow for computing recurring monthly costs is described. The study flow is illustrated in Figure 3.3.

Figure 3.3



The loop cost study uses several interrelated models and special studies. SLCS is the primary model in the study. It is used to compute *the plant investment per loop for the distribution and feeder cable components* of the loop. Plant investments are computed for the three geographic zones based on loop characteristics in each zone. These characteristics include:

- *Loop length*. Samples of actual loops in service are used to determine average loop lengths in zones 1, 2 and 3. (See Section 3.4.)

- *Mix of cable types*. Different proportions of aerial, buried and underground cable are used in rural, mid-sized and urban wire centers. These are based on a study of cable types in service. (See Section 3.6.)

- *Installed cable costs per pair-foot* by cable type and wire gauge (26, 24, 22, and 19 gauge). Installed cable costs vary depending on the size of cable in terms of pairs per cable. Calculations are made to determine the mix of cable sizes, and based on this mix installed cable costs per pair-foot are determined for each combination of cable type and wire gauge. (See Section 3.5.)

- *Fill factors*. Other calculations are made to determine actual utilization levels for copper distribution cables, copper feeder cables and fiber feeder cables. (See Section 3.7.)

These characteristics are measured for the existing local facilities network. Adjustments then can be made if characteristics are expected to be different in the future. SLCS also determines investments in poles and conduit structures per loop based upon investment loading factors.

In parallel with the calculation of distribution and feeder cable investments per loop, the investments in digital loop carrier systems and the other loop components are computed. The latter includes the premises termination equipment, feeder-distribution interface, feeder stub, and main distributing frame stringer. Each of these additional loop investments is calculated using a special study created by a cost analyst with input from company databases or from subject matter experts in engineering.

3.4 Loop Samples

Loop length is a key driver of loop costs … the longer the loop, the more plant investment that is required. Since the object of the loop cost study is to determine the forward-looking cost to serve the total demand for loops, *average loop lengths* must be estimated for all loops in each geographic area.

Rather than measure the lengths of all loops, a representative sample is taken at random. In random sampling, the number of samples which must be taken to accurately measure the average of the population depends on several factors:

- *Variability*. The more loop lengths vary within a study area, the greater the chance the average loop length of a sample is significantly different than the true average. Sample sizes must be larger when loop lengths vary significantly. On the other hand, geographic areas which have less variance in loop lengths require smaller samples. Small sample sizes often provide very good estimates of the true average.

- *Confidence Interval*. When a sample is taken and the average loop length is computed, some assurance is needed that the true average is within a reasonable range around the sample average. Typically, a 95% confidence interval is used. This means the cost analyst can assume there is a 95% chance the true average is within this range. The confidence interval can be "tightened" to a satisfactory range by increasing the sample size.

- *Size of the Population*. The larger the population of loops the greater the chance a random sample will be representative. In SBC studies loop populations typically number in the hundreds of thousands.

The sampling techniques used by SBC determine proper sample sizes. Samples are taken at random from the company databases which maintains records of the characteristics of the lines in service. The system records actual lengths of feeder cables and provides estimates of distribution cable lengths. Once a valid sample of several hundred loop lengths is obtained, the data are entered in the SLCS model to compute average feeder and distribution cable investments per loop.

3.5 Cable Investment / Pair-Foot

Cable costs are measured by linear foot and vary by *cable type*, *wire gauge* and *cable size*. For example, assume a foot of buried cable with 26 gauge wire in a 200 pair cable size has an installed cost of approximately $5.00. This figure includes the cable material, telco engineering and labor, miscellaneous materials and contractor charges for placing the cable. Similarly, buried cable comprised of 300 pairs of 26 gauge wire might cost about $1.00 more per foot, or $6.00.[1]

Loop cable plant is made up of numerous sections of cable of various cable type, wire gauge and cable size. To calculate loop investments it is necessary first to compute a cable cost for the mix of cable sizes in a geographic zone. This figure is expressed as a *cable investment / pair-foot of cable capacity.* Separate investments / pair-foot are computed for each cable type and wire gauge. These *unit investments* are applied to the average loop lengths from the loop samples to compute loop investments.

In the example above, the first 26 gauge buried cable requires an investment of $0.0250 per pair-foot, and the second cable $0.0200 per pair-foot. A unit investment for 26 gauge buried cable in each geographic zone is computed based on the weighted average of these and other cable sizes in the zone. This average reflects both *feeder* and *distribution* cables.

Since feeder cables tend to be larger than distribution cables, the cable cost per pair-foot for feeder cable is less than the cost of distribution cable. To reflect this difference, the unit investment for feeder and distribution cables combined is “deaveraged” between feeder and distribution cables. This is done in two steps. For example, the unit investment for *buried feeder cable* is calculated based on the quantity of each FDI size. Then, the unit investment for distribution cable is “solved for” based on the unit investment for feeder and distribution cables combined, the feeder unit investment and the relative proportion of feeder and distribution cable lengths in a geographic zone. Figure 3.4 illustrates the level of detail of cable unit investments for each of three geographic zones.

[1] Cable costs are obtained from SBC’s Engineering records of current outside plant construction cost data. These data are used by engineers in planning current outside plant construction projects. Cable costs are adjusted to reflect any change in cable cost anticipated in the near future.

Figure 3.4

Geographic Zone

Copper Feeder Cable

	Wire Gauge			
Cable Type	26	24	22	19
Aerial Cable	$0.XXX	$0.XXX	$0.XXX	$0.XXX
Buried Cable	$0.XXX	$0.XXX	$0.XXX	$0.XXX
Underground Cable	$0.XXX	$0.XXX	$0.XXX	$0.XXX

Copper Distribution Cable

	Wire Gauge			
Cable Type	26	24	22	19
Aerial Cable	$0.XXX	$0.XXX	$0.XXX	$0.XXX
Buried Cable	$0.XXX	$0.XXX	$0.XXX	$0.XXX
Underground Cable	$0.XXX	$0.XXX	$0.XXX	$0.XXX

Fiber cable investments / pair-foot are computed for buried and underground cables. First, fiber costs per foot are obtained from Engineering's cable construction cost data. The cable sizes used in the study are 24 fiber cable for zone one, 48 fiber cable in zone 2, and 144 fiber cable in zone 3. Contractor placement costs and innerduct costs (for underground cable) are added. The total installed cost per foot for each cable size then is divided by the number of fibers per cable (24, 48 or 144) to compute the installed cost / fiber-foot.

Four fibers are assumed for each DLC system. Consequently, the installed cost / fiber-foot for each cable size is multiplied by four fibers to compute the installed cost / foot and DLC system. This figure is divided by the voice grade channel capacity of the DLC systems to arrive at fiber cable investments / pair-foot.

3.6 Cable Mix Measurement

The relative proportions or mix of cable types (*percentages of aerial, buried and underground cables*) for loop distribution and feeder cable in the geographic zones is determined by measuring in-service quantities (total cable sheath-feet) of each cable type. Two measurements are required. Cable mixes are separately computed for distribution and feeder cables by zone based on the resulting quantities of each cable type.

3.7 Fill Factor Estimation

Fill factors are based on actual plant utilization. A separate fill factor is calculated for feeder cable, distribution cable and DLC systems. The cable factors are computed by dividing the number of working pairs by the number of available and spare pairs in each cable route. The DLC fill factor is based upon actual DLC channel utilization.

3.8 Loop Cost Model

The SBC Loop Cost System (SLCS) is the cost model used to compute forward-looking loop plant investments. The model relies on the cost data described in Sections 3.4 - 3.7. These data include loop lengths divided between distribution and feeder cable for a sample of loops in each geographic zone, cable investments / pair-foot of capacity, cable mixes and fill factors. Two additional input items - pole and conduit plant investment factors - also are used in SLCS to compute the investment in structures required to support cables.

To calculate *loop plant investments for distribution and feeder cable* by geographic zone the following steps are used by SLCS:

- *Calculation of average loop length*. The distribution and feeder cable lengths are calculated based on a sample of loops taken at the state or the zone level.

- *Distinction of loops with copper and fiber feeder cable*. Loops with feeder cables above and below the copper - fiber cutover point (12,000') are separated. Therefore, for each geographic zone there actually are three frequency distributions - one for the distribution cable portion of loop length, another for the feeder cable portion of the loop when the loop design calls for copper feeder cable, and the third for the feeder cable portion of the loop when fiber cable is used. The three distributions, in effect, are used to compute average lengths of distribution cable, copper feeder cable and fiber feeder cable.

- *Mix of wire gauge*. SLCS also distinguishes the mix of wire gauges for copper distribution and feeder cables. Since the electrical resistance in copper wire increases with length, SLCS contains tables which indicate the maximum distance at which the smallest gauge wire (26 gauge) can be used, at which point the next size wire (24 gauge) is used until its limit is reached. Thus, SLCS estimates the average length and mix of wire gauges for copper distribution and feeder cables in rural, mid-sized and urban wire centers.[2]

- *Mix of cable types*. In the proceeding steps, SLCS computes average copper distribution and feeder lengths by wire gauge, and an average fiber feeder cable length. Since the cables are a mix of aerial, buried and underground cable, the next step is to apply the percentages of each cable type to the average lengths. These percentages vary for copper distribution, copper feeder and fiber feeder cables.

---

[2] Gauge measurements do not apply to *fiber* feeder cable. In this case, SLCS simply determines average feeder cable length for loops with feeder cable exceeding the 12,000' threshold for fiber cable.

- *Cable investments / pair-foot in service*. Section 3.5 described the special study used to compute cable investments / pair-foot of *capacity* for each cable type. Because not all cable pairs will be in service, it is necessary to adjust the cable unit investments to reflect expected utilization. This is done by dividing the unit investment for each cable type by the fill factor. (See Section 3.7.) This calculation yields an amount equal to the cable investment / pair-foot *in service*.

- *Loop investments*. The cable investments / pair-foot in service then are applied to the average cable lengths to determine the investment in distribution and feeder cables in each geographic zone.

- *Structures investment*. In addition to the investment in cable, loops also require investment for poles and conduit. These investments are calculated by applying ratios of structure investment to cable investment to the aerial and underground cable portions of loop investment. This step completes the SLCS investment calculations, and the results are carried forward to be summarized with the digital loop carrier and other loop component investments described in Sections 3.9 and 3.10.

3.9 Digital Loop Carrier Investment

Digital loop carrier (DLC) systems are assumed for loops with *feeder cable lengths* above a certain threshold - typically 12,000 feet. A DLC system consists of digital electronic circuit equipment which enables many voice channels to be combined over the same fiber. This is accomplished using "time-division multiplexing." The result is lower costs and better transmission than traditional copper cables for loops with long feeder cable lengths.

Three sizes of DLC systems are used in the loop cost study. The smallest system has a capacity of 192 voice channels and is used in the rural geographic zone. The second system has 692 channels of capacity and is used in the mid-size geographic zone. The third system handles up to 1,344 channels in the urban zone.

One of the key factors underlying DLC costs is whether the system is "integrated" with the serving end office. An integrated DLC system is connected directly to the switching system such that digital signals from subscribers do not have to be "demultiplexed" and converted to analog signals. This saves from having to have *central office terminating equipment* for the DLC system. Non-integrated DLC systems require central office terminating equipment to demultiplex signals and covert them to analog signals as they were before entering the DLC system. In both cases, DLC equipment, called *remote terminating equipment*, is required in the field. The loop cost study calculates DLC investment per loop reflecting a relative frequency of integrated and non-integrated systems.

DLC investments are computed in a special study which identifies the equipment components, quantities, current material prices and engineering and labor to construct the three sizes of DLC system. DLC investments per loop are calculated by dividing the DLC investments by the expected channel utilization for each system. The latter is computed by dividing the physical capacity of each system (192, 672 or 1,344 voice channels) by the DLC system fill factor. This factor reflects the expected utilization of the system.

3.10 Other Loop Components

The investments in distribution and feeder cables and the digital loop carrier system typically represent 90% or more of the investment in loop plant. There are several other important loop components included in the study. These are illustrated in Figure 3.2 and described below:

- *Premises termination equipment (NID and drop cable).* An 8db loop requires a single premises termination with a one or two pair drop cable. Investments are computed for one and two pair drop cables and weighted based upon the frequency of each. Premises termination investment includes the equipment costs of the network interface device and drop cable, as well as labor costs for installing the equipment and cable splicing. Cost data are from Engineering's outside plant construction cost data.

- *Feeder distribution interface (FDI).* The FDI investment represents the cost of the cabinet and equipment providing the cross-connect point between the feeder and distribution cables. FDI investment per loop is computed based on an analysis of the number of FDI boxes of various line sizes and the installed costs of each.

- *Feeder stub.* The feeder stub investment is calculated based on an average feeder stub length derived from a random sample and the installed cost / pair-foot for feeder stub cable. The unit investment for the stub cable is divided by the fiber feeder cable fill factor to allow for the cost of spare capacity in the feeder stub.

- *Main distributing frame stringer*. Frame stringer investments include the costs of a protector unit and protector block, the riser cable connecting the outside plant cable to the main distributing frame, and installation labor. Investments are calculated for copper feeder cables and fiber feeder cables. Unit investments are increased by the copper or fiber feeder cable fill factors to recognize the costs of spare frame stringer equipment.

After these special studies for the other loop components are completed, loop investments are summarized for each geographic zone on a "loop spreadsheet" Figure 3.4 illustrates the type of cost information which is contained. Note that the investments for copper and fiber feeder cables, the DLC system and the feeder stub are multiplied times a frequency factor to reflect the percentage of loops which are provided using these components. The primary purpose of the loop spreadsheet is to summarize loop investment by account so that capital cost and operating expense factors can be applied to the investments to calculate recurring monthly costs.

Figure 3.4

Geographic Zone

Loop Component	Frequency	Copper Aerial Cable	Copper Buried Cable	Copper Underground Cable	Fiber Buried Cable	Fiber Underground Cable	Poles	Conduit	Circuit Equipment	COE Frame
Premises Termination	100%	$XX.XX	$XX.XX							
Distribution Cable	100%	$XX.XX	$XX.XX	$XX.XX			$XX.XX	$XX.XX		
Feeder - Distribution Interface	YY%		$XX.XX							
Feeder Cable										
Copper	XX%	$XX.XX	$XX.XX	$XX.XX			$XX.XX	$XX.XX		
Fiber	YY%				$XX.XX	$XX.XX	$XX.XX	$XX.XX		
Feeder Stub	YY%		$XX.XX							
DLC System	YY%								$XX.XX	
MDF Stringer	100%									$XX.XX
		$XX.XX	$XX.XX	$XX.XX	$XX.XX	$XX.XX	$XX.XX	$XX.XX	$XX.XX	$XX.XX

Note: XX% + YY% = 100%

4.0 **Switch Port Cost Studies**

4.1 Switch Port Investment Models

The investment model used to develop the recurring portion of an analog line termination at the digital switch is the Switching Information Cost Analysis Tool (SICAT 2.0). SICAT is a cost tool that develops unit investments for switching components as determined by SBC's most current vendor contracts. SICAT produces the investment per trunk port channel. Refer to the model documentation for further information regarding the SICAT model.

4.2 Port Cost Elements

The port costs are derived from the SICAT model based on the most recent switch vendor contracts. After the port investment is derived from the model, capital costs and operating expense factors are applied to develop recurring monthly costs. See sections below for a description of the factors.

4.3 Recurring Cost Elements

- *Monthly Analog Line Termination Cost, Per Line*. This recurring cost element represents the monthly cost associated with the termination of an analog line at a digital switch.

- *Monthly Main Distribution Frame Cost, Per Line*_ This recurring cost element represents the monthly cost associated with the use of one half of the Main Distribution Frame (MDF) equipment by an analog line.

- *Monthly Terminal Block Connector Cost, Per Line* This recurring cost element represents the monthly cost associated with the Terminal Block Connector equipment at the central office MDF.

5.0 Capital Costs

5.1 Definition of Capital Costs

Capital costs include *depreciation expense*, the *cost of money* and *income taxes*.

- *Depreciation* is the annual expense of recovering the original construction cost of telephone plant, less any net salvage, over the service life of the plant. Depreciation is computed for each plant account based upon the prospective lives and expected net salvages.

- *Cost of money* is the annual return required on investor supplied capital used to construct telephone plant. The return requirement includes the prospective costs of debt and equity, weighted by the proportion of debt and equity anticipated in Southwestern Bell's forward-looking capital structure.

- *Income taxes* represent the amount of income taxes which would be owed on taxable income from revenues sufficient to cover the cost of equity after taxes.

When revenues from offering a network element are sufficient to recover its operating expenses and capital costs, revenues are said to recover all costs, including the costs of capital recovery and the return required on investor capital.

5.2 Capital Cost Calculation

Figure 6.1 provides a simplified example of capital cost calculations for a single item of telephone plant with a five year service life. The results of the calculations shown on the last three lines are factors which are multiplied times the original cost of plant or gross investment to compute capital costs.

- *Plant investment and net salvage*. The original cost of telephone plant or *plant investment* is incurred at the beginning of the plant's *service life*. At the end of the service life, the Company may realize some value, *gross salvage*, in disposing of the plant. This amount is reduced by any *cost of removal*, yielding a *net salvage* value. Service lives and net salvages expressed as a percentage of plant investment are estimated annually for each plant account based on the forward-looking lives and salvages expected for telephone equipment. They vary somewhat among the states in which Southwestern Bell operates.

- *Depreciation rate, depreciation expense, depreciation reserve and net investment*. The *depreciation rate* equals 100% of plant investment less the percentage net salvage, divided by the service life. *Depreciation expense* is the product of the depreciation rate and plant investment. Depreciation rates vary among plant accounts.

  Over the life of the plant, depreciation is accrued in a reserve reflecting the gradual recovery of the initial capital investment. The difference between plant investment and the *depreciation reserve* equals the *net investment*. A annual return must be earned on the remaining investor capital in the plant.

- *Costs of debt and equity, debt ratio and the cost of money*. Funds for telephone plant construction come from depreciation accruals or cash from current operations used to recover prior plant investment, capital from the issuance of bonds and stock, and retained earnings. (As described below, deferred income taxes also are used to fund capital investment.)

  Debt capital has an interest payment obligation referred to as the *cost of debt*, and equity capital from stocks and retained earnings has a return requirement or *cost of equity*. The mix of debt and equity capital, measured by the *debt ratio* or ratio of debt to debt and equity capital, determines the composite *cost of money*. Southwestern Bell estimates its forward-looking costs of debt and equity and debt ratio to determine the cost of money used in the network element cost studies.

  The annual cost of money equals the cost of money percentage applied to the net investment. As the net investment declines, the cost of money or return requirement also declines.

- *Income tax rate, taxable income required and income tax expense*. The *income tax rate* is the effective federal and state income tax rate. In order to realize income after taxes sufficient to cover the cost of equity requires a level of *taxable income* equal to the cost of equity divided by (1 - income tax rate).[3] The *income tax expense* is the income tax rate times the taxable income requirement.

The capital costs vary each year as net investment in telephone plant declines. In order to "levelize" the series of capital costs, they are brought to the present using *present worth factors* computed at the cost of money, and then spread back over the service life using an *annuity factor*.[4] After these steps are completed, the levelized capital costs are divided by the original plant cost to compute levelized capital cost factors. These factors are then used in ACES to compute capital costs for each type of plant.

Capital cost calculations actually are more complicated than those shown in Figure 8.1. Several additional factors are take into consideration. For example,

- *Effects of accelerated tax depreciation*. The use of accelerated tax depreciation and the normalization of deferred income taxes reduces investor-supplied capital in telephone plant. Recognizing accelerated tax depreciation lowers the cost of money and associated income taxes.

- *Multiple units of plant, survivor curves and method of depreciation*. Unlike the earlier example, telephone plant normally consists of multiple units of plant placed during a year, and these units usually have different survival patterns, with some retiring before others. The plant placed in a single year is subject to equal life group depreciation.

---

[3] Since interest expense is tax deductible, there is no need to "gross up" the cost of debt to a pre-taxable income amount.

[4] Capital costs also can be computed over planning periods less than the service life by computing the present worth and annuity of capital costs for shorter periods of time.

These factors require modeling the timing of plant investment, retirements, annual depreciation and net investment.

SBC uses the CAPCS model to reflect these and other factors in computing capital costs. The variables described above are the key input variables to the CAPCS model.

Figure 6.1 - ***Illustrative.***

	Line	Factor	End of Year 0	1	2	3	4	5	Source
Plant Investment	1		$ 1,000						Investment Study
Gross Salvage	2							$ 200	Engineering
Cost of Removal	3							$ 100	Engineering
Net Salvage	4							$ 100	Ln. 2 - Ln. 3
Depreciation Rate	5	18.00%							(100% - NS%) / S.L.
Depreciation Expense	6			$ 180	$ 180	$ 180	$ 180	$ 180	Ln. 1 X Ln. 5
Depreciation Reserve	7		$ -	$ 180	$ 360	$ 540	$ 720	$ -	Cumulative Ln. 6
Net Investment	8		$ 1,000	$ 820	$ 640	$ 460	$ 280	$ -	Ln. 1 - Ln. 7
Cost of Debt	9	8.0%							Finance
Cost of Equity	10	12.0%							Finance
Debt Ratio	11	50.0%							Finance
Cost of Money	12	10.0%							Ln. 9 X Ln. 11 + (1 - Ln. 11)X Ln. 10
Cost of Money	13			$ 100	$ 82	$ 64	$ 46	$ 28	Ln. 8 X Ln. 12
Income Tax Rate	14	40.0%							Finance
Fraction Equity of COM	15	60.0%							(Ln. 12 - (Ln. 9 X Ln. 11)) / Ln. 12
Cost of Equity	16			$ 60	$ 49	$ 38	$ 28	$ 17	Ln. 13 X Ln. 15
Taxable Income Required	17			$ 100	$ 82	$ 64	$ 46	$ 28	Ln. 16 / (1 - Ln. 14)
Income Tax Expense	18			$ 40	$ 33	$ 26	$ 18	$ 11	Ln. 14 X Ln. 17
Present Worth Factors	19			0.909	0.826	0.751	0.683	0.621	1 / (1 + Ln. 12) ^ Year
Present Worths									
Depreciation	20			$ 164	$ 149	$ 135	$ 123	$ 112	Ln. 6 X Ln. 19
Cost of Money	21			$ 91	$ 68	$ 48	$ 31	$ 17	Ln. 13 X Ln. 19
Income Taxes	22			$ 36	$ 27	$ 19	$ 13	$ 7	Ln. 18 X Ln. 19
Sum of Present Worths									
Depreciation	23	$ 682							Sum of Ln. 20
Cost of Money	24	$ 256							Sum of Ln. 21
Income Taxes	25	$ 102							Sum of Ln. 22
Annuity Factor	26	0.264							1 / Sum of Ln. 19
Levelized Capital Costs									
Depreciation	27	$ 180							Ln. 23 X Ln. 26
Cost of Money	28	$ 67							Ln. 24 X Ln. 26
Income Taxes	29	$ 27							Ln. 25 X Ln. 26
Capital Cost Factors									
Depreciation	30	18.0%							Ln. 27 / Ln. 1
Cost of Money	31	6.7%							Ln. 28 / Ln. 1
Income Taxes	32	2.7%							Ln. 29 / Ln. 1

NS% - Net Salvage %
S.L. - Service Life

6.0 **Investment Loadings**

6.1 Definition of Investment Loadings

In performing cost studies, much of the effort goes to computing the *primary plant construction costs*. These include material costs of major equipment components, vendor engineering and installation labor costs, and others. The studies also focus on the *primary plant accounts*, such as cable and wire facilities, central office switching and central office transmission. A significant portion of the investment necessary to provide network elements is attributable to other construction costs, such as sales taxes, telco engineering and labor, miscellaneous materials, power equipment and buildings. These construction costs typically are included in the cost study by using *investment loading factors*.

Investment loading factors represent the ratio of these additional costs to the primary plant construction costs, such as the ratio of power equipment cost for switching systems to the cost of the switching system itself. Another investment loading for buildings is the ratio of investment in network buildings to the total investment in switching, circuit and other equipment housed in the buildings. They are used to estimate the additional plant investment required to provide services.

6.2 Description

Seven investment loading factors are used in the forward-looking cost studies. The factors are based on special studies of financial and engineering records and vary by state. Each factor is briefly described below.

- *Ratio of material to total EF&I and sales tax factor*. These two factors are used to compute sales taxes on central office switching, central office transmission, operator systems and general purpose computers. The first factor is applied to vendor charges for plant, including vendor engineering and labor, to estimate the cost of materials on which sales taxes apply. The factors are based on a special study of actual vendor material purchases during the most recent three year period and sales taxes paid in the previous year.

- *Telco engineering and plant labor factors*. These factors are used to compute the additional investment required for Southwestern Bell's engineering and labor in constructing central office switching, central office transmission and general purpose computer plant. The factors are based on special studies for the most recent three year period.

- *Sundry & miscellaneous factor*. This factor accounts for interest during construction, contracted labor and other miscellaneous costs in placing central office switching, central office transmission and general purpose computers. As with the previous factors, this factor is based on a study of financial records during a recent three year period.

- *Power equipment factor*. The power equipment factor is used to compute the costs of electrical equipment, such as generators, batteries, etc., needed to operate central office switching, central office transmission, general purpose computers and operator systems.

It is based on an analysis of power equipment and costs in the Separations regulatory accounting process.

- *Building factor*. A building factor is used to calculate the forward-looking investment in building space needed for central office switching, transmission and operator systems equipment. The factor is based on the ratio of the current cost of network buildings to the current cost of switching, circuit and operator systems.

7.0 **Operating Expense Factors**

7.1 Definition of Operating Expenses

Operating expenses are the *recurring* and *non-recurring* plant specific and plant non-specific costs attributable to a service or network component. Recurring expenses are computed using operating expense factors applied to network investments, although recurring expenses may be computed based on special studies of recurring work activities and associated costs.

7.2 Description of Operating Expense Factors

There are *four* operating expense factors used in cost studies.

- *Maintenance factor*. The maintenance factor includes *plant specific* expenses for a type of plant (expenses of maintaining, repairing and rearranging telephone plant in service), power expense, and testing expense. Special studies are performed to identify the portions of power and testing expenses attributable to switching, circuit, cable and wire, and other types of plant. Maintenance factors vary by plant account recognizing, for example, that aerial and underground cable have different maintenance requirements and costs.

  The maintenance factors are computed as the ratio of prior year maintenance expenses to average book investment, *adjusted to a current cost basis*. Current cost to book cost ratios are used to express plant investments in terms of current costs. Maintenance factor studies are performed annually using information from SBC financial accounting systems.

- *Support asset expense factor*. This factor is used to compute network element *plant non-specific expenses*, such as network administration, plant operations administration and engineering expenses, and s*upport asset costs* attributable to the network element. There are separate expense factors for central office switching, central office transmission, cable and wire facilities, public telephone and other terminal equipment. The factor is based on the ratio of support asset expenses during the previous year to average plant investment, adjusted to a current cost basis.

- *Miscellaneous expense factor*. A single factor is applied to all plant types to compute miscellaneous expenses for property taxes, franchise taxes and other operating taxes. The factor also is referred to as the *ad valorem tax factor*.

Attachment 2

SBC Loop Costing System

(SLCS)

Documentation

Version 1.0

Notice of Disclaimer

SBC reserves the right to revise this document for any reason, including but not limited to, conformity with standards promulgated by various agencies, utilization of advances in the state of the technical arts, or reflection of changes in the design of any equipment, techniques, or procedures described or referred to herein.

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1.0 Introduction

The SBC Loop Costing System (SLCS)[1] is a Microsoft Excel® based investment and cost development tool. This document is intended to familiarize the reader with the purpose of this costing system, a primer on telecommunication loops, the inputs and outputs of SLCS, and finally, a detailed description of the SLCS methodology. The numbers imbedded in the figures and calculations within this document are to help the reader better understand the flow of SLCS and are not based on any particular cost study and do not reflect real cost of a loop.

Section 1.0 of this document provides an introduction to the SBC Loop Costing System. The purpose and an overview are presented in Sections 1.1 and 1.2. Then, the costing methodology employed in SLCS is briefly covered in Section 1.3.

For those wanting a more detailed description of a loop and its associated costs, Section 2 describes the local telephone network, including a comprehensive description of the components of local loop plant, and the nature of loop costs. Section 3 reviews all the various input data needed for SLCS and then outlines the cost output information. Finally, Section 4 details the methodology that SLCS uses to calculate all the loop unit investments.

1.1 Purpose of SLCS

SLCS develops the forward-looking costs of a local loop in SBC's telecommunications networks. Local loops are used to provide a communications path from customer premises equipment to the public switched telephone network (for local or long distance calling) or to private networks. A local loop consists of SBC telephone plant from the customer's premises, through distribution and feeder cable facilities, to the main distribution frame in the serving central office. Loop costs are calculated for the following types of loops:

> *2-Wire 8dB Analog Loop.* This is a general purpose voice grade local loop consisting of a copper cable pair or an equivalent electronic communications channel from the customer premises to the serving central office or remote switching system[2]. The designation, 8dB analog loop, indicates that the loop is designed to have no more then an 8dB signal loss for analog waveform

[1] Throughout this document, the SBC Costing System will be referred to as either SLCS or the loop costing system.

[2] Loops from the customer premises to the serving central office may be provided via electronic transmission systems, called digital loop carrier systems, and fiber cables. In this case, copper cable pairs from the customer premises are terminated on the carrier system at a remote terminal where digital communication channels are established over a common fiber cable facility to the serving central office. There the electronic channels are converted to analog signals and connected to the switching system located in the central office.

transmission from the customer premises to the central office. Loops of this type are used for basic voice telecommunications services.

4-Wire 8dB Analog Loop. This is a special purpose voice grade local loop consisting of two copper cable pairs or two equivalent communications channels. 4-wire loops typically are used for special services where improved signal transmission is required.

2-Wire xDSL Loop. 2-wire xDSL loops are similar to the 2-wire 8dB loops except that xDSL loops are all-copper conductor loops. In addition, equipment that interferes with digital transmission, such as load coils and bridge taps, is removed from 2 wire xDSL loops. These loops are used for Digital Subscriber Line (DSL) services, which provide high-speed access to Internet Service Providers. Average xDSL loops are typically longer then average 2-wire 8dB analog loops.

4-Wire xDSL Loop. 4-wire xDSL loops are the same as the 2-wire xDSL loops, except that two copper pairs are provided between the central office and the customer premises. Typically, 4-wire xDSL loops are also used for special services when improved signal transmission is required.

Basic Rate Interface (BRI) Loop. The BRI loop supports digital transmission of two 64 Kbps bearer ("B") channels and one 16 Kbps data ("D") channel upon a single twisted copper pair. Special plug-in circuit cards are required within any digital loop carrier equipment that may be utilized in providing the service. BRI loops are used for Basic Rate Integrated Digital Service Network (ISDN) service. They enable voice and data communications over a single local loop.

DS1 Loop. This loop provides a transmission channel capable of conveying digital signals of 1.544 megabits per second from the customer premises to the serving central office. The system also supports the 1.536 megabits per second Primary Rate ISDN (PRI) service. The plant required for a DS1 loop includes a 4-wire digital loop.

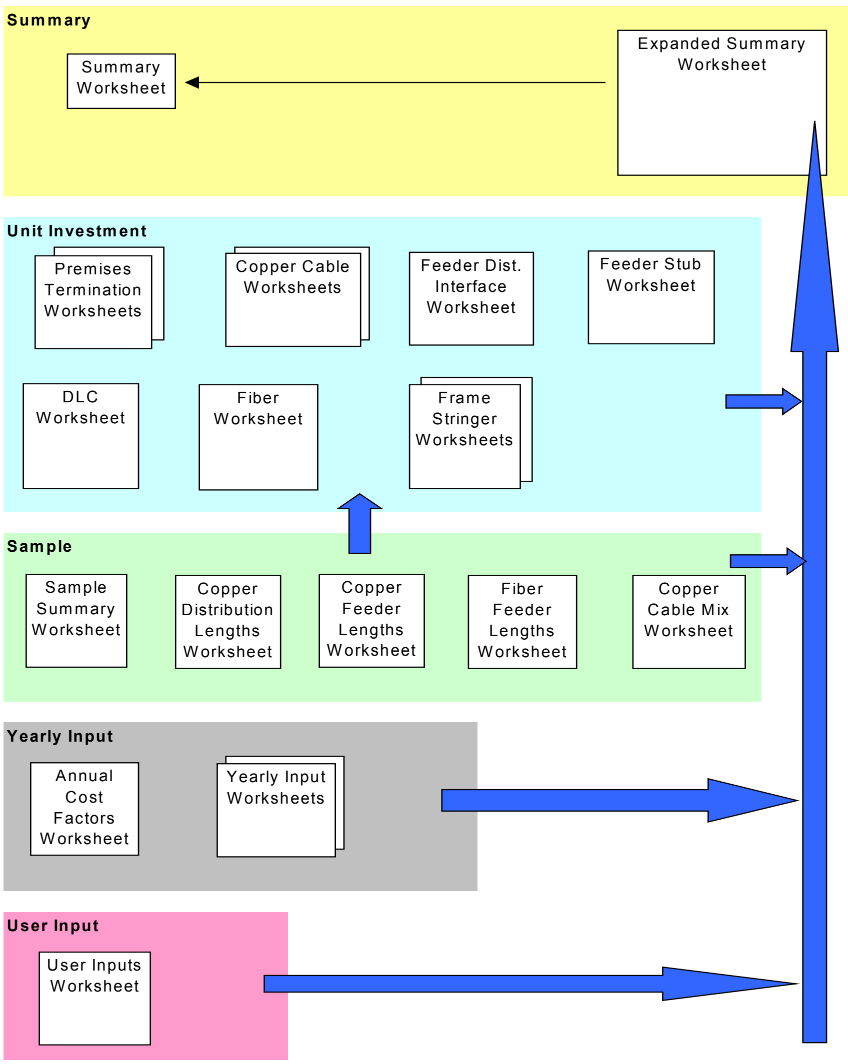
SLCS determines the plant investment required for each type of loop, and then computes monthly recurring capital costs and operating expenses associated with this plant investment.[3] Loop costs may be determined as average values representative of loops within a state, a jurisdiction, or a zone within a state.[4] Loop costs may also be calculated for more specific subsets of loops such as private line loops or special access local channels. The output from SLCS is used in cost studies for SBC wholesale and retail loop products.

[3] Capital costs include depreciation, cost of money, and income taxes. Operating expenses include maintenance and support assets.
[4] Geographic zones often are defined in terms of groupings of wire centers with similar loop densities. Loop density refers to the number of loops or access lines per square mile of wire center area. A wire center refers to the geographic area served by a local central office.

1.2 SLCS Overview

SLCS is a Microsoft Excel® workbook containing worksheets with inputs, unit investments, and summaries of outputs that reflect the average costs per loop (See Figure 1). The workbook flow can be generalized as going from back to front, meaning input data are entered on the back sheets of the workbook, and the resulting output summaries are presented on the front sheets. The center spreadsheets perform investment and cost calculations based on the sample worksheets and inputs. Input data include material costs, plant inventory, and fill factor information. As mentioned above, the output costs are used in SBC cost studies for wholesale and retail products that require local loops.

Figure 1 - SLCS Excel® Workbook



SLCS input consists of two types of cost data:

User Input. This input section contains both general and specific study information that will be updated prior to generating each SLCS study. General information includes the loop type to be studied, jurisdiction, study area, study name, and the planning period of the study. Specific information to the study includes utilization, digital loop carrier, main distribution frame, and premises termination related data. Loop samples are extracted from SBC databases and are used in SLCS. Data pertaining to the loop sample for a given state or study area of a state is also included and contains information about copper and fiber feeder, distribution, and feeder stub. The characteristics of the network are also in this section and includes the copper-fiber cross-over point, feeder distribution interface (FDI) connections, maximum resistance for copper feeder and distribution, as well as the weighting of aerial, buried, and underground fiber for the state. The pole and conduit factors, calculated by state, complete this input section.

Yearly Input. Representing the system's core input section, it is typically updated annually or when a change is warranted, such as a change to a loop design due to technological advancement. It includes various loop data and cost information for copper and fiber cabling, cable inventory, digital loop carrier, and feeder distribution interface. It also contains inflation and cost factor information, as well as specific data for premises termination and main distribution frame terminations. See Section 3 for a detailed description of each input.

Unit Investment worksheets calculate investments for each plant component. While the format for each worksheet varies somewhat, their purpose is the same—to develop the plant investment per unit of capacity for each plant component necessary to provide a loop. In developing these unit investments, plant resource costs are used such as cable costs per linear foot, which vary by cable and gauge size. Figure 2 and Figure 3 are examples of the unit investment calculation for fiber and distribution cable.

Figure 2 - Fiber Unit Investment

Fiber Unit Investment

Fiber Cost per Foot

Acc't	Fiber Cost Per Ft.	Innerduct Cost Per Ft.	Contractor Cost Per Ft.	Total Fiber Cost Per Ft.
85C	$6.9800	$0.3000	$2.5000	$9.7800
845C	$13.0000	$0.3000	$1.8500	$15.1500
822C	$8.0000	$0.3000	$0.8000	$9.1000

Fiber Cost per DLC System

Acc't	Total Fiber Cost Per Ft.	Fibers Per Cable	Total Cost Per Fiber Ft.	Fibers Per System	Total Fiber Cable Cost Per System Ft.	DS0 Capacity Per DLC System	Cost Per DS0 System Ft.	Total Number of DS0s Utilized	Fill Factor	Total Cost Per Ckt. Ft.
85C	$9.7800	48	$0.2038	4	$0.8152	2,016	$0.00040	1	62.00%	$0.00065
845C	$15.1500	48	$0.3156	4	$1.2624	2,016	$0.00063	1	62.00%	$0.00102
822C	$9.1000	48	$0.1896	4	$0.7584	2,016	$0.00038	1	62.00%	$0.00061

After unit investments have been determined, they are carried forward in SLCS to the Expanded Summary worksheet. Next, resource quantities (number of premises terminations, distributions cable pair-feet, etc.) per loop are applied to calculate the total plant investments for a loop. Finally, the investments per loop component are multiplied by appropriate annual cost factors and divided by 12 to compute the monthly recurring cost. Figure 4 shows the Expanded Summary worksheet.

Figure 3 - Copper Cable Unit Investment for Distribution Cable

Copper Cable Unit Investment - Buried 19 Gauge

Distribution Cable

Cable Size (Pairs)	Broad Gauge Cost / Foot	Contract Installation Cost / Foot	Installed Cost / Foot	Installed Cost/Pair Foot	Sheath Feet in Service	Distribution Percentage of Sheath by Cable Size	Distribution Sheath Feet	Distribution Pair Feet in Service	Percent of Total	Weighted Installed Cost/Pair Foot
25	$2.0000	$9.0000	$11.0000	$0.4400	19,000,000	100%	19,000,000	475,000,000	23.54%	$0.1036
50	$2.0000	$9.0000	$11.0000	$0.2200	6,500,000	100%	6,500,000	325,000,000	16.11%	$0.0354
100	$4.0000	$9.0000	$13.0000	$0.1300	4,000,000	100%	4,000,000	400,000,000	19.82%	$0.0258
200	$6.0000	$9.0000	$15.0000	$0.0750	2,400,000	100%	2,400,000	480,000,000	23.79%	$0.0178
300	$8.0000	$9.0000	$17.0000	$0.0567	800,000	90%	720,000	216,000,000	10.70%	$0.0061
400	$8.0000	$9.0000	$17.0000	$0.0425	100,000	80%	80,000	32,000,000	1.59%	$0.0007
600	$8.0000	$9.0000	$17.0000	$0.0283	300,000	50%	150,000	90,000,000	4.46%	$0.0013
900	$8.0000	$9.0000	$17.0000	$0.0189	0	40%	0	0	0.00%	$0.0000
1,200	$8.0000	$9.0000	$17.0000	$0.0142	0	20%	0	0	0.00%	$0.0000
1,500	$8.0000	$9.0000	$17.0000	$0.0113	0	10%	0	0	0.00%	$0.0000
1,800	$8.0000	$9.0000	$17.0000	$0.0094	0	0%	0	0	0.00%	$0.0000
2,100	$8.0000	$9.0000	$17.0000	$0.0081	0	0%	0	0	0.00%	$0.0000
2,400	$8.0000	$9.0000	$17.0000	$0.0071	0	0%	0	0	0.00%	$0.0000
2,700	$8.0000	$9.0000	$17.0000	$0.0063	0	0%	0	0	0.00%	$0.0000
3,000	$8.0000	$9.0000	$17.0000	$0.0057	0	0%	0	0	0.00%	$0.0000
3,600	$8.0000	$9.0000	$17.0000	$0.0047	0	0%	0	0	0.00%	$0.0000
4,200	$8.0000	$9.0000	$17.0000	$0.0040	0	0%	0	0	0.00%	$0.0000
Total					33,100,000		32,850,000	2,018,000,000	100%	$0.1907

Average Unit Investments

Item	Installed Cost / Pair Foot	Percent Utilization	Average Cost/Pair Foot
Feeder Cable	$0.0341	65.00%	$0.0525
Distribution Cable	$0.1907	44.00%	$0.4334

Figure 4 - Expanded Summary

Expanded Summary

Loop Component	Acc't	Units	Unit Investment	Quantity	Percent Occurrence	Investment Per Loop	Annual Cost Factor	Monthly Cost
Premises Termination								
Residential								
Aerial	622C	Pair	$119.7832	1	11.05%	$13.2360	0.2632	$0.2903
Buried	645C	Pair	$181.1201	1	53.95%	$97.7143	0.2565	$2.0886
Business								
Aerial	622C	Pair	$34.2808	1	5.95%	$2.0397	0.2632	$0.0447
Buried	645C	Pair	$49.4660	1	29.05%	$14.3699	0.2565	$0.3072
Building Entrance Facility	12C	Pair	$0.8667	1	35.00%	$0.3033	0.2252	$0.0057
Subtotal						*$127.6632*		*$2.7365*
Distribution								
Copper								
Aerial Cable	22C							
26 Gauge		Pair-Feet	$0.5320	301	100.00%	$160.1320	0.2632	$3.5122
24 Gauge		Pair-Feet	$0.5884	6	100.00%	$3.5304	0.2632	$0.0774
22 Gauge		Pair-Feet	$0.7032	3	100.00%	$2.1096	0.2632	$0.0463
19 Gauge		Pair-Feet	$0.8757	0	100.00%	$0.0000	0.2632	$0.0000
Buried Cable	45C							
26 Gauge		Pair-Feet	$0.1700	639	100.00%	$108.6300	0.2565	$2.3220
24 Gauge		Pair-Feet	$0.1691	13	100.00%	$2.1983	0.2565	$0.0470
22 Gauge		Pair-Feet	$0.2309	7	100.00%	$1.6163	0.2565	$0.0345
19 Gauge		Pair-Feet	$0.4334	1	100.00%	$0.4334	0.2565	$0.0093
U.G.Cable	5C							
26 Gauge		Pair-Feet	$0.0398	432	100.00%	$17.1936	0.2349	$0.3366
24 Gauge		Pair-Feet	$0.0393	8	100.00%	$0.3144	0.2349	$0.0062
22 Gauge		Pair-Feet	$0.0480	5	100.00%	$0.2400	0.2349	$0.0047
19 Gauge		Pair-Feet	$0.0800	1	100.00%	$0.0800	0.2349	$0.0016
Poles	1C	Factor	-	-	-	$38.1276	0.2143	$0.6809
Conduit	4C	Factor	-	-	-	$11.7665	0.1831	$0.1795
Subtotal						*$346.3721*		*$7.2582*
Feeder Distribution Interface	45C	Connection	$5.7150	3	100.00%	*$17.1456*	0.2565	*$0.3665*
Feeder								
Copper Cable								
Aerial Cable	22C							
26 Gauge		Pair-Feet	$0.1011	165	63.00%	$10.5093	0.2632	$0.2305
24 Gauge		Pair-Feet	$0.1020	1	63.00%	$0.0643	0.2632	$0.0014
22 Gauge		Pair-Feet	$0.1188	0	63.00%	$0.0000	0.2632	$0.0000
19 Gauge		Pair-Feet	$0.1692	0	63.00%	$0.0000	0.2632	$0.0000
Buried Cable	45C							
26 Gauge		Pair-Feet	$0.0297	712	63.00%	$13.3222	0.2565	$0.2848
24 Gauge		Pair-Feet	$0.0326	5	63.00%	$0.1027	0.2565	$0.0022
22 Gauge		Pair-Feet	$0.0428	0	63.00%	$0.0000	0.2565	$0.0000
19 Gauge		Pair-Feet	$0.0525	0	63.00%	$0.0000	0.2565	$0.0000
U.G Cable	5C							
26 Gauge		Pair-Feet	$0.0158	4,825	63.00%	$48.0281	0.2349	$0.9402
24 Gauge		Pair-Feet	$0.0202	37	63.00%	$0.4709	0.2349	$0.0092
22 Gauge		Pair-Feet	$0.0282	0	63.00%	$0.0000	0.2349	$0.0000
19 Gauge		Pair-Feet	$0.0349	0	63.00%	$0.0000	0.2349	$0.0000
Poles	1C	Factor	-	-	-	$2.4319	0.2143	$0.0434
Conduit	4C	Factor	-	-	-	$32.0093	0.1831	$0.4884
Pair Gain								
Feeder Stub	45C	Pair-Feet	$0.0424	848	37.00%	$13.3034	0.2565	$0.2844
Digital Loop Carrier								
C.O. Terminating Equipment	257C	Channel	$114.1590	1	37.00%	$42.2388	0.2530	$0.8905
Remote Terminating Equipment	257C	Channel	$318.1298	1	37.00%	$117.7080	0.2530	$2.4817
Power Equipment	257C	Factor	-	-	-	$7.70	0.2530	$0.1623
Building	10C	Factor	-	-	-	$59.31	0.1916	$0.9470
Land	11C	Factor	-	-	-	$0.73	0.1861	$0.0113
Fiber Cable								
U.G. Cable	85C	Fiber-Feet	$0.0007	11,589	37.00%	$3.0016	0.2004	$0.0501
Buried Cable	845C	Fiber-Feet	$0.0010	3,090	37.00%	$1.1433	0.2037	$0.0194
Aerial Cable	822C	Fiber-Feet	$0.0006	773	37.00%	$0.1716	0.1974	$0.0028
Pole	1C	Factor	-	-	-	$0.0395	0.2143	$0.0007
Conduit	4C	Factor	-	-	-	$1.9811	0.1831	$0.0302
Subtotal						*$354.2666*		*$6.8805*
Main Distribution Frame								
Copper Cable Termination	377C	Pair	$19.0000	1	63.00%	$11.9700	0.2685	$0.2678
DLC Termination	377C	Pair	$4.0161	1	24.66%	$0.9904	0.2685	$0.0222
Building	10C	Factor	-	-	-	$4.5850	0.1916	$0.0732
Land	11C	Factor	-	-	-	$0.0562	0.1861	$0.0009
Subtotal						*$17.6016*		*$0.3641*
Total						*$863.6479*		*$17.6058*

1.3 General Description of SLCS Methodology

SLCS determines the Long Run Incremental Cost (LRIC) to SBC for providing local loop facilities. SLCS does not measure historical or embedded loop costs.

Loop costs reflect the current cost of distribution and feeder cable materials, and engineering and installation, including contractor labor. Digital loop carrier (DLC) system costs reflect the current vendor equipment and technologies being deployed in SBC local exchange carrier local networks, as well as current prices and capacities for the equipment. The costs of the structures and other miscellaneous loop components are included and, again, are based on current materials costs. Therefore, SLCS measures the costs of current and future loop plant costs suitable for LRIC and Total Element Long Run Incremental Cost (TELRIC) studies.

Unit investments reflect either engineering fill or actual fill. SLCS allows the user to specify the fill factor used in calculating per-unit costs. One option is to use engineering fills, which represent the utilization level at which additional plant capacity must be added. Engineering fills vary depending upon the loop component. For example, the engineering fill for copper feeder cables typically is 85%, whereas for certain plug-in equipment on DLC systems, engineering fill may reach as high as 90%. When loop costs are measured with engineering fills, an incremental loop cost is computed. This value is appropriate for LRIC studies used to measure "price floors" for retail services requiring local loops.

The other option is to use current or forward-looking actual fill. This is the ratio of plant capacity in service to total plant capacity. Using this value in SLCS results in the cost of spare capacity being attributed to the loop cost. This option is appropriate for TELRIC studies used to establish prices for unbundled loops. Actual utilization levels vary by loop component.

Section 2.2 provides additional background on the costing concepts underlying these methods.

2.0 Telecommunication Networks and Loop Costs

This section provides a basic understanding of the public telecommunications network and the function and typical design of the local loop. It also provides information on local loop investments and cost drivers.

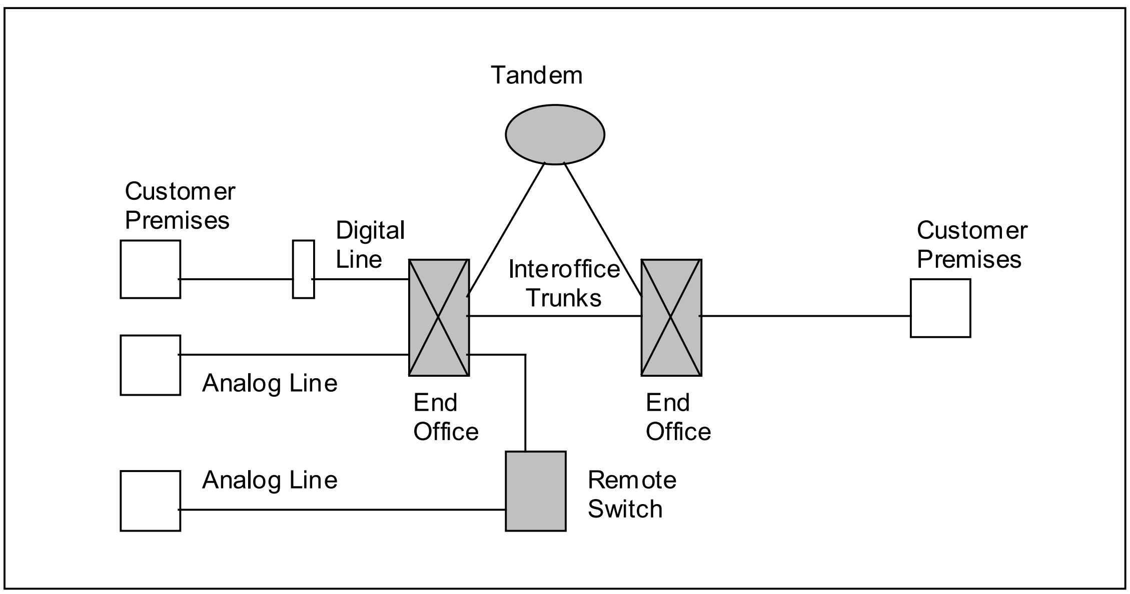
2.1 Telecommunications Networks

This section will describe a telecommunication network in general terms and then will identify and define the major portions of the local loop.

2.1.1 General Telecommunications Network Overview

Figure 5 is a simplified diagram of the public telecommunications network.

Figure 5 - Network Overview



Telephone equipment at a customer's premises is connected to copper cables, which provide a communications path from the telephone equipment to a local telephone company end office (central office). The communications path may be over a pair of copper wires running from the customer's premises to the central office, or the copper pair may terminate at an intermediate terminal (remote terminal) where a digital communications channel is provided using electronic equipment and fiber cables to the central office. This is the local loop.

At the central office, the copper cable pair is connected to line equipment on the central office switch. The line equipment provides direct current to the customer's telephone line, detects when the customer goes "off hook" to make a call, provides dial-tone and performs other functions. Line equipment typically is dedicated to each customer line,

and is often referred to as non-traffic sensitive plant, since the amount of customer line use does not affect the amount of line equipment required.
If the customer is provided access to the central office via a digital line, the digital transmission may be converted back to an analog signal, or the digital channels may be directly terminated on the switch. Copper access lines and digital lines reconverted to analog signals are referred to as analog lines, whereas digital channels terminating directly on the switch are digital lines.

When a customer makes a phone call, the central office switch performs several functions. It receives digits of the telephone number being called, communicates with the signaling network to establish the call, and provides a call path through the switch to another telephone line or to an interoffice trunk (if the called party is served by another central office). The capacity requirements for switch equipment providing these functions is sensitive to the number of call attempts and call duration during the peak period of use.

Customer lines also may terminate on remote switches located closer to customers than central offices. Remote terminals perform some central office functions. They are connected to a host—central offices via trunks.

Tandem switches are used to connect interoffice trunks transporting traffic among central offices and between the SBC network and those of other carriers.

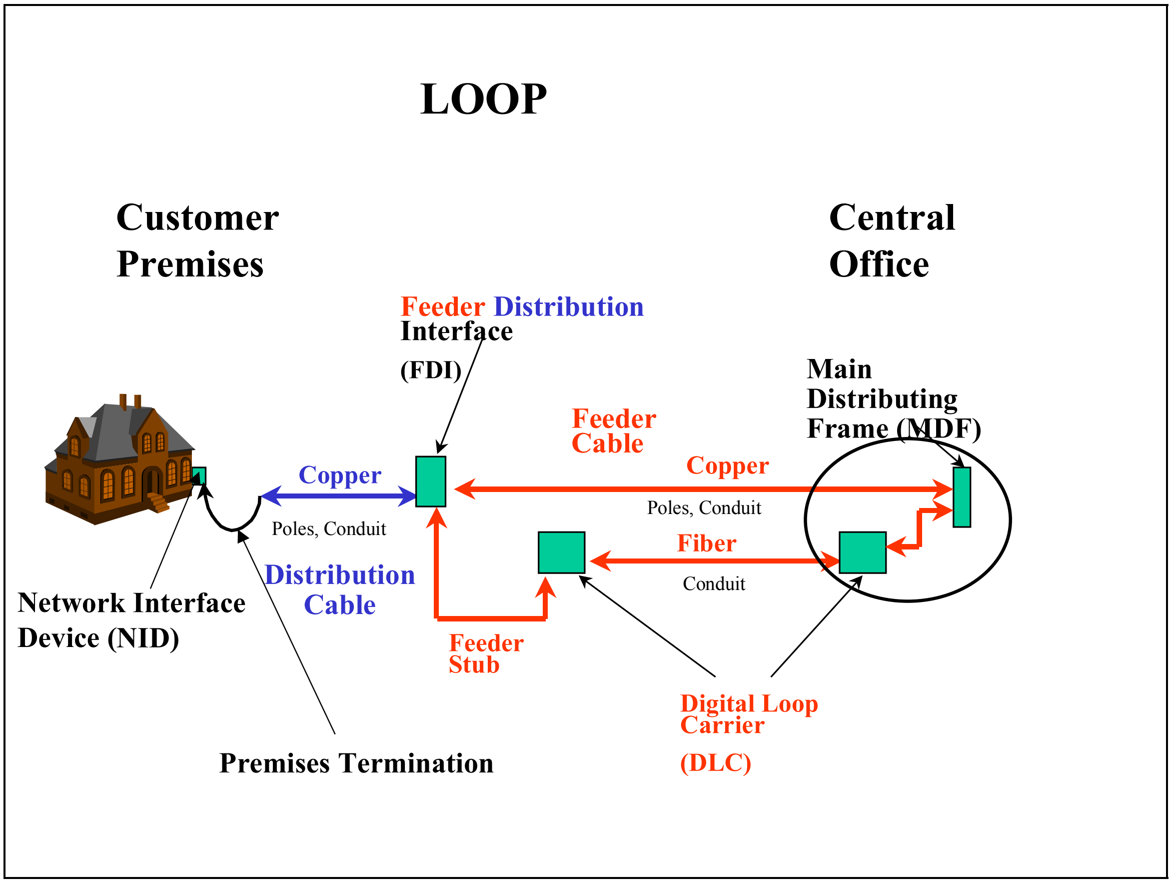
2.1.2 Local Loop in Telecommunications Network

Figure 6 illustrates the design of a typical local loop.

The local loop can be broken into six primary parts.

> *Premises Termination.* The combination of the network interface device (NID), the drop cable, and the terminal (the point of connection to the distribution cable) is referred to as premise termination equipment in the Loop Costing System. They provide the transmission path from the terminal located near the customer's premises in the outside plant network to the customer's premises.
>
> *Distribution Cable*. This is the copper cable that runs from the feeder-distribution interface to the terminal located near the customer's premises. The cable is generally placed on private property in a utility easement and, as such, is sized in order to minimize the disruption that results from placement of additional facilities. Distribution cable is often smaller in size and capacity relative to feeder cables.
>
> *Feeder-Distribution Interface (FDI).* It is at this point that the "cross-connection" between the feeder plant from the serving central office and the distribution plant takes place.

Figure 6 - Local Loop



Feeder Plant. The feeder portion of the local loop runs from the serving central office to the feeder-distribution interface. Feeder plant can be comprised of either copper cables or digital loop carrier (DLC) systems using fiber cables. These facilities are usually located on public rights of way and are sized to provide capacity for a specified engineering period of time. These cables are generally large in size and capacity, relative to distribution cable.

Feeder Stub and Pair Gain System. When loop feeder cable lengths exceed a certain threshold, fiber feeder cable and digital loop carrier systems are used. A copper feeder stub is required to connect the FDI and the DLC equipment. In addition, DLC systems require circuit equipment located in the field and usually in the central office. DLC equipment provides multiplexing of voice channels over the fiber cable between the central office and the feeder-distribution interface.

Frame Stringer. Frame stringer, also referred to as Main Distribution Frame equipment, connects outside plant cables to the Main Distribution Frame. One important role of the frame stringer is to protect personnel and sensitive electronic equipment from external electrical power such as lightning. It does this by using protector units and connector blocks.

2.2 Loop Costs

Local loops are one of several types of telephone plant. Others include switching, cable and wire facilities, transmission equipment, etc. According to the Federal Communications Commission's Uniform System of Accounts, telephone plant investments include all costs of constructing plant – vendor materials and supplies, telco labor and engineering costs, transportation, taxes, etc.[5]

SLCS draws plant cost information from several special studies, computes unit investments for the loop components, and then determines recurring monthly costs for each components and the loop as a whole. Plant investments are computed for the study areas based on loop characteristics in each area. These characteristics include:

> *Loop Length*. Samples of actual loops in service are used to determine average loop lengths. These average lengths are usually separated into study areas so that the study results will truly represent the characteristics of the study area.
>
> *Mix of cable types*. Different proportions of aerial, buried, and underground cable are used in rural, mid-sized or suburban, and urban wire centers. They are based on a study of the actual cable types in service in each study area.
>
> *Installed cable costs per pair-foot* by cable type and wire gauge (26, 24, 22, and 19 gauge). Installed cable costs vary depending on the size of cable (in terms of the number of pairs per cable), on the gauge of copper wire used, and on the plant type (aerial, buried, or underground). Calculations are made to determine the mix of cable sizes, and based on this mix, installed cable costs per pair-foot are determined for each combination of cable type and wire gauge.
>
> *Fill Factors*. Telephone plant is provisioned with adequate capacity to serve immediate needs and to provide capacity for growth. At some point, capacity is effectively exhausted, and additional capacity must be placed. The difference between plant capacity and in-service demand represents spare capacity. SLCS expresses capacity utilization in terms of fill factors. Generally speaking, SLCS will use either actual fill rate values or engineering fill rates depending on the study's purpose.
>
> *Digital Loop Carrier (DLC).* When feeder cable lengths exceed a certain threshold, SLCS assumes that DLC systems are in place. DLC systems consist of digital electronic circuit equipment that enables many voice channels to be combined over a single fiber. This is accomplished by using "time-division multiplexing." The result is lower costs and better transmission quality than traditional copper cables for loops with long feeder cable lengths.

[5] See FCC Part 32.1500 (c) for a description of telephone plant construction costs.

The investments in distribution and feeder cables and the digital loop carrier systems typically represent the majority of the investment in loop plant. Several other important loop components that are included in SLCS are:

> *Premises termination equipment* (NID, drop cable, and terminal). Investments are computed for the network interface device, drop cables, and terminals. The investment include labor costs for installing the equipment and cable splicing.
>
> *Feeder distribution interface* (FDI). The FDI investment represents the cost of the cabinet, equipment, and labor to provide the cross-connect point between the feeder and distribution cable.
>
> *Feeder stub*. Investments for the feeder stub are based on the average feeder stub length and the installed cost/pair-foot.
>
> *Main Distribution Frame Stringer*. Frame stringer investments include the cost of a protector unit and a protector block, the frame and lighting, the riser cable, and installation labor.

3.0 SLCS Input and Output

This section describes input data required by SLCS and the SLCS cost output information found in the Expanded Summary

Section 3.1 outlines in detail the user input, and yearly input worksheets, respectively. Input data consists of various cost drivers such as, material and equipment prices, labor rates, and fill factors. Cost output information, which is compiled in the Expanded Summary worksheet, is described in Section 3.2.

3.1 Input Data

As mentioned above, input for SLCS resides in two Excel® worksheets. The User Inputs worksheet assembles the inputs that vary from study to study. The Yearly Input worksheet includes information that is constant for every study and are updated annually or when necessary. Section 3.1.1 will define all user inputs and section 3.1.2 will define all yearly inputs.

3.1.1 User Input

This worksheet identifies the components of the cost study that vary from study to study. Figure 7 is a visual of how the User Inputs worksheet looks.

Figure 7 – User Inputs

USER INPUTS:

GENERAL

8db 2Wire	Loop Type
State	State
Study Area	Study Area
8db2w	Study Name
2002-2005	Planning Period

PERCENT UTILIZATION (FILL FACTOR)

62.00%	DLC		
44.00%	Distribution	1.1069	Lines per Premises
65.00%	Copper Feeder	18.45%	PremTerm - Res (6-term)
50.00%	Feeder Stub	22.14%	PremTerm - Res (5-term)

DLC & MDF TERMINATION

48	Fiber Size
66.66%	Percent Non-integrated DLC
63.00%	Percent Copper Feeder
37.00%	Percent Fiber Feeder

PREMISES TERMINATION

100.00%	Percent Residential Premises Termination
0.00%	Percent Business Premises Termination
17.00%	Percent Aerial Premises Termination
83.00%	Percent Buried Premises Termination

SAMPLE DATA

848	Avg. Feeder Stub Length of sample
8db Copper Feeder - State.xls	Copper Feeder sample File
2380000	Copper Feeder sample Qty
8db Fiber Feeder - State.xls	Fiber Feeder sample File
1300000	Fiber Feeder sample Qty
8db Distribution - State.xls	Distribution sample File
3680000	Distribution sample Qty

NETWORK CHARACTERISTICS

12000	Crossover Length		
3	FDI connections		
900	Ohms for Copper Feeder		
900	Ohms for Distribution		
75.00%	Percent Fiber Underground	5.00%	Percent Fiber Aerial
20.00%	Percent Fiber Buried		

POLE

	Use Pole Factor?
Y	If Y, then:
23.00%	Pole Factor
	else:
	Percent Pole utilization
	Percent Leased Poles
	Percent Shared Poles

CONDUIT

	Use Conduit Factor?
Y	If Y, then:
66.00%	Conduit Factor
	else:
	Percent Conduit utilization
	Percent Shared Conduit

General

- *Loop type* defines the type of loop being studied; e.g., 2-wire 8dB or BRI.
- *State* refers to the state or jurisdiction that is being studied.
- *Study area* is often referred to as zones (see footnote 3). The study area can also be the whole state or perhaps some other defined region.
- *Study* names describe the state, loop type, study area, and year. For example, MOxDSL2wZ1 2001 describes a Missouri 2-wire xDSL study done during the year 2001 for zone number 1.
- *Planning period* identifies the time frame that the study uses. Unless otherwise noted, the planning period is four years.

Percent Utilization (Fill Factors)

- *DLC fill* accounts for unused digital loop carrier equipment and is applied in the Digital Loop Carrier System sheet.
- *Distribution fill* is used in the Copper Cable Unit Investment sheets to account for spare copper cable capacity in the distribution.
- *Copper feeder fill* is use in the Copper Cable Unit Investment sheets to account for the spare copper cable capacity in the feeder.
- *Feeder Stub fill* is used in the Feeder Stub Investment development to account for spare feeder stub.
- *Fiber fill* is used in the Fiber Unit Investment sheet to account for spare fiber capacity.

DLC and MDF Termination

- *Fiber Size* used can be 24, 48, 216 fibers per cable. The fiber size is generally determined by the study area.
- *Percent non-integrated DLC*, when applicable, is used to determine the ratio of those loops that utilize a DLC termination verses loops that use conventional frames termination.
- *Percent Copper Feeder* represents the percent of the feeder that is copper and is taken forward to the Expanded Summary to identify the percent occurrence that copper feeder occurs in an average loop.
- *Percent Fiber Feeder* represents the percent of the feeder that is fiber and is also taken forward to the Expanded Summary to identify the percent occurrence that fiber feeder occurs in an average loop.

Premise Termination

- *Percent Residential Premise Termination* represents the percent of the customers that are residential. Residential premise termination consists of different equipment then business termination.
- *Percent Business Premise Termination* represents the percent of the customers that are business. Business premise termination consists of different equipment then residential termination.
- *Percent Aerial Premise Termination* is the percentage of aerial cable that feeds the premise termination.

- *Percent Buried Premise Termination* is the percentage of buried cable that feeds the premise termination.

Sample Data

- *Avg. Feeder Stub Length* is the average of the feeder stub lengths taken from a sample of fiber feeder cable. The average is used in the Expanded Summary as the quantity of feeder stubs.
- *Samples files* identify the Microsoft Excel file that contains the various cable samples that are extracted from the LEIS database. Copper and fiber feeder and distribution each have their own files that SLCS pulls data from. These files help develop the average loop lengths.
- *Sample Quantity* identifies the number of loops in a sample.

Network Characteristics

- *Crossover length*[6] is used in conjunction with the loop sample for determining average loop lengths of fiber feeder and copper feeder.
- *FDI connections* identify the total quantity of feeder and distribution connections. Typically, SLCS assumes one feeder pair going in and two distribution pairs going out giving a total of three FDI connections.
- *Ohms for copper feeder* describes the resistance or ohms of the loop design limit. The design limit can either be 900 or 1500 ohms.
- *Ohms for distribution* is also the resistance associated with the loop design.
- *Percent fiber underground* is the percent of the fiber in the study that is underground. This percentage is used as the fiber cable mix for a given study. Percent fiber underground, buried and aerial summed equals 100%.
- *Percent fiber buried* is the percent of the fiber in the study that is buried. This percentage is used as the fiber cable mix for a given study. Percent fiber underground, buried and aerial summed equals 100%.
- *Percent Fiber Aerial* is the percent of the fiber in the study that is aerial. This percentage is used as the fiber cable mix for a given study. Percent fiber underground, buried and aerial summed equals 100%.

Pole Input

- *Pole Factor* indicates if the cost study is to include a pole factor (Y for yes it is included and N for no it is not included). When a pole factor is used in a study, the pole factor value is populated and represents a current ratio of pole investment to aerial cable investment.

Conduit Input

- *Conduit Input* indicates if the cost study is to include a conduit factor (Y for yes it is included and N for no it is not included). When a conduit factor is used in a study, the conduit factor value is populated and represents a current ratio of conduit investment to underground cable investment.

[6] When the feeder cable length exceeds a certain crossover point or threshold, fiber cable and digital loop carrier system is are assumed in the total loop length as the most efficient loop design.

3.1.2 Yearly Inputs

Labor Rates

These are the labor rates charged by independent contractors for placing drop wire. They are also the SBC Group 1 Craft rates used to calculate the placement of the Frame Stringer assemblies. See appendix A for a more detail description of how labor rates are developed.

Premises Termination

The data listed in this block pertains to the material unit costs and the times necessary for placing the Premises Termination components.

Frame Stringer for Copper and DLC

This information pertains to the material costs associated with the frame stringer assembly. Also included are the labor hours necessary for placing the protector block and riser cable.

Fiber Cable

This section contains the broadgauge costs associated with underground and buried cable. Broadgauge costs come from a state specific Broadgauge Unit Investment Binder[7]. The costs are displayed by fiber size and are used in the development of the fiber cable investments.

FDI Quantity

This section lists the number of the various sizes of Feeder Distribution Interfaces (FDI) that are in service. This data is used to calculate the percent of occurrence of each FDI size and to estimate the quantity and sizes of placed feeder cable. This information is obtained from company inventory databases.

FDI Cost

This section lists the investment of each type of FDI used by SBC. These investments are obtained from the state specific Broadgauge Unit Investment Binder.

Business Premises Terminal Fill Rates

This section lists the optimal utilization for a business premises terminal.

Business Premises Terminal

This section lists the investments for business premises terminals by block size. These cost are obtained from the state specific Broadgauge Unit Investment Binder.

Business Premises Terminal Lines in Service

This is the number of business premises terminal lines in service for each block size.

[7] BroadGauge Unit Investment Binder is an engineering estimating tool that contains material costs that are taken from purchase invoices. Throughout this document when “broadgauge” or “broadgauge costs,” are mentioned, it is referring to this binder.

Building Cable

This section lists the investment of building cable by cable size. These investments are obtained from the state specific Broadgauge Unit Investment Binder.

DLC - Remote Terminal Common -

This block contains the material investments and their quanities by part type and number, for provisioning one DLC system.

DLC - RT Channel Units

This block contains the material investments, by part type and number, for the plug in circuit cards. These cards, depending on the service type being studied, are plugged into the DLC.

DLC - Central Office Terminal Common

This block contains the material investments and their quantities, by part type and number, that are necessary to equip a central office terminal (COT) with a digital loop carrier.

DLC - COT Channel Units

This block contains the material investments, by part type and number, for the plug in circuit cards. These cards, depending on the service type being studied, are plugged into the DLC.

Miscellaneous

This section includes Sales Tax, the Power Factor and the Building Factor. These factors are applied against equipment investment when the cost associated with each factor is considered a direct cost and when it is appropriate for application. Sales Tax, when applied, adds to the investment the appropriate state specific sales tax, when the investment input does not already include sales tax. The Power and Building Factors are applied when the investment being studied is located in a SBC-owned building, uses power and occupies building space. A separate building factor is identified to account for buildings associated with DLC equipment and building associated with frame equipment. Innerduct[8] cost per foot adders are included when figuring buried and underground cable investments.

The Engineered, Furnished & Installed (E, F&I) percentages are used to determine the cost associated with installing 257C and 357C circuit equipment. The factors are provided by the PICS/DCPR organization and are a ratio of total in-placed equipment investment over total equipment material investment.

[8] Innerduct is a nonmetallic raceway that loosely holds telephone cable and is similar to conduit but is typically larger.

Cost Factors

This section includes the annual cost factors, by account code, used to calculate the annual recurring cost associated with each component of the loop. The loop costing system applies the individual factors against the appropriate investment for the particular account code. See appendix A for a more detail description of how labor rates are developed.

Inflation Factors

This section includes the factors necessary to inflate and levelize the cost over the proposed planning period of the study. Generally, SLCS studies are developed using a four year time period, meaning levelization is an average over the four year period.

Copper Cable Costs

This section contains the broadgauge costs associated with aerial, buried and underground cable. The costs are displayed by cable size and gauge and are used in the development of the copper cable investments for the copper-based facilities. The cable investments are taken from the latest available state specific Broadgauge Unit Investment Binder.

Copper Cable Lengths (Feeder + Distribution)

This section represents the total copper sheath feet of feeder cable plus distribution cable by cable size, gauge and type. This data is used to calculate the weightings for each cable size by type and construction type for distribution cable. This information is obtained from company inventory databases.

3.2 SLCS Cost Output

SLCS brings forward all of the unit investments to the Expanded Summary worksheet where it applies unit quantity, percent occurrence and annual cost factors. These results are then divided by 12 to derive a monthly cost. Finally, the loop component costs are summarized at the bottom of the worksheet.

The following sections describe of the individual loop component calculations associated with the Expanded Summary. Annual factors are identified in the Annual Cost Factor worksheet of the cost system and described in detail in Appendix A. Unless otherwise stated, material costs are taken from broadgauge.

3.2.1 Premises Termination – Expanded Summary

Premises termination consists of the network interface device (NID) or building terminal, a drop cable and terminal (located near the customer's premises).

<u>Aerial Service Wire</u>: Unit Investments for this component, identified per pair under account 622C, are brought forward from the premises termination investment worksheets. The unit investment is multiplied by the quantity required and the percent occurrence rate. The resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to obtain a monthly cost**.**

Buried Service Wire: The steps for these calculations are the same as those for the Single/Multi Line Aerial Service Wire termination. However, for buried service wire termination, account 645C information is applied.

Building Entrance Facility: The steps for these calculations are the same as those for the Single/Multi Line Aerial Service Wire termination. However, for building entrance facility termination, account 12C information is applied.

Figure 8 – Premises Termination - Expanded Summary

Expanded Summary

Loop Component	Acc't	Units	Unit Investment	Quantity	Percent Occurrence	Investment Per Loop	Annual Cost Factor	Monthly Cost
Premises Termination								
Residential								
Aerial	622C	Pair	$119.7832	1	11.05%	$13.2360	0.2632	$0.2903
Buried	645C	Pair	$181.1201	1	53.95%	$97.7143	0.2565	$2.0886
Business								
Aerial	622C	Pair	$34.2808	1	5.95%	$2.0397	0.2632	$0.0447
Buried	645C	Pair	$49.4660	1	29.05%	$14.3699	0.2565	$0.3072
Building Entrance Facility	12C	Pair	$0.8667	1	35.00%	$0.3033	0.2252	$0.0057
Subtotal						*$127.6632*		*$2.7365*

3.2.2 Distribution Cable – Expanded Summary

Distribution cable is the copper cable that runs from the feeder distribution interface to the terminal located near the customer's premises.

Copper: Unit investments in copper cable, including accounts in aerial (22C), buried (45C) and underground (5C) for the four common gauges, 19, 22, 24 and 26, are calculated on a pair-foot unit basis and brought forward to the expanded summary from the Cable Unit Investment worksheets (Average Unit Investment). The pair-foot unit investment is multiplied by the average total pair-feet of distribution cable from the Copper Distribution Lengths worksheet and then multiplied by the percent occurrence of copper cable in the distribution. The resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to result in a monthly cost. These calculations are made for each account and gauge.

Figure 9 – Distribution Cable – Expanded Summary

Expanded Summary

Loop Component	Acc't	Units	Unit Investment	Quantity	Percent Occurrence	Investment Per Loop	Annual Cost Factor	Monthly Cost
Distribution								
Copper								
Aerial Cable	22C							
26 Gauge		Pair-Feet	$0.5320	301	100.00%	$160.1320	0.2632	$3.5122
24 Gauge		Pair-Feet	$0.5884	6	100.00%	$3.5304	0.2632	$0.0774
22 Gauge		Pair-Feet	$0.7032	3	100.00%	$2.1096	0.2632	$0.0463
19 Gauge		Pair-Feet	$0.8757	0	100.00%	$0.0000	0.2632	$0.0000
Buried Cable	45C							
26 Gauge		Pair-Feet	$0.1700	639	100.00%	$108.6300	0.2565	$2.3220
24 Gauge		Pair-Feet	$0.1691	13	100.00%	$2.1983	0.2565	$0.0470
22 Gauge		Pair-Feet	$0.2309	7	100.00%	$1.6163	0.2565	$0.0345
19 Gauge		Pair-Feet	$0.4334	1	100.00%	$0.4334	0.2565	$0.0093
U.G.Cable	5C							
26 Gauge		Pair-Feet	$0.0398	432	100.00%	$17.1936	0.2349	$0.3366
24 Gauge		Pair-Feet	$0.0393	8	100.00%	$0.3144	0.2349	$0.0062
22 Gauge		Pair-Feet	$0.0480	5	100.00%	$0.2400	0.2349	$0.0047
19 Gauge		Pair-Feet	$0.0800	1	100.00%	$0.0800	0.2349	$0.0016
Poles	1C	Factor	-	-	-	$38.1276	0.2143	$0.6809
Conduit	4C	Factor	-	-	-	$11.7665	0.1831	$0.1795
Subtotal						*$346.3721*		*$7.2582*

Poles and Conduit: Typically, separate pole and conduit studies are conducted wherein factors are developed using company accounting records. Within these studies, recent annual pole (or conduit) expenses that have been incurred by the company relative to the annual aerial (or underground) cable expenses are determined. This ratio comprises the pole and conduit factors.

3.2.3 Feeder Distribution Interface (FDI) - Expanded Summary

The feeder distribution interface is the "cross-connection" terminal connecting the feeder plant (described later) from the serving central office to the distribution cable just described.

The number of FDIs in service is determined from company Loop Engineering Information System (LEIS) data. LEIS is a company database that provides an inventory of loop plant.

Feeder Distribution Interface: The unit investment for the Feeder Distribution Interface, account 45C, is brought forward from the FDI worksheet to the expanded summary worksheet and is provided on a per-connection unit basis. The unit investment is multiplied first by a quantity of 3 (6 for 4-wire) representing the number of incoming and outgoing terminations required for the loop and secondly by the percentage of FDIs that are required (percent occurrence). This resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

Figure 10 – Feeder Distribution Interface (FDI) – Expanded Summary

Expanded Summary

Loop Component	Acc't	Units	Unit Investment	Quantity	Percent Occurrence	Investment Per Loop	Annual Cost Factor	Monthly Cost
Feeder Distribution Interface	45C	Connection	$5.7150	3	100.00%	$17.1450	0.2565	$0.3665

3.2.4 Feeder - Expanded Summary

The feeder cable is the portion of the loop that runs from the serving central office to the feeder-distribution interface. Feeder plant can be comprised of either copper or fiber cables. If comprised of fiber cable, digital loop carrier (DLC) systems are used. (These DLC systems are also called Pair Gain systems.) Within the study, DLC/fiber system costs are determined separately from the copper-only feeder system costs, and the results of each are blended according to their forward-looking weighting, for the final results.

Copper Cable (Aerial, Buried and Underground): Copper cable unit investments, including accounts for aerial (22C), buried (45C) and underground (5C), for the four common gauges, 19, 22, 24 and 26, are calculated on a pair-foot unit basis in the Cable Unit Investment worksheets (Average Unit Investment). This unit investment for the cable is multiplied by the quantity from the Copper Feeder Length worksheet and then multiplied by the percent occurrence (versus fiber). The resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to compute the monthly cost. Similar calculations are made for each type and gauge of feeder cable.

The copper cable material costs are taken from the Broadgauge. Broadgauge is an engineering estimating tool that contains material costs that are taken from purchase invoices.

Poles and Conduit: Same as previously mentioned above.

Digital Loop Carrier System: For these studies, when loop feeder cable lengths exceed a certain threshold, a DLC system with fiber feeder cable is assumed to be used as the forward-looking loop design. The DLC pair gain system requires circuit equipment located in the field, referred to as remote terminal (RT) equipment, and in the central office, referred to as central office terminal (COT) equipment. Depending on the study, a mix of universal and integrated DLCs may be assumed.

C.O. Terminal Equipment: Unit investment for central office terminal equipment, account 257C, is calculated on a per DS0 unit basis in the Digital Loop Carrier System worksheets. This unit investment is multiplied by the quantity of DS0s consumed for the loop service, and then multiplied by a percent occurrence, which represents the percentage of loops that are assumed to be using DLC. The resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

Remote Terminal Equipment: Unit investment for remote terminal equipment, account 257C, is calculated on a per DS0 unit basis in the Digital Loop Carrier System worksheets. This unit investment is multiplied by the quantity of DS0s consumed for the loop service, and then multiplied by a percent occurrence, which represents the percentage of loops that are assumed to be using DLC. The resulting Investment per loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

Power Equipment: Investment per loop for power, account 257C, is determined through the use of a power equipment factor. The factor is multiplied by the sum of account 257C equipment Investments per Loop identified in the previously described DLC equipment categories. The resulting investment per loop is multiplied by the annual cost factor for equipment and divided by 12 to calculate the monthly cost.

Building: Investment per loop for building equipment, account 10C, is determined through the use of a building factor. The factor is multiplied by the sum of account 257C equipment Investments per Loop identified in the previously described DLC equipment categories. The resulting investment per loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

Land: Investment per loop for land, account 11C, is determined through the use of a land factor. The factor is multiplied by the sum of account 257C equipment Investments per loop identified in the previously described DLC equipment categories. The resulting investment per loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

Fiber Cable: Unit investments for underground and buried fiber cable, accounts 85C and 845C, respectively, are calculated on a fiber-foot unit basis in the Fiber Unit Investment worksheet. This unit investment is multiplied by the quantity consumed and then multiplied by the percent occurrence, which represents a ratio of the amount of fiber to the total cable for the loop feeder. The resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

Poles and Conduit: Same as previously mentioned above.

Figure 11 – Feeder – Expanded Summary

Expanded Summary

Loop Component	Acc't	Units	Unit Investment	Quantity	Percent Occurrence	Investment Per Loop	Annual Cost Factor	Monthly Cost
Feeder								
Copper Cable								
Aerial Cable	22C							
26 Gauge		Pair-Feet	$0.1011	165	63.00%	$10.5093	0.2632	$0.2305
24 Gauge		Pair-Feet	$0.1020	1	63.00%	$0.0643	0.2632	$0.0014
22 Gauge		Pair-Feet	$0.1188	0	63.00%	$0.0000	0.2632	$0.0000
19 Gauge		Pair-Feet	$0.1692	0	63.00%	$0.0000	0.2632	$0.0000
Buried Cable	45C							
26 Gauge		Pair-Feet	$0.0297	712	63.00%	$13.3222	0.2565	$0.2848
24 Gauge		Pair-Feet	$0.0326	5	63.00%	$0.1027	0.2565	$0.0022
22 Gauge		Pair-Feet	$0.0428	0	63.00%	$0.0000	0.2565	$0.0000
19 Gauge		Pair-Feet	$0.0525	0	63.00%	$0.0000	0.2565	$0.0000
U.G Cable	5C							
26 Gauge		Pair-Feet	$0.0158	4,825	63.00%	$48.0281	0.2349	$0.9402
24 Gauge		Pair-Feet	$0.0202	37	63.00%	$0.4709	0.2349	$0.0092
22 Gauge		Pair-Feet	$0.0282	0	63.00%	$0.0000	0.2349	$0.0000
19 Gauge		Pair-Feet	$0.0349	0	63.00%	$0.0000	0.2349	$0.0000
Poles	1C	Factor	-	-	-	$2.4319	0.2143	$0.0434
Conduit	4C	Factor	-	-	-	$32.0093	0.1831	$0.4884
Pair Gain								
Feeder Stub	45C	Pair-Feet	$0.0424	848	37.00%	$13.3034	0.2565	$0.2844
Digital Loop Carrier								
C.O. Terminating Equipment	257C	Channel	$114.1590	1	37.00%	$42.2388	0.2530	$0.8905
Remote Terminating Equipment	257C	Channel	$318.1298	1	37.00%	$117.7080	0.2530	$2.4817
Power Equipment	257C	Factor	-	-	-	$7.70	0.2530	$0.1623
Building	10C	Factor	-	-	-	$59.31	0.1916	$0.9470
Land	11C	Factor	-	-	-	$0.73	0.1861	$0.0113
Fiber Cable								
U.G. Cable	85C	Fiber-Feet	$0.0005	11,589	37.00%	$2.1440	0.2004	$0.0358
Buried Cable	845C	Fiber-Feet	$0.0009	3,090	37.00%	$1.0290	0.2037	$0.0175
Aerial Cable	822C	Fiber-Feet	$0.0005	773	37.00%	$0.1430	0.1974	$0.0024
Pole	1C	Factor	-	-	-	$0.0329	0.2143	$0.0006
Conduit	4C	Factor	-	-	-	$1.4150	0.1831	$0.0216
Subtotal						*$352.6928*		*$6.8552*

3.2.7 Main Distribution Frame - Expanded Summary

Frame Stringer connects outside plant cables to the Main Distribution Frame. It includes a protector unit, protector block, riser cable and the labor cost to place the equipment. This equipment protects personnel and sensitive electronic equipment from external electrical power.

Copper Cable Termination: Unit investment for the frame associated copper cable, account 377C, is calculated on a per pair unit basis in the Frame Stringer (MDF) Copper worksheet of the cost tool. This unit investment is multiplied by the quantity consumed, then multiplied by the percent occurrence, which represents the percentage of non-DLC loops. The resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

DLC Termination: Unit investment for frame related DLC terminations, account 377C, is calculated on a per DS0 (channel) basis in the Frame Stringer (MDF) DLC worksheet of the cost tool. This unit investment is multiplied by the quantity consumed for the loop and then multiplied by a percent occurrence, which represents the percentage of lines requiring a central office terminal termination. The resulting Investment per Loop is multiplied by the annual cost factor and divided by 12 to calculate the monthly cost.

Building Equipment: Same as previously mentioned above.

Land: Same as previously mentioned above.

Figure 12 – Main Distribution Frame – Expanded Summary

Expanded Summary

Loop Component	Acc't	Units	Unit Investment	Quantity	Percent Occurrence	Investment Per Loop	Annual Cost Factor	Monthly Cost
Main Distribution Frame								
Copper Cable Termination	377C	Pair	$19.0000	1	63.00%	$11.9700	0.2685	$0.2678
DLC Termination	377C	Pair	$4.0161	1	24.66%	$0.9904	0.2685	$0.0222
Building	10C	Factor	-	-	-	$4.5850	0.1916	$0.0732
Land	11C	Factor	-	-	-	$0.0562	0.1861	$0.0009
Subtotal						*$17.6016*		*$0.3641*

4.0 Detailed Description of SLCS Methodology

Section 4 describes in greater detail the calculations that are used in the unit investment worksheets. Many of the calculations performed by the unit investment worksheets utilize data from the sample and input worksheets as diagramed in Figure 1.

4.1 Premises Termination Investment Worksheets

For Premises Termination – Residence, the unit investment is calculated as follows: the unit cost (from broadgauge) is multiplied by the quantity, divided by the capacity, and then divided by the fill factor to arrive at a unit investment.

The residential premises termination fill factor is determined by obtaining the number of working telephone lines per residence from company billing databases. This number divided by the premises termination capacity comprises the residential premises termination fill factor.

Figure 13 – Premises Termination - Residential

Premises Termination - Residential

Single Line - Aerial (Six Pair Service Wire)

Item	Acc't	Units	Unit Cost	Qty	Capacity	Fill Factor	Unit Investment
Service Wire (Aerial Cable - Copper)	622C	Feet	$0.4000	194	6	18.45%	$70.0994
Wire Apparatus / Wire Protector	622C	Unit	$55.0000	1	6	18.45%	$49.6838
Total							$119.7832

Single Line - Buried (Five Pair Service Wire)

Item	Acc't	Units	Unit Cost	Qty	Capacity	Fill Factor	Unit Investment
Trenching by Contractor	645C	Feet	$0.5000	194	5	22.14%	$87.6242
Service Wire (Buried Cable - Copper)	645C	Feet	$0.2500	194	5	22.14%	$43.8121
Wire Apparatus / Wire Protector	645C	Unit	$55.0000	1	6	18.45%	$49.6838
Total							$181.1201

For Premises Termination – Business, the unit investment calculation is computed in a similar manner to the residential premises termination, but also recognizes the weighting of the different NID or building entrance terminal (BET) capacities that are in service.

These weightings are determined from data obtained from company billing databases. The number of working telephone lines at each business location is acquired from the billing data. An optimally sized BET is assumed for each location. The individual line count, and proportionate weighting with relation to the total working line count, of all of the BETs, of all sizes, is determined by the study area.

The business premises termination fill factor is determined by dividing the number of working lines in the zone by the number of available lines.

Figure 14 – Premises Termination - Business

Premises Termination - Business

Multi Line - Buried (Five Pair Service Wire)

Item	Acc't	Units	Unit Cost	Qty	Pair Capacity	Fill Factor	Lines In-Service	Percent of Total	Unit Investment
Trenching by Contractor	645C	Feet	$0.5000	194	5	40.82%		45.64%	$21.6907
Service Wire (Buried Cable - Copper)	645C	Feet	$0.2500	194	5	40.82%		45.64%	$10.8454
Wire Apparatus / Wire Protector (6pr capacity)	645C	Unit	$55.0000	1	6	34.02%	936,000	45.64%	$12.2977
Wire Apparatus / Wire Protector (25pr capacity)	12C	Unit	$150.0000	1	25	46.58%	608,000	29.64%	$3.8179
Wire Apparatus / Wire Protector (50pr capacity)	12C	Unit	$200.0000	1	50	68.72%	113,000	5.51%	$0.3207
Wire Apparatus / Wire Protector (100pr capacity)	12C	Unit	$300.0000	1	100	68.08%	128,000	6.24%	$0.2750
Wire Apparatus / Wire Protector (200pr capacity)	12C	Unit	$340.0000	1	200	68.84%	73,000	3.56%	$0.0879
Wire Apparatus / Wire Protector (300pr capacity)	12C	Unit	$413.0000	1	300	81.59%	40,000	1.95%	$0.0329
Wire Apparatus / Wire Protector (400pr capacity)	12C	Unit	$479.0000	1	400	85.69%	34,000	1.66%	$0.0232
Wire Apparatus / Wire Protector (600pr capacity)	12C	Unit	$678.0000	1	600	82.16%	53,000	2.58%	$0.0355
Wire Apparatus / Wire Protector (900pr capacity)	12C	Unit	$877.0000	1	900	80.33%	66,000	3.22%	$0.0391
Total							2,051,000		$49.4660

Multi Line - Aerial (Six Pair Service Wire)

Item	Acc't	Units	Unit Cost	Qty	Pair Capacity	Fill Factor	Lines In-Service	Percent of Total	Unit Investment
Service Wire (Aerial Cable - Copper)	622C	Feet	$0.4000	194	6	34.02%		45.64%	$17.3509
Wire Apparatus / Wire Protector (6pr capacity)	622C	Unit	$55.0000	1	6	34.02%	936,000	45.64%	$12.2977
Wire Apparatus / Wire Protector (25pr capacity)	12C	Unit	$150.0000	1	25	46.58%	608,000	29.64%	$3.8179
Wire Apparatus / Wire Protector (50pr capacity)	12C	Unit	$200.0000	1	50	68.72%	113,000	5.51%	$0.3207
Wire Apparatus / Wire Protector (100pr capacity)	12C	Unit	$300.0000	1	100	68.08%	128,000	6.24%	$0.2750
Wire Apparatus / Wire Protector (200pr capacity)	12C	Unit	$340.0000	1	200	68.84%	73,000	3.56%	$0.0879
Wire Apparatus / Wire Protector (300pr capacity)	12C	Unit	$413.0000	1	300	81.59%	40,000	1.95%	$0.0329
Wire Apparatus / Wire Protector (400pr capacity)	12C	Unit	$479.0000	1	400	85.69%	34,000	1.66%	$0.0232
Wire Apparatus / Wire Protector (600pr capacity)	12C	Unit	$678.0000	1	600	82.16%	53,000	2.58%	$0.0355
Wire Apparatus / Wire Protector (900pr capacity)	12C	Unit	$877.0000	1	900	80.33%	66,000	3.22%	$0.0391
Total							2,051,000		$34.2808

Building Entrance Facility

Item	Acc't	Units	Unit Cost	Qty	Pair Capacity	Fill Factor	Percent of Total	Unit Investment
Building Wire (25pr capacity)	12C	Feet	$3.0000	10	25	46.58%	29.64%	$0.7636
Building Wire (50pr capacity)	12C	Feet	$2.9000	10	50	68.72%	5.51%	$0.0465
Building Wire (100pr capacity)	12C	Feet	$3.5000	10	100	68.08%	6.24%	$0.0321
Building Wire (200pr capacity)	12C	Feet	$4.0000	10	200	68.84%	3.56%	$0.0103
Building Wire (300pr capacity)	12C	Feet	$4.5000	10	300	81.59%	1.95%	$0.0036
Building Wire (400pr capacity)	12C	Feet	$5.0000	10	400	85.69%	1.66%	$0.0024
Building Wire (600pr capacity)	12C	Feet	$7.0000	10	600	82.16%	2.58%	$0.0037
Building Wire (900pr capacity)	12C	Feet	$10.0000	10	900	80.33%	3.22%	$0.0045
Total								$0.8667

The ratio of residential lines or business lines to the total number of lines determines the percent residential premises termination, and the percent business premises termination weightings, respectively.

4.2 Copper Cable Unit Investment Worksheets

The cable unit investment calculations develop the average unit investments for feeder and distribution (average unit investments table, average costs per pair foot column). These costs are developed separately for feeder and distribution since feeder cables tend to be larger, less expensive on a per unit basis, and serve more lines than distribution cables. The average cost per pair foot is calculated in a three-step process described below (Figure 15):

Feeder Cable Table:

The installed cost per foot is computed by adding the cable cost per foot from broadgauge to the contractor installation cost per foot. This amount is then divided by the appropriate cable size, resulting in the installed cost per pair foot. Next, the sheath feet in service is multiplied by a predetermined percentage to allocate cable inventory to feeder cable. This predetermined percentage is based on the characteristics of the typical design of outside plant. This results in feeder sheath feet which is then multiplied by the cable size (pairs) to compute feeder pair feet in service. Each cable size is then weighted according to feeder pair feet in service and multiplied by the installed cost per pair foot, resulting in a weighted installed cost per pair foot.

Distribution Cable Table:
The installed cost per foot is computed by adding the cable cost per foot from broadgauge to the contract installation cost per foot. This amount is then divided by the appropriate cable size, resulting in the installed cost per pair foot. Next, the sheath feet in service is multiplied by a predetermined percentage to allocate cable inventory to distribution cable. This predetermined percentage is based on the characteristics of the typical design of outside plant. This results in distribution sheath feet, which is then multiplied by the cable size (pairs) to compute distribution pair feet in service. Each cable size is then weighted according to distribution pair feet in service and multiplied by the installed cost per pair foot, resulting in a weighted installed cost per pair foot.

Figure 15 - Feed and Distribution Cable Investment

Copper Cable Unit Investment - Underground 19 Gauge

Feeder Cable

Cable Size (Pairs)	Broad Gauge Cost / Foot	Contract Installation Cost / Foot	Installed Cost / Foot	Installed Cost/Pair Foot	Sheath Feet in Service	Feeder Percentage of Sheath by Cable Size	Feeder Sheath Feet	Feeder Pair Feet in Service	Percent of Total	Weighted Installed Cost/Pair Foot
25	$2.0000	$5.0000	$7.0000	$0.2800	65,489	0%	0	0	0.00%	$0.0000
50	$3.0000	$5.0000	$8.0000	$0.1600	103,781	0%	0	0	0.00%	$0.0000
100	$4.0000	$5.0000	$9.0000	$0.0900	174,160	0%	0	0	0.00%	$0.0000
200	$6.0000	$5.0000	$11.0000	$0.0550	135,422	0%	0	0	0.00%	$0.0000
300	$8.0000	$5.0000	$13.0000	$0.0433	624,173	10%	62,417	18,725,100	5.80%	$0.0025
400	$8.0000	$5.0000	$13.0000	$0.0325	58,453	20%	11,691	4,676,400	1.45%	$0.0005
600	$8.0000	$5.0000	$13.0000	$0.0217	966,145	50%	483,073	289,843,800	89.79%	$0.0195
900	$8.0000	$5.0000	$13.0000	$0.0144	0	60%	0	0	0.00%	$0.0000
1,200	$8.0000	$5.0000	$13.0000	$0.0108	0	80%	0	0	0.00%	$0.0000
1,500	$8.0000	$5.0000	$13.0000	$0.0087	0	90%	0	0	0.00%	$0.0000
1,800	$8.0000	$5.0000	$13.0000	$0.0072	0	100%	0	0	0.00%	$0.0000
2,100	$8.0000	$5.0000	$13.0000	$0.0062	4,543	100%	4,543	9,540,300	2.96%	$0.0002
2,400	$8.0000	$5.0000	$13.0000	$0.0054	0	100%	0	0	0.00%	$0.0000
2,700	$8.0000	$5.0000	$13.0000	$0.0048	0	100%	0	0	0.00%	$0.0000
3,000	$8.0000	$5.0000	$13.0000	$0.0043	0	100%	0	0	0.00%	$0.0000
3,600	$8.0000	$5.0000	$13.0000	$0.0036	0	100%	0	0	0.00%	$0.0000
4,200	$8.0000	$5.0000	$13.0000	$0.0031	0	100%	0	0	0.00%	$0.0000
Total					2,132,166		561,724	322,785,600	100%	$0.0227

Distribution Cable

Cable Size (Pairs)	Broad Gauge Cost / Foot	Contract Installation Cost / Foot	Installed Cost / Foot	Installed Cost/Pair Foot	Sheath Feet in Service	Distribution Percentage of Sheath by Cable Size	Distribution Sheath Feet	Distribution Pair Feet in Service	Percent of Total	Weighted Installed Cost/Pair Foot
25	$2.0000	$5.0000	$7.0000	$0.2800	65,489	100%	65,489	1,637,225	0.31%	$0.0009
50	$3.0000	$5.0000	$8.0000	$0.1600	103,781	100%	103,781	5,189,050	0.98%	$0.0016
100	$4.0000	$5.0000	$9.0000	$0.0900	174,160	100%	174,160	17,416,000	3.30%	$0.0030
200	$6.0000	$5.0000	$11.0000	$0.0550	135,422	100%	135,422	27,084,400	5.13%	$0.0028
300	$8.0000	$5.0000	$13.0000	$0.0433	624,173	90%	561,756	168,526,800	31.89%	$0.0138
400	$8.0000	$5.0000	$13.0000	$0.0325	58,453	80%	46,762	18,704,800	3.54%	$0.0012
600	$8.0000	$5.0000	$13.0000	$0.0217	966,145	50%	483,073	289,843,800	54.85%	$0.0119
900	$8.0000	$5.0000	$13.0000	$0.0144	0	40%	0	0	0.00%	$0.0000
1,200	$8.0000	$5.0000	$13.0000	$0.0108	0	20%	0	0	0.00%	$0.0000
1,500	$8.0000	$5.0000	$13.0000	$0.0087	0	10%	0	0	0.00%	$0.0000
1,800	$8.0000	$5.0000	$13.0000	$0.0072	0	0%	0	0	0.00%	$0.0000
2,100	$8.0000	$5.0000	$13.0000	$0.0062	4,543	0%	0	0	0.00%	$0.0000
2,400	$8.0000	$5.0000	$13.0000	$0.0054	0	0%	0	0	0.00%	$0.0000
2,700	$8.0000	$5.0000	$13.0000	$0.0048	0	0%	0	0	0.00%	$0.0000
3,000	$8.0000	$5.0000	$13.0000	$0.0043	0	0%	0	0	0.00%	$0.0000
3,600	$8.0000	$5.0000	$13.0000	$0.0036	0	0%	0	0	0.00%	$0.0000
4,200	$8.0000	$5.0000	$13.0000	$0.0031	0	0%	0	0	0.00%	$0.0000
Total					2,132,166		1,570,443	528,402,075	100%	$0.0352

Average Unit Investments

Item	Installed Cost/Pair Foot	Percent Utilization	Average Cost/Pair Foot
Feeder Cable	$0.0227	65.00%	$0.0349
Distribution Cable	$0.0352	44.00%	$0.0800

Average Unit Investments (Average Unit Investment Table):
The average unit investments for Feeder and Distribution cables, last column, are obtained by dividing the Installed Cost per Pair Foot just calculated for Feeder and Distribution Cable by the percent utilization (fill factor).

Feeder and Distribution Fill Factors

A mechanized data extraction program, called wcstats, is used to determine the feeder and distribution fill factors. The program runs daily on the company Loop Engineering Information System (LEIS) server. Each day, wcstats scans the data from several wire centers within the LEIS system, and determines the number of working lines and the number of available lines extending from each wire center, in both the feeder and the distribution. Over the course of a month, all of the wire centers in the state are analyzed, and their data stored in the wcstats table. This information is used to determine the feeder and distribution fill factors, by zone. Feeder and distribution fill factors are included in the user input worksheet.

4.2.1 Copper Distribution Lengths Worksheet

After the lengths by gauge are determined for copper distribution, the distribution cable mix is applied. The total feet for aerial, buried and underground is brought forward and applied to the calculations computed on the distribution cable – Expanded Summary worksheet.

Figure 16 – Copper Distribution Lengths

Copper DistributionLengths by Cable Type

	Total	Aerial		Buried		UnderGround	
Gauge	Sample Feet	Cable Mix	Total Feet	Cable Mix	Total Feet	Cable Mix	Total Feet
		21.93%		46.61%		31.46%	
19	2		0		1		1
22	15		3		7		5
24	27		6		13		8
26	1,372		301		639		432

4.2.2 Sample Summary

The sample summary provides a representation of the cable gauging that an average subscriber loop in an area would contain. Assuming a forward-looking design, most loops over a certain length would contain a digital loop carrier system and fiber.

The actual lengths of subscriber loops in a study area are obtained by extracting data samples from the company engineering database called LEIS. The samples contain the actual lengths of the feeder and distribution portions of these subscriber loops. The samples are processed so that the feeder portion of the samples is separated into loops that are copper-only and loops that are fiber. This is done by imposing the copper-fiber crossover point onto the samples. When loop lengths are less than this crossover point, copper feeder is placed; when loop lengths are greater or equal to this distance, it is more economical to place fiber feeder.

The samples are then processed within SLCS. Electrical resistance formulas are used to determine the gauge of wire that should be used for each loop based on its corresponding length. The result is an average loop comprised of an mix of copper gauges that provide the specified resistance for the loop of average length.

Averaging the loop sample lengths for the loops with lengths less than the copper-fiber crossover point provides the copper feeder lengths. The length for Fiber Feeder is determined by averaging the feeder lengths for each assumed fiber loop in the sample.

Figure 17 – Sample Summary

Sample Summary

The following numbers are based on a Feeder Copper-Fiber Crossover point of: XXXXXX

Total Sample Feet				
Transmission Medium	Copper Feeder	Fiber Feeder	Copper Distribution	Copper Feeder Stub
19 gauge	0		2	
22 gauge	0		15	
24 gauge	43		27	848
26 gauge	5,702		1,372	
Fiber Size 48		15,452		

4.2.3 Copper Cable Mix Worksheet

The cable mix represents the percentages of aerial, buried and underground cable that are in an "average" loop identified for both the feeder and the distribution. Using the total feeder pair feet for aerial, buried and underground, the three cable types are weighted against their sum to produce a feeder weighting for aerial, buried and underground. This is carried forward to the Copper Feeder Lengths worksheet. Using the total distribution pair feet for aerial, buried and underground, the three cable types are weighted against their sum to produce a distribution weighting for aerial, buried and underground. This is carried forward to the Copper Distribution Lengths worksheet.

Figure 18 – Copper Cable Mix

Copper Cable Mix

	Feeder pair ft.	Feeder Wtg by pair feet	Distribution pair ft.	Dist Wtg by pair feet
Aerial	3,339,255,700	2.90%	13,916,381,450	21.93%
Buried	14,352,245,200	12.48%	29,579,193,425	46.61%
Underground	97,306,498,900	84.62%	19,961,494,925	31.46%

Feeder Pair Ft.	26 Gauge	24 Gauge	22 Gauge	19 Gauge	Total
Aerial	1,905,486,800	1,108,981,900	304,062,200	20,724,800	3,339,255,700
Buried	5,409,424,800	6,553,861,600	2,244,723,900	144,234,900	14,352,245,200
Underground	45,640,783,200	34,362,542,500	16,980,387,600	322,785,600	97,306,498,900

Distribution Pair Ft.	26 Gauge	24 Gauge	22 Gauge	19 Gauge	Total
Aerial	7,451,516,200	4,350,210,350	1,733,660,600	380,994,300	13,916,381,450
Buried	8,796,625,400	11,154,649,050	7,609,918,975	2,018,000,000	29,579,193,425
Underground	4,774,979,275	6,455,518,600	8,202,594,975	528,402,075	19,961,494,925

4.2.4 Annual Cost Factors Worksheet

The Annual Cost Factor consists of the Capital Cost Factor plus the Operating Expense Factor plus Commission Assessment Factor (if applicable). The Capital Cost Factor is the sum of the cost factors for depreciation, cost of money and income tax, followed by the application of the appropriate capital cost inflation factor. The Operating Expense

Factor is the sum of the cost factors for maintenance, support assets and miscellaneous taxes, followed by the application of the appropriate operating expense inflation factor. Many jurisdictions directly charge consumers for the cost of regulation. This assessment is typically an additional fee on each dollar spent by a customer for services. In those states where a fee is charged to consumers, a commission assessment factor is computed.

Figure 19 – Annual Cost Factors

Annual Cost Factors

Capital Cost Factor

Plant	Field Reporting Code	Depreciation Factor	Cost of Money Factor	Income Tax Factor	Ad Valorem Tax Factor	Capital Cost Factor Subtotal	Capital Cost Inflation Factor	Capital Cost Factor w/ Inflation
Poles	1C	0.08333	0.05496	0.03078	0.00790	0.17697	1.06539	0.18854
Aerial Cable	(6)22C	0.08333	0.06453	0.03614	0.00790	0.19190	1.05610	0.20267
DLC Equipment	257C	0.11111	0.05349	0.02996	0.00790	0.20246	0.99215	0.20087
Frame Equipment	377C	0.10000	0.05347	0.02995	0.00790	0.19132	1.02917	0.19690
Buried Cable - Copper	(6)45C	0.07333	0.06842	0.03832	0.00790	0.18797	1.05900	0.19906
Conduit	4C	0.02200	0.07904	0.04427	0.00790	0.15321	1.06282	0.16283
Underground Cable - Copper	5C	0.08333	0.06453	0.03614	0.00790	0.19190	1.05351	0.20217
Buried Cable - Fiber	845C	0.05500	0.06932	0.03883	0.00790	0.17105	1.03566	0.17715
Underground Cable - Fiber	85C	0.06000	0.06701	0.03753	0.00790	0.17244	1.00457	0.17323
Aerial Cable - Fiber	822C	0.06250	0.06585	0.03688	0.00790	0.17313	0.99989	0.17311
Buildings - DLC	10C	0.02386	0.08904	0.04987	0.00790	0.17067	1.05008	0.17922
Buildings - Frame Equipment	10C	0.02386	0.08904	0.04987	0.00790	0.17067	1.05008	0.17922
Land	11C	0.00000	0.11420	0.06397	0.00790	0.18607	1.00000	0.18607
Building Cable	12C	0.07667	0.06712	0.03760	0.00790	0.18929	1.05573	0.19984

Operating Expense Factor

Plant	Field Reporting Code	Maintenance Factor	Support Assets Factor	Operating Exp. Factor Subtotal	Capital Cost Inflation Factor	Operating Exp. Inflation Factor	Operating Exp. Factor w/ Inflation
Poles	1C	0.01702	0.00741	0.02443	1.06539	0.98770	0.02571
Aerial Cable	(6)22C	0.05015	0.00741	0.05756	1.05610	0.99578	0.06053
DLC Equipment	257C	0.02570	0.02219	0.04789	0.99215	1.09664	0.05211
Frame Equipment	377C	0.05575	0.01130	0.06705	1.02917	1.03804	0.07163
Buried Cable - Copper	(6)45C	0.04732	0.00741	0.05473	1.05900	0.99168	0.05748
Conduit	4C	0.01164	0.00741	0.01905	1.06282	1.00295	0.02031
Underground Cable - Copper	5C	0.02368	0.00741	0.03109	1.05351	0.99843	0.03270
Buried Cable - Fiber	845C	0.01758	0.00741	0.02499	1.03566	1.02493	0.02653
Underground Cable - Fiber	85C	0.01777	0.00741	0.02518	1.00457	1.07233	0.02712
Aerial Cable - Fiber	822C	0.01497	0.00741	0.02238	1.00457	1.07998	0.02428
Buildings - DLC	10C	0.01177	0.00000	0.01177	1.05008	1.00121	0.01237
Buildings - Frame Equipment	10C	0.01177	0.00000	0.01177	1.05008	1.00121	0.01237
Land	11C	0.00000	0.00000	0.00000	1.00000	1.00000	0.00000
Building Cable	12C	0.01669	0.00741	0.02410	1.05573	0.99759	0.02538

Annual Cost Factor

Plant	Field Reporting Code	Capital Cost & Operating Exp. Combined	Commission Assessment Factor	Annual Cost Factor w/ Commission Assessment
Poles	1C	0.21425	0.00000	0.21425
Aerial Cable	(6)22C	0.26320	0.00000	0.26320
DLC Equipment	257C	0.25298	0.00000	0.25298
Frame Equipment	377C	0.26853	0.00000	0.26853
Buried Cable - Copper	(6)45C	0.25654	0.00000	0.25654
Conduit	4C	0.18314	0.00000	0.18314
Underground Cable - Copper	5C	0.23487	0.00000	0.23487
Buried Cable - Fiber	845C	0.20368	0.00000	0.20368
Underground Cable - Fiber	85C	0.20035	0.00000	0.20035
Aerial Cable - Fiber	822C	0.19739	0.00000	0.19739
Buildings - DLC	10C	0.19159	0.00000	0.19159
Buildings - Frame Equipment	10C	0.19159	0.00000	0.19159
Land	11C	0.18607	0.00000	0.18607
Building Cable	12C	0.22522	0.00000	0.22522

4.3 Feeder Distribution Interface Investment Worksheet

Total feeder distribution interface (FDI) cost is derived by multiplying the number of FDIs in service by the cost per FDI size. FDI connection capacity is obtained by multiplying the FDI size by the FDIs in service. Total FDI cost is then divided by the FDI connection capacity and multiplied by the weighting of this capacity to the total capacity to arrive at a weighted cost per connection.

The total investment per connection is determined by summing the weighted cost per connection in the last column for each FDI size.

The resulting total investment with utilization is simply the total investment divided by the percent utilization or fill factor.

Figure 20 – Feeder Distribution Interface

Feeder Distribution Interface

FDI Size (Connections)	Broad Gauge Cost Per FDI Size	FDIs in Service	Total FDI Cost	FDI Connection Capacity	Percent of Total	Weighted Cost Per Connection
200	$1,000.0000	803	$803,000.0000	160,600	0.47%	$0.0235
600	$2,000.0000	4,465	$8,930,000.0000	2,679,000	7.87%	$0.2623
900	$3,000.0000	3,055	$9,165,000.0000	2,749,500	8.07%	$0.2690
1,200	$4,000.0000	2,735	$10,940,000.0000	3,282,000	9.64%	$0.3213
1,800	$5,000.0000	3,820	$19,100,000.0000	6,876,000	20.19%	$0.5608
2,700	$7,000.0000	3,817	$26,719,000.0000	10,305,900	30.26%	$0.7845
3,600	$9,000.0000	1,695	$15,255,000.0000	6,102,000	17.92%	$0.4480
4,800	$12,000.0000	396	$4,752,000.0000	1,900,800	5.58%	$0.1395
Total Investment			$95,664,000.0000	34,055,800	100.00%	$2.8089
Percent Utilization						49.15%
Total Investment with Utilization						$5.7150

4.3.1 Copper Feeder Lengths Worksheet

After the lengths by gauge are determined for copper cable (using the sample), the feeder cable mix is applied. The total feet for aerial, buried and underground is brought forward and applied to the calculations computed on the Feeder Cable – Expanded Summary worksheet.

Figure 21 – Copper Feeder Lengths

Copper Feeder Lengths by Cable Type

Gauge	Total Sample Feet	Aerial		Buried		UnderGround	
		Cable Mix	Total Feet	Cable Mix	Total Feet	Cable Mix	Total Feet
		2.90%		12.48%		84.62%	
19	0		0		0		0
22	0		0		0		0
24	43		1		5		37
26	5,702		165		712		4,825

4.4 Feeder Stub Unit Investment Worksheet

The Feeder Stub (FS) is a copper cable that originates at the Digital Loop Carrier remote terminal or cabinet and terminates on the feeder side of a Feeder Distribution Interface (FDI). This cable is the transmission pathway for the derived pairs from the DLC. The Feeder Stub is not utilized 100% of the time; there are instances when the FDI is located in the DLC remote terminal.

To calculate the unit investment per foot per pair, unit cost per foot per pair for the average 26 gauge copper cable (account 45C) placed is divided by the fill factor.

Figure 22 – Feeder Stub

Feeder Stub

Item	Acc't	Units	Unit Cost	Fill Factor	Unit Investment
Buried Cable - Copper	45C	Feet	$0.0212	50.00%	$0.0424

4.5 Digital Loop Carrier Worksheet (Remote Terminal – Central Office Terminal)

The DLC section reflects the use of Litespan-2000 from Alcatel as the digital loop carrier. The Litespan-2000 system has become the company standard.

The remote terminal configuration represented is a modified 2016.9 configuration. The modification entails substituting all digital subscriber line (DSL) related components (e.g. line cards) with POTS-only components. For remote terminals (RTs), cabinet costs are used rather than CEV or hut costs.

This methodology presents the most conservative (lowest) cost per user for a DLC system and is *not* representative of actual SBC deployment.

To compute the total remote terminal investment, a three-step process is employed:

Step 1 - Total Investment with Utilization per DS0

Equipment costs for the Litespan-2000 – 2016.9 Configuration includes such items as the cabinet, power, cooling and protection equipment, as well as common cards and panels.

The required quantity of each equipment item is multiplied by the material unit price to compute Total Material Price. The EF&I (Engineered, Furnished, and Installed) Loading Factor is then applied to the Total Material Price to compute the Total Investment. Dividing this total by the System DS0 capacity produces the Average Unit Investment per DS0. This result is then divided by the percent utilization (fill factor) to compute Total Investment with Utilization per DS0. See Figure 23.

Figure 23 – Total Investment with Utilization per DS0 (Step 1)

DLC - REMOTE TERMINAL COMMON - Litespan LS2000 - 2016.9 Configuration

Equipment Item	Quantity	Material Unit Price	Total Material Price	EF&I Loading	Total Investment
LS2000 LSC-2016 Cabinet, Equipped 9 CBA/Wired 9 CBA, 3 PDFA, MS2	1	$66,332.5200	$66,332.5200	3.26	$216,244.0152
LS2000 Getting Started Package, RT, Fiber Fed, (TCP3)	1	$6,316.5900	$6,316.5900	1.07	$6,758.7513
LS2000/2012 RT, Channel Bank Common Plug Package	8	$524.1400	$4,193.1200	1.07	$4,486.6384
Time Slot Interchanger V.4	8	$1,158.5400	$9,268.3200	1.07	$9,917.1024
Saft Batteries	6	$2,972.0000	$17,832.0000	3.26	$58,132.3200
Power Pedestal	1	$1,673.0000	$1,673.0000	3.26	$5,453.9800
Concrete Pad	1	$545.8400	$545.8400	3.26	$1,779.4384
Total Investment					$302,772.2457
System DS0 Capacity					2,016
Average Unit Investment					$150.1846
Percent Utilization					62.00%
Total Investment with Utilization per DS0					$242.2332

Step 2 - Total RT channel investment with utilization

The type of loop being studied determines the channel equipment costs that are used to compute RT Channel Investment. Channels per unit and channel DS0 capacity will also vary between equipment items.

In order to compute total material price, channel unit quantity is multiplied by material unit price. The EF&I loading factor is then applied to the total material price to compute the total investment per channel unit and divided by channels per unit to compute the average channel investment. This result is divided by the percent utilization (fill factor) to compute total RT channel investment with utilization. See Figure 24.

Figure 24 – Total RT Channel Units investment with Utilization (Step 2)

DLC - Litespan LS2000 - RT Channel Units

Equipment Item	Channels per Unit	Channel DS0 Capacity	Channel Unit Quantity	Material Unit Price	Total Material Price	EF&I Loading	Total Investment
Remote, POTS (4)	4	1	1	$175.9100	$175.9100	1.07	$188.2237
Universal Four Wire (2)	2	2	0	$416.1300	$0.0000	1.07	$0.0000
ISDN Basic Rate Interface (4)	4	3	0	$302.8000	$0.0000	1.07	$0.0000
ISDN Bank Power Supply	n/a	n/a	0	$0.5300	$0.0000	1.07	$0.0000
Async T1 Channel Unit (1)	1	24	0	$669.5900	$0.0000	1.07	$0.0000
Total Investment per Channel Unit							$188.2237
Channels per Unit							4
Average Channel Investment							$47.0559
Percent Utilization							62.00%
Total RT Channel Investment with Utilization							$75.8966

Step 3 - Total remote terminal investment

Total RT common investment per DS0 (step 1) is multiplied by total number of DS0s consumed per channel to compute total RT common investment per channel. This result is then added to the total RT channel investment (step 2) with utilization resulting in total remote terminal investment (step 3). The result is brought forward and applied to the calculations computed on the DLC – Expanded Summary worksheet. See Figure 25.

Figure 25 – Total Remote Terminal investment (Step 3)

Total RT Common Investment per DS0	$242.2332
Total Number of DS0s Consumed per Channel	1
Total RT Common Investment per Channel	$242.2332
Total RT Channel Investment with Utilization	$75.8966
Total Remote Terminal Investment	$318.1298

The computation for total central office terminal investment uses this same process.

4.6 Fiber Cable Unit Investment Worksheet

To compute the unit investment for underground and buried fiber cable, accounts 85C and 845C, respectively, the first step is to compute the Total Fiber Cost per Foot for each type of cable. Total Fiber Cost per Foot is the sum of Fiber Cost per Foot, Innerduct Cost per Foot and Contractor Cost per Foot.

Total Fiber Cost per Foot is then divided by the number of fibers per cable, which results in the Total Cost per Fiber Foot. This quotient is then multiplied by the number of Fibers per System to arrive at the Total Fiber Cable Cost per System Foot. Total Fiber Cable Cost per System Foot is subsequently divided by DS0 Capacity per DLC System, resulting in Cost per DS0 System Foot. This result is multiplied by the Number of DS0s Utilized and divided by the fill factor to compute the Total Investment per Circuit Foot (unit investment). Results for underground and buried fiber cable are brought forward and applied to the calculations on the Fiber Cable – Expanded Summary.

Figure 26 – Fiber Unit Investments

Fiber Unit Investment

Fiber Cost per Foot

Acc't	Fiber Cost Per Ft.	Innerduct Cost Per Ft.	Contractor Cost Per Ft.	Total Fiber Cost Per Ft.
85C	$6.9800	$0.3000	$2.5000	$9.7800
845C	$13.0000	$0.3000	$1.8500	$15.1500
822C	$8.0000	$0.3000	$0.8000	$9.1000

Fiber Cost per DLC System

Acc't	Total Fiber Cost Per Ft.	Fibers Per Cable	Total Cost Per Fiber Ft.	Fibers Per System	Total Fiber Cable Cost Per System Ft.	DS0 Capacity Per DLC System	Cost Per DS0 System Ft.	Total Number of DS0s Utilized	Fill Factor	Total Cost Per Ckt. Ft.
85C	$9.7800	48	$0.2038	4	$0.8152	2,016	$0.00040	1	62.00%	$0.00065
845C	$15.1500	48	$0.3156	4	$1.2624	2,016	$0.00063	1	62.00%	$0.00102
822C	$9.1000	48	$0.1896	4	$0.7584	2,016	$0.00038	1	62.00%	$0.00061

4.6.1 Fiber Feeder Length Worksheet

After the average fiber feeder length is determined in the sample summary, the cable mix for buried and underground fiber is applied. The cable mix is the percentage of buried and underground fiber cable to total fiber feeder cable. The cable mix is obtained from company records. The total feet for buried and underground fiber is brought forward and applied to the calculations computed on the Fiber Feeder – Expanded Summary.

Figure 27 – Fiber Feeder Length

Fiber Feeder Lengths by Cable Type

Cable Size	Total Sample Feet	Aerial		Buried		UnderGround	
		Cable Mix	Total Feet	Cable Mix	Total Feet	Cable Mix	Total Feet
		5.00%		20.00%		75.00%	
48	15,452		773		3,090		11,589

4.7 Frame Stringer (Copper/DLC) - Main Distribution Frame Investment Worksheets

The Material Unit Investment and Engineered & Installed cost is brought forward from the Yearly Inputs. These values are multiplied by the quantity and summed to develop the subtotal of Unit Investment. A separate subtotal for the equipment requiring utilization is developed, and the appropriate utilization (fill) is then applied. All subtotals are added together to develop the Total Unit Investment. These results are carried forward to the Frame Stringer – Expanded Summary Unit Investment column.

Figure 28 - Copper Frame Stringer

Frame Stringer

Main Distribution Frame (Copper Feeder)

Equipment Item	Units	Quantity	Unit Investment	Total Unit Investment
Termination:				
Protector Unit - One each per Pair **	Pair	1	$2.0000	$2.0000
Protector Block per Pair	Pair	1	$3.6000	$3.6000
Riser Cable per Pair	Pair	1	$2.7000	$2.7000
Labor for Placing Prot. Block and Riser Per Pair	Hours	.01	$69.0000	$0.6900
Labor for Splicing Riser Cable Per Pair	Hours	.04	$69.0000	$2.7600
Frame Work and Lighting Per Pair	Pair	1	$1.3000	$1.3000
Sub-Total (requires utilization)				$11.0500
Forward Looking Utilization				65.00%
Sub-Total (with utilization)				$17.0000
Sub-Total (no utilization **)				$2.0000
Total Investment				$19.0000

Figure 29 - DLC Frame Stringer

Frame Stringer

Main Distribution Frame (Digital Loop Carrier - Derived Pair Configuration)

Equipment Item	Units	Quantity	Unit Investment	Total Unit Investment
Termination:				
Connector Block - per Pair	Pair	1	$0.5000	$0.5000
Labor for Placing Conn. Block Per Pair	Hours	.01	$69.0000	$0.6900
Frame Work and Lighting Per Pair	Pair	1	$1.3000	$1.3000
Sub-Total				$2.4900
Forward Looking Utilization				62.00%
Total Investment				$4.0161

Appendix A

Annual Cost Factors

SBC applies factors to calculate expenses for a service. These factors are a ratio of current expense to current investment. When this ratio is multiplied by the current investment in the cost study, the result is the current expense associated with the investment. SBC's use of factors makes the cost study flow easier to understand and audit.

SBC develops the following types of factors:

> ***Investment Factors*** calculate the capitalized expense SBC incurs when equipment is installed. Sales tax, engineering, and plant labor are expenses which must be treated as capital (i.e. investment). These factors determine the amount in addition to the purchase price of the equipment (may include vendor engineering and labor), to treat as investment.
>
> ***Investment Recovery Factors (depreciation, cost of money and income tax)*** identify the costs of purchasing equipment. Depreciation is the annual expense of recovering capital invested in telephone plant over the service life of the plant. When any company places equipment, it incurs a cost for the interest and dividends it must pay for the use of the money that bought the equipment. Because this cost of money is earnings, income tax must be paid on those earnings.
>
> ***Operating Expense Factors*** calculate the yearly operating cost associated with equipment. Maintenance and support assets are examples of this type of cost.

Factors are relationships between expense and investment. Expenses are current, but investments have been placed at different points in time. SBC applies a Current Cost to Book Cost ratio (CC/BC) when it develops factors to ensure that current expense is compared to current investment. Applying a CC/BC factor ensures that the cost factors develop the proper relationships.

> ***Inflation Factors*** are used to identify changes in costs that will occur during the study period. Inflation factors for equipment are based on the Telephone Plant Index (TPI), while inflation factors for labor expense are based on the Consumer Price Index (CPI). SBC uses the TPI or CPI, as appropriate, to assure that its costs reflect the best forecast of future cost changes in each particular case.

SBC's factor method is a sound means to project future expenses from current financial data. They identify the capital costs incurred when equipment is placed—cost of money, depreciation and income tax. They also identify operating expenses that will be incurred when equipment is placed. For these reasons, SBC's factor process is fundamentally sound, easy to audit, and an easy-to-understand method for identifying costs.

Labor Rates

Labor rates identify the cost to the firm of consuming a particular resource—an hour of labor. Labor rate calculations begin with a basic hourly wage or salary. Next, costs directly caused by direct labor but not captured in the basic wage are added. These other direct labor costs include:

- break time and/or tour length costs,
- paid absence costs,
- special payments such as team awards and recognition,
- payroll taxes, pension costs, benefit costs,
- support assets, including capital costs associated with support assets,
- other direct costs such as travel and training, and clerical support and supervision.

Labor rates are developed at the proper level of detail to provide accurate costs for specific activities. First, SBC looks at specific groups of function codes (which designate a specific job function) or activity codes (which designate a specific job activity). These function/activity codes are part of SBC's functional accounting system used to report expenses company-wide. For example, the group 43XX is the group of all wages and expenses charged to function codes or activity codes that begin with "43". Specifically, "43" represents Network and Installation functions and activities.

Within the specific group, SBC develops labor rates by Market Zone (for management employees) or Wage Category (for non-management employees). The Market Zones and Wage Categories are specific job classifications that determine how much the company pays for a particular job.

The Labor rates in this study begin with an average wage per hour from payroll records. Planned increases are added to make the average wage forward-looking. SBC derives relationships of expenses to wages (or expenses to hours worked) to develop labor factors or loadings that are applied to basic wages to produce total hourly labor cost.

Attachment 3

Switching Information Cost Analysis Tool

Tool Documentation

Version 3.0

Notice of Disclaimer

SBC reserves the right to revise this document for any reason, including but not limited to, conformity with standards promulgated by various agencies, utilization of advances in the state of the technical arts, or reflection of changes in the design of any equipment, techniques, or procedures described or referred to herein.

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Switching Information Cost Analysis Tool

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1.0 Introduction

Section 1.0 provides an overview of the Switching Information Cost Analysis Tool (SICAT). The purpose of SICAT and its overall organization and output are described. Then, the costing methodology is briefly covered.

For those wanting more background on switching and switch costs, Section 2 discusses the public switched telephone network, the switch architecture and the nature of switch costs, especially today's vendor pricing of switching systems. Sections 3 and 4 provide detailed descriptions of SICAT input data and the bills of costs used to develop output.

Electronic and paper copies of SICAT are contained in Appendix B.

1.1 Purpose of SICAT

SICAT measures the forward-looking costs of switching systems in SBC telecommunications networks. These include material costs, vendor engineering and labor charges, and other charges for the design, construction and installation of switches and additions to switch capacity. These are referred to as vendor engineered, furnished and installed (EF&I) costs. [1]

A telecommunications switch is an electronic device connecting subscriber telephone lines to the lines of other telephone subscribers in a local network or to trunks providing interoffice communications with other switches and telephone subscribers. The interoffice communications can be within the local exchange area or for long distance calling. The switch also supervises calls for the duration of calls, provides calling features and performs administrative functions.

End office switches terminate local subscriber telephone lines, and *tandem* switches are used for the interconnection of interoffice trunks in the local and long distance networks. (See Section 2.1 for a further description of switching in the telecommunications network.)

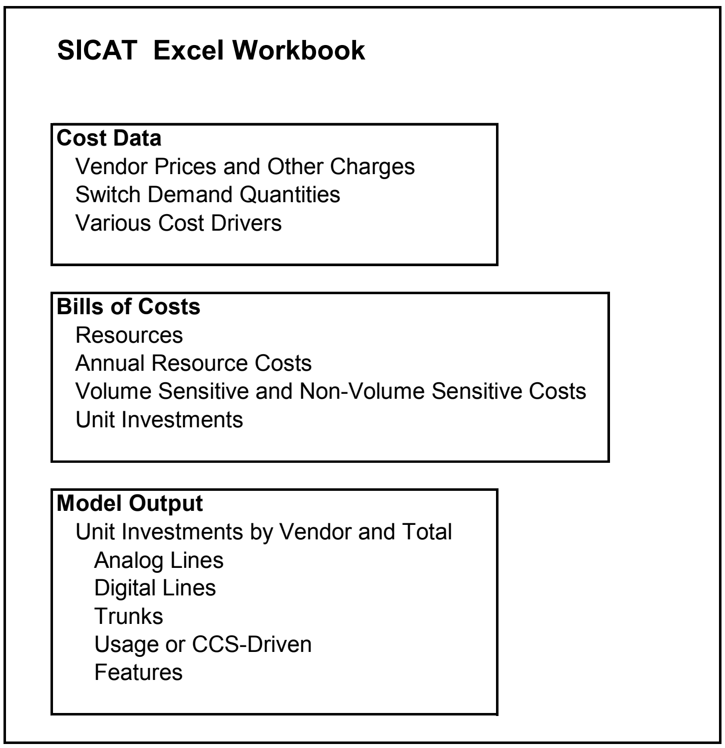
SICAT measures switch costs in terms of *EF&I costs per unit of demand*; i.e., switch lines, trunks, etc. Its output is used in subsequent cost studies of wholesale and retail products, which require switch functions (line termination, call processing, features, etc.).

[1] Throughout the documentation the terms cost and investment are used interchangeably. Unless specified otherwise, the terms mean the engineered, furnished and installed costs of switching equipment. Costs do not mean the recurring capital costs (depreciation, cost of money and income taxes) associated with capital invested in switches or operating expenses (maintenance, property taxes, etc.).

1.2 SICAT Overview and Output

SICAT is a Microsoft Excel® workbook containing spreadsheets with user-supplied cost data, “bills of costs” in which switching costs are calculated, and an output report containing switch costs per line, trunk, etc. (See Figure 1.1.) As mentioned above, this cost information is used in SBC cost studies for wholesale and retail products that require end office and tandem switches for terminating lines, processing calls and providing calling features. Unit investments are used in cost studies for unbundled network elements (UNEs) provided to competitive local exchange carriers (CLECs) and for retail services, such as residential and business local telephone service.

Figure 1.1



SICAT input consists of three types of cost and other data:

> *Vendor prices and other charges*. SBC operating companies acquire switching systems from three vendors – Vendor A Technologies, Vendor B Networks and Vendor C. The vendor’s switching systems are referred to as the AESS, BESS, and CESS respectively. SICAT contains spreadsheets with current vendor prices used to calculate switch costs. It also captures the costs of network upgrades and

capitalized software necessary to maintain the call processing capability of switching systems in the future.

Switch Demand Quantities. Switching systems are sized to accommodate customer demand for telephone lines and trunks. SICAT determines costs over a five-year planning period based on forecasts of switch replacements, growth in existing switches and the placement of new switches.

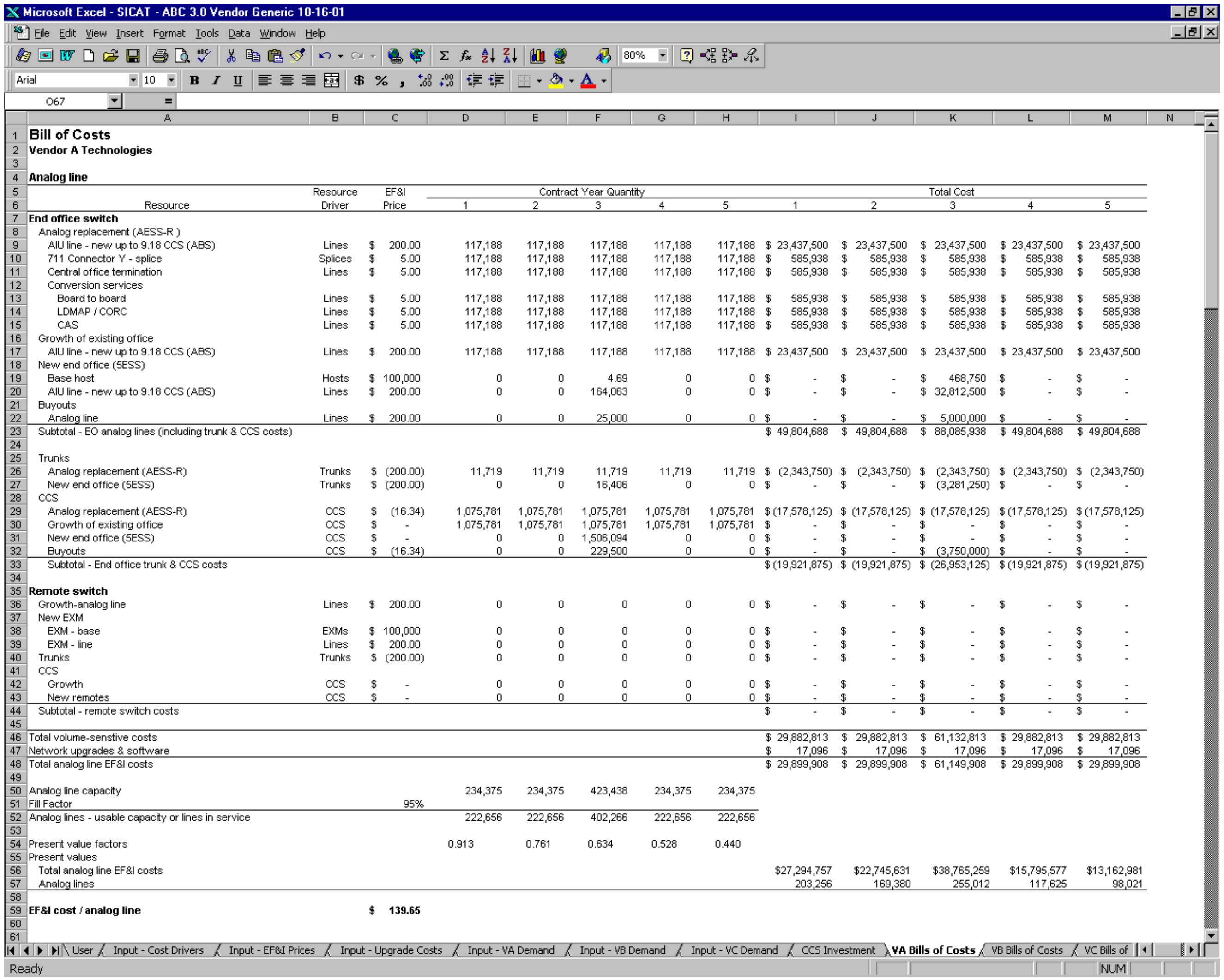
Various cost drivers. There are sizing relationships, such as the numbers of telephone subscriber lines per trunk or the call usage per line, that influence switch sizing and costs. These values are used to compute trunk and switch usage capacity requirements and costs.

An important feature of SICAT is its use of “bills of costs.” The bills of costs are similar to a bill a consumer or business receives for purchased goods or services. It summarizes vendor contract items, prices, quantities, and total costs each year of the planning period. Figure 1.2 illustrates a bill of cost for the Vendor A analog line.

Costs are calculated on separate bills for lines, trunks, call usage, and features. Bills of costs are provided for each vendor. The bills also capture the costs of major hardware and software upgrades during the planning period necessary to keep switching systems up-to-date. Total costs for a switch component (lines, trunks, etc.) are tallied and divided by the demand volume to compute unit investments.

Unit investments are then summarized for switch components and vendors on the Output spreadsheet, where state-specific technology weighting factors are applied to compute average switch investments. This is shown in Figure 1.3.

Figure 1.2

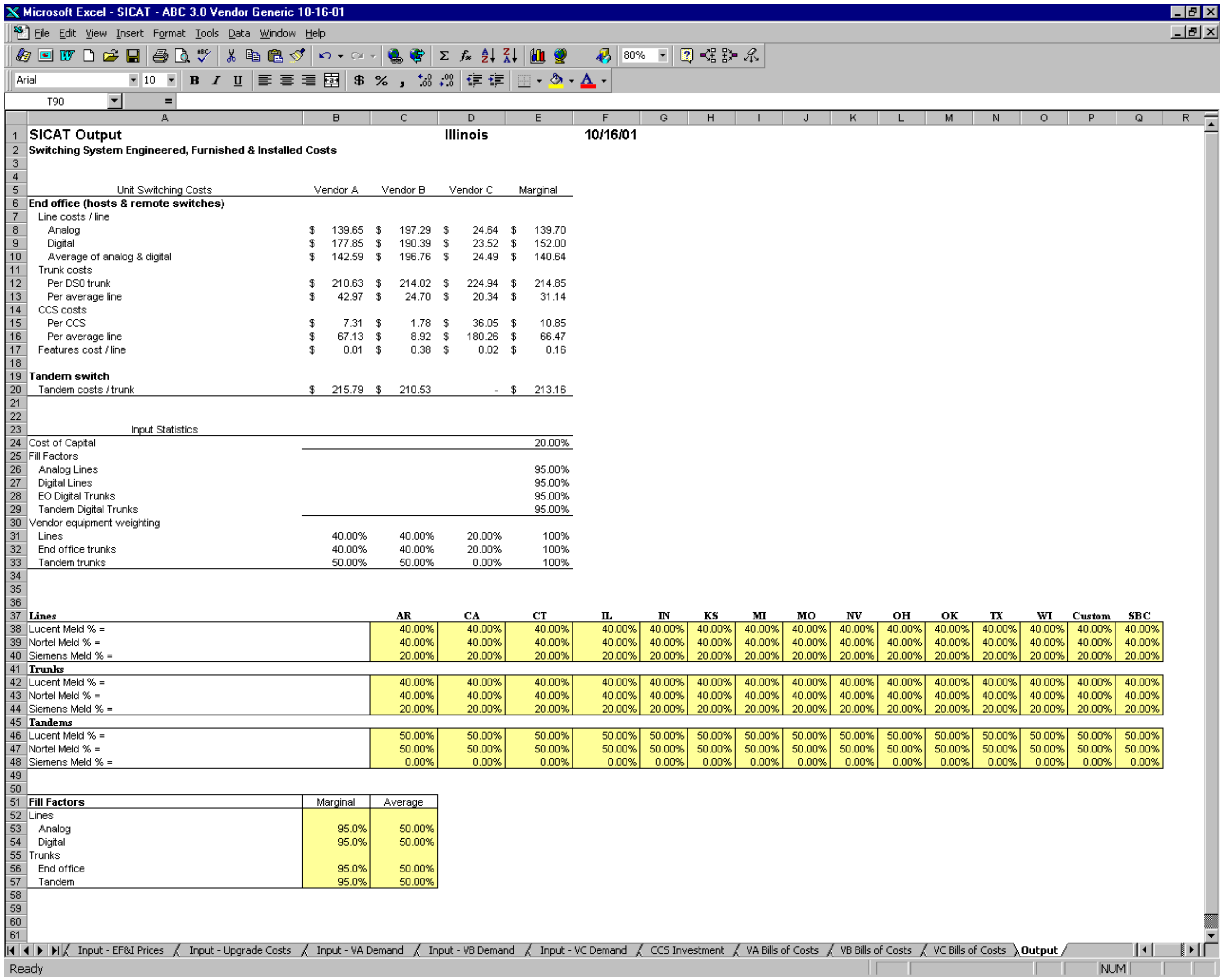


Bill of Costs
Vendor A Technologies

Analog line

	Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
7	**End office switch**												
8	Analog replacement (AESS-R)												
9	AIU line - new up to 9.18 CCS (ABS)	Lines	$ 200.00	117,188	117,188	117,188	117,188	117,188	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500
10	711 Connector Y - splice	Splices	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
11	Central office termination	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
12	Conversion services												
13	Board to board	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
14	LDMAP / CORC	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
15	CAS	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
16	Growth of existing office												
17	AIU line - new up to 9.18 CCS (ABS)	Lines	$ 200.00	117,188	117,188	117,188	117,188	117,188	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500
18	New end office (5ESS)												
19	Base host	Hosts	$ 100,000	0	0	4.69	0	0	$ -	$ -	$ 468,750	$ -	$ -
20	AIU line - new up to 9.18 CCS (ABS)	Lines	$ 200.00	0	0	164,063	0	0	$ -	$ -	$ 32,812,500	$ -	$ -
21	Buyouts												
22	Analog line	Lines	$ 200.00	0	0	25,000	0	0	$ -	$ -	$ 5,000,000	$ -	$ -
23	Subtotal - EO analog lines (including trunk & CCS costs)								$ 49,804,688	$ 49,804,688	$ 88,085,938	$ 49,804,688	$ 49,804,688
24													
25	Trunks												
26	Analog replacement (AESS-R)	Trunks	$ (200.00)	11,719	11,719	11,719	11,719	11,719	$ (2,343,750)	$ (2,343,750)	$ (2,343,750)	$ (2,343,750)	$ (2,343,750)
27	New end office (5ESS)	Trunks	$ (200.00)	0	0	16,406	0	0	$ -	$ -	$ (3,281,250)	$ -	$ -
28	CCS												
29	Analog replacement (AESS-R)	CCS	$ (16.34)	1,075,781	1,075,781	1,075,781	1,075,781	1,075,781	$ (17,578,125)	$ (17,578,125)	$ (17,578,125)	$ (17,578,125)	$ (17,578,125)
30	Growth of existing office	CCS	$ -	1,075,781	1,075,781	1,075,781	1,075,781	1,075,781	$ -	$ -	$ -	$ -	$ -
31	New end office (5ESS)	CCS	$ -	0	0	1,506,094	0	0	$ -	$ -	$ -	$ -	$ -
32	Buyouts	CCS	$ (16.34)	0	0	229,500	0	0	$ -	$ -	$ (3,750,000)	$ -	$ -
33	Subtotal - End office trunk & CCS costs								$ (19,921,875)	$ (19,921,875)	$ (26,953,125)	$ (19,921,875)	$ (19,921,875)
34													
35	**Remote switch**												
36	Growth-analog line	Lines	$ 200.00	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
37	New EXM												
38	EXM - base	EXMs	$ 100,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
39	EXM - line	Lines	$ 200.00	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
40	Trunks	Trunks	$ (200.00)	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
41	CCS												
42	Growth	CCS	$ -	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
43	New remotes	CCS	$ -	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
44	Subtotal - remote switch costs								$ -	$ -	$ -	$ -	$ -
45													
46	Total volume-senstive costs								$ 29,882,813	$ 29,882,813	$ 61,132,813	$ 29,882,813	$ 29,882,813
47	Network upgrades & software								$ 17,096	$ 17,096	$ 17,096	$ 17,096	$ 17,096
48	Total analog line EF&I costs								$ 29,899,908	$ 29,899,908	$ 61,149,908	$ 29,899,908	$ 29,899,908
49													
50	Analog line capacity			234,375	234,375	423,438	234,375	234,375					
51	Fill Factor		95%										
52	Analog lines - usable capacity or lines in service			222,656	222,656	402,266	222,656	222,656					
53													
54	Present value factors			0.913	0.761	0.634	0.528	0.440					
55	Present values												
56	Total analog line EF&I costs								$27,294,757	$22,745,631	$38,765,259	$15,795,577	$13,162,981
57	Analog lines								203,256	169,380	255,012	117,625	98,021
58													
59	**EF&I cost / analog line**		**$ 139.65**										

Figure 1.3



Microsoft Excel - SICAT - ABC 3.0 Vendor Generic 10-16-01

SICAT Output **Illinois** **10/16/01**

Switching System Engineered, Furnished & Installed Costs

Unit Switching Costs	Vendor A	Vendor B	Vendor C	Marginal
End office (hosts & remote switches)				
Line costs / line				
Analog	$ 139.65	$ 197.29	$ 24.64	$ 139.70
Digital	$ 177.85	$ 190.39	$ 23.52	$ 152.00
Average of analog & digital	$ 142.59	$ 196.76	$ 24.49	$ 140.64
Trunk costs				
Per DS0 trunk	$ 210.63	$ 214.02	$ 224.94	$ 214.85
Per average line	$ 42.97	$ 24.70	$ 20.34	$ 31.14
CCS costs				
Per CCS	$ 7.31	$ 1.78	$ 36.05	$ 10.85
Per average line	$ 67.13	$ 8.92	$ 180.26	$ 66.47
Features cost / line	$ 0.01	$ 0.38	$ 0.02	$ 0.16
Tandem switch				
Tandem costs / trunk	$ 215.79	$ 210.53	-	$ 213.16

Input Statistics				
Cost of Capital				20.00%
Fill Factors				
Analog Lines				95.00%
Digital Lines				95.00%
EO Digital Trunks				95.00%
Tandem Digital Trunks				95.00%
Vendor equipment weighting				
Lines	40.00%	40.00%	20.00%	100%
End office trunks	40.00%	40.00%	20.00%	100%
Tandem trunks	50.00%	50.00%	0.00%	100%

Lines	AR	CA	CT	IL	IN	KS	MI	MO	NV	OH	OK	TX	WI	Custom	SBC
Lucent Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Nortel Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Siemens Meld % =	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Trunks															
Lucent Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Nortel Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Siemens Meld % =	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Tandems															
Lucent Meld % =	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
Nortel Meld % =	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
Siemens Meld % =	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Fill Factors	Marginal	Average
Lines		
Analog	95.0%	50.00%
Digital	95.0%	50.00%
Trunks		
End office	95.0%	50.00%
Tandem	95.0%	50.00%

Input - EF&I Prices / Input - Upgrade Costs / Input - VA Demand / Input - VB Demand / Input - VC Demand / CCS Investment / VA Bills of Costs / VB Bills of Costs / VC Bills of Costs / Output

Additional costs of construction, such as telephone company engineering and labor costs, power plant and miscellaneous and sundry expenditures are added to the output of SICAT to determine total switching investments for use in subsequent product cost studies.

1.3 General Description of Methodology

EF&I costs per line, trunk, etc. represent the *incremental cost* SBC will incur in the future for replacements of existing analog switching systems, growth in existing digital switching systems and construction of entirely new switch entities. *SICAT does not measure historical or embedded switch costs*.

The methods used to compute costs include the following:

> *Use of current resource costs*. Costs are based on current contracts with Vendor A, Vendor B and Vendor C. The prices contained in the input data are obtained directly from the contracts. Since contract items and price levels apply for the foreseeable future, prices are not inflated or deflated over the planning period.
>
> *Volume-sensitive costs reflect total switch additions*. SICAT determines quantities of contract items SBC will purchase to satisfy digital switching system replacements, growth and construction each year of a five-year planning period. The quantities are applied to contract prices to compute total annual vendor purchases.
>
> *Non-volume sensitive costs for switching hardware and software upgrades are separately identified and apportioned*. SBC will make annual investments for switch hardware and software upgrades. The investments are shared by existing switch capacity and future capacity additions. SICAT separately identifies hardware and software upgrade investments and attributes them to existing capacity and future capacity additions.
>
> *Unit investments reflect either engineering fill or average utilization*. SICAT allows the user to specify the fill factor used in calculating per-unit costs. Engineering fill factors are used to measure *marginal* investments, and average utilization factors are used to compute *average* investments, which include spare capacity costs.[2]

Section 2.3 provides additional background on the costing concepts underlying these methods.

[2] Marginal unit investments do not include the cost of spare capacity. They include the cost of resource capacity for a small amount of defective equipment, administrative use, etc. Switch engineering fill factors used to compute marginal investments usually are 95% or greater.

2.0 Background on Switching System Costs

This section provides a basic understanding of the public telecommunications network and the function of switching systems. It also provides background on the typical switch architecture. This information is important in understanding the categories of switch costs – lines, trunks, usage and features – and the differences between end office, tandem and remote switches.

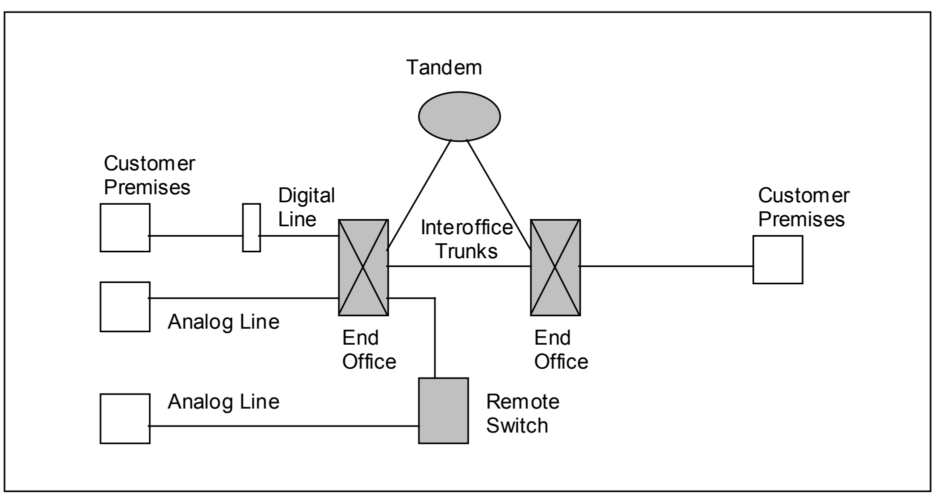
The cost structure of switches also is covered. For many years, vendors individually priced switching system equipment components – line equipment, trunk equipment, processors of different types, memory equipment, etc. Switch costs were a function of the demand for many equipment items, and complex engineering rules were needed to determine equipment quantities and costs. Today, vendors offer much simpler pricing arrangements. It is important to understand the current vendor pricing structure.

There are several important cost concepts underlying the methodology in SICAT, such as the method used to distinguish line-driven and usage-driven costs and the effect of utilization on unit investments. These concepts are discussed.

2.1 Switching in Telecommunications Networks

Figure 2.1 is a simplified diagram of the public telecommunications network.

Figure 2.1



Telephone equipment at a customer's premises is connected to copper cables, which provide a communications path from the telephone equipment to a local telephone company *end office*. The communications path may be over a pair of copper wires running from the customer's premises to the end office, or the copper pair may terminate at an intermediate terminal where a digital communications channel is provided using electronic equipment and fiber cables to the end office.

At the end office, the copper cable pair is connected to *line equipment* on the end office switch. The line equipment provides direct current to the customer's telephone line, detects when the customer goes "off hook" to make a call, provides dial-tone and performs other functions. Line equipment typically is dedicated to each customer line, and is often referred to as *non-traffic sensitive* plant, since the amount of customer calling does not affect the amount of line equipment required.

If the customer is provided access to the end office via a digital line, the digital transmission may be converted back to an analog signal, or the digital channels may be directly terminated on the switch. Copper access lines and digital lines reconverted to analog signals are referred to as *analog lines*, whereas digital channels terminating directly on the switch are *digital lines*. Each requires different line termination equipment with different switch costs.

When a customer makes a phone call, the end office switch performs several functions. It receives digits of the telephone number being called, communicates with the signaling network to establish the call, and provides a call path through the switch to another telephone line or to an interoffice trunk (if the called party is served by another end office). The capacity requirements for switch equipment providing these functions is sensitive to the number of call attempts and call duration during the peak period of use.[3]

In some vendor contracts, prices vary depending upon peak period usage per access line. Usage or call duration can be measured in *minutes of use* per line. In the telephone industry usage is measured in increments of 100 call seconds (centi call seconds or CCS). In SICAT, line and CCS-driven costs are distinguished.

The other key switching equipment category is trunk equipment. The equipment capacity required to connect switches to interoffice trunks depends on the amount of incoming and outgoing interoffice traffic. SICAT separately identifies switch costs for trunk equipment.

In addition to switch hardware, SBC purchases software and pays right-to-use fees for generic operating systems and features. These fees also are part of switch investment.[4]
Customer lines also may terminate on *remote* switches located closer to customers than end offices. Remotes perform some end office functions. They are connected to host,

[3] Usage sensitive switching equipment is sized to handle traffic during the Average Busy Season (ABS) busy hour (BH). Usage is measured during this period, and switching equipment is sized to provide a satisfactory grade of service during the period.

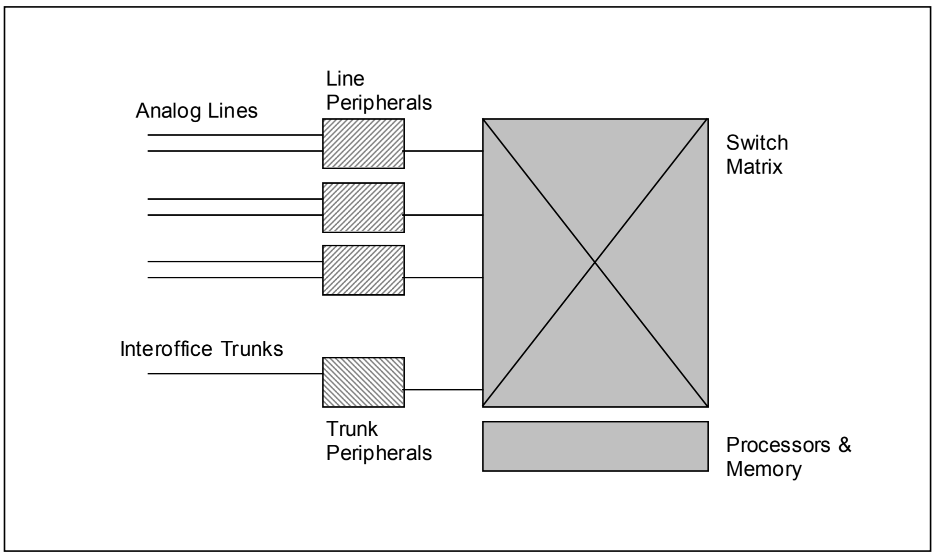
[4] Software and right-to-use fees can either be expensed or capitalized for accounting purposes. SICAT only considers those fees that are capitalized.

end offices via trunks. Vendors charge different prices for lines terminating on remote switches.

Tandem switches are used to connect interoffice trunks transporting traffic among end offices and between the SBC network and those of other carriers. SICAT separately measures the tandem switch costs and develops an investment per tandem trunk.

Figure 2.2 illustrates the architecture of a typical end office switch and shows the equipment categories for which costs are determined by SICAT.

Figure 2.2



End office switching systems are essentially large computers. Line and trunk peripherals are similar to ports on a computer. They terminate access lines and interoffice trunks. Switch processors perform many functions, including call set-up, providing features and administering the switch. The switch matrix provides call paths among lines and trunks for the duration of calls. Both switch processors and the switch matrix are usage sensitive in that they are engineered to handle call processing during peak periods of use.

As with a personal computer, the switch requires software to perform these functions. Some software is for the generic operating system of the switch, and others provide features, such as Call Waiting, Caller ID, etc. SICAT determines the portion of switch investment attributable to each of these resources – lines, trunks, usage-driven plant and features.

It is important to note that SICAT determines only the costs of digital electronic switching systems, rather than analog electronic or electromechanical switching. Analog electronic and electromechanical switches are no longer constructed in SBC telecommunications networks. SICAT also does not determine the costs of Common Channel Signaling Systems and Asynchronous Transfer Mode (ATM) switches that also are considered digital electronic switching in the Federal Communication Commission's (FCC) Part 32 Account 2212. These are specialized switches used for signaling and data communications.

2.2 Switch Costs

Switching systems are one of several types of telephone plant. Others include cable and wire facilities, transmission equipment, etc. According to the Federal Communications Commission's Uniform System of Accounts, telephone plant investments include all costs of constructing plant – vendor materials and supplies, telco labor and engineering costs, transportation, taxes, etc.[5]

SICAT captures a portion of these construction costs, specifically the vendor EF&I cost. These represent the total charges from the switch manufacturer for materials, vendor engineering and installation labor. SICAT unit investments must be augmented with the other costs of construction. This is done using digital switching *investment loading factors* developed specifically for this purpose. Figure 2.1 illustrates the calculation of the total investment per analog line, beginning with the output of SICAT and applying the various investment loadings for the other switch construction costs.

[5] See FCC Part 32.1500 (c) for a description of telephone plant construction costs.

Table 2.1

Digital Switching Investment / Analog Line	
SICAT EF&I investment / analog line	$85.00
Material to EF&I ratio	85%
Material cost	$72.25
Sales tax rate	9%
Sales tax	$6.50
EF&I investment incl. sales tax	$91.50
Telco engineering loading	8%
Telco labor loading	8%
Miscellaneous & sundry loading	3%
Total installed cost	$ 108.89
Power equipment loading	0%
Total investment / analog line	$109.38

Prior to 1998, vendor EF&I charges for switching systems were based on purchased quantities of various switching system components, such as access interface units, analog line packs, integrated digital carrier units, analog trunk circuits, etc. Quantities for each component were determined based upon engineering rules specifying the capacity required to satisfy demand for analog and digital lines, peak period usage per line and other factors. Elaborate tools, such as Telcordia Technologies' Switching Cost Information System (SCIS), were necessary to reflect these engineering rules and to calculate switch costs based upon component pricing.

Beginning in 1998, the SBC operating companies negotiated simplified vendor contract arrangements. Rather than charging for switching systems based on switch components, charges now are based on aggregate measures of switch capacity requirements, such as analog and digital lines, trunks etc. SICAT develops switch costs based on the new vendor contracts and pricing. Figure 3.2 in Section 3 show the price structure for SBC's three switch suppliers.

Today, SBC determines the capacity of lines required for switch replacements, growth in existing switches and new switch construction. Vendor EF&I charges then are based on the line quantities and prices. Line prices differ for replacement and new switches and growth additions. Depending on the vendor, line prices also may vary depending upon the usage per line.

There also are prices for what are called buyout lines. In the past, vendors sometimes provisioned line capacity in existing switches and did not charge for the capacity until it went into service. The buyout line price is the vendor charge for this growth line capacity.

There are other contract prices besides the line prices, such as prices for new remote switch lines, end office and tandem trunk prices, and base host prices, when new end office and remote switches are purchased. In addition to the contract prices, there also are annual costs for hardware and software upgrades.

2.3 Important Cost Concepts

This section provides additional background on cost concepts related to volume-sensitive and non-volume sensitive costs, fill factors and the identification of trunk and usage-related switch costs.

2.3.1 Volume-Sensitive and Non-Volume Sensitive Costs

The majority of vendor charges for switches vary with the volume of lines and trunks. Only hardware and software upgrade costs tend to be insensitive to volume. SICAT treats upgrade costs as shared non-volume sensitive costs and assigns the costs to total lines in service, consisting of existing lines in service and future line additions. Then, the portion of upgrade costs attributed to future line additions is assigned to lines, trunks, usage and features. Unit investments, therefore, reflect volume sensitive costs and a portion of future non-volume sensitive upgrade costs.

For example, suppose hardware and software upgrades to be paid to one of the switch vendors over the five-year planning period total $250 million. Also assume the existing lines in service for this vendor's switching system total 20 million, and that the present value of line additions over the planning period is 3 million. SICAT assigns 3/(20+3) of the $250 millions to line additions. Then, assume approximately 50% of switch costs are attributable to line equipment. Hardware and software upgrade costs of $16.3 million are assigned to line additions. The average cost per line in the example is $5.43, which is added to the volume sensitive cost per line.

2.3.2 Fill Factors

Telephone plant is provisioned with adequate capacity to serve immediate needs and to provide capacity for growth. At some point, capacity is effectively exhausted, and additional capacity must be placed. The difference between plant capacity and in-service demand represents spare capacity.

SICAT expresses capacity utilization in terms of fill factors. SICAT requires fill factors for lines, trunks, and features. Generally speaking, there are two values for the fill factor.

Average utilization. This is the ratio of capacity in service to total capacity. Average utilization can be estimated at the present (current average utilization) or over the planning period (forward-looking, average utilization). For many types of plant, the current and forward-looking average utilization are effectively the same, because utilization for network elements tends to reach a stable value as some elements gradually reach higher utilization levels, while new network elements are brought on-line.

Engineering fill. This represents the expected level of utilization when network elements, such as switch line or trunk peripherals, are exhausted, and additional capacity must be added. Engineering fill is seldom, if ever, 100%, because a portion of plant capacity will be unusable due to damage or defects. Often a portion of plant capacity is used to administer the network. And, sufficient spare must be retained to allow time for additional capacity to be constructed, once the decision is made to expand capacity.

Engineering fill for line equipment normally is in the range of 95 – 97%. This means for every 100 lines of capacity, three to five lines are set aside for administrative and testing purposes, and to provide temporary spare when capacity exhausts and additional lines must be placed.

In developing unit investments, SICAT applies either the average utilization factor or engineering fill factor to total switch capacity. If average utilization is used, the result is the average quantity in-service. When total switch costs are divided by this quantity, the result is the average incremental cost, including spare capacity costs. If engineering fill is applied to total switch capacity, the result is the quantity of usable capacity, and the unit investment is the marginal investment.

2.3.3 Identification of CCS and Trunk Costs

When an existing switching system is replaced or an entirely new switch is constructed, vendors charge line prices covering the costs of lines, trunks and usage-related equipment. There are no separate prices for lines, trunks and usage. When growth additions are made to existing switches, separate prices apply for lines and trunks, but not usage. Consequently, it is necessary to impute costs for trunks and usage inherent in the replacement and new line prices. In addition, usage costs must be imputed for growth and buyout line prices.

In the case of trunks, the approach is straightforward. The vendor contract price for growth additions of trunks can be used as the trunk cost and the cost removed from replacement and new line prices. This allows separate line and trunk costs to be measured. For example, the Vendor A replacement price for an analog line, splicing for 0% of lines and various conversion services total $0.00 per line. The price per digital trunk is $0.00, and one trunk is required for every five lines. Therefore, the implicit trunk cost per line included in the replacement line price is $0.00 ($0.00 / 0). This amount is subtracted from the $0.00 line price to remove the cost of trunks.

For usage, the incremental cost per CCS must be calculated. The Vendor A contract provides three line prices depending upon the CCS per line. The incremental cost per CCS is calculated as the difference in line prices divided by the difference in usage between the prices for a basic line and the line with the next higher level of usage. The Vendor A end office CCS cost per replacement line is computed as follows:

$$Cost / CCS = (\$0.00 - \$0.00) \div (12.24 - 9.18) = \$0.00$$

where,

$0.00 = price per AIU line engineered at 12.24 CCS
$0.00 = price per AIU line engineered at 9.18 CCS

The cost per CCS is multiplied times the amount of CCS included in the line price to compute the CCS cost per line ($0.00 X 9.18). This amount is subtracted from the line price to remove the usage cost. In the previous example, the $0.00 line price is divided among the following costs: $0.00 trunk cost, $0.00 CCS cost and $0.00 line cost.

3.0 SICAT Input and Output

This section describes input data required by SICAT and the cost information provided. Input data consist of various cost drivers, vendor switch prices, network upgrade and software costs, and demand forecasts. Section 3.1 describes these data in detail. Cost information provided by SICAT includes switching investments per line, trunk and CCS of usage. Feature software investments per line also are provided. Section 3.2 describes SICAT output and its use.

3.1 Input Data

SICAT input data are contained in a series of six spreadsheets at the beginning of the workbook. The spreadsheets are organized to collect data of a particular type. For example, vendor prices are contained in the Input – EF&I Prices spreadsheet, and demand forecasts are provided in the Input – Demand spreadsheets.

Input data are the same for all SBC states, with the exception of technology weighting factors. These are percentages of lines and trunks in-service in a state used to weight vendor switch investments to compute average investments. Other cost data, such as vendor prices and engineering rules, are common to all states.

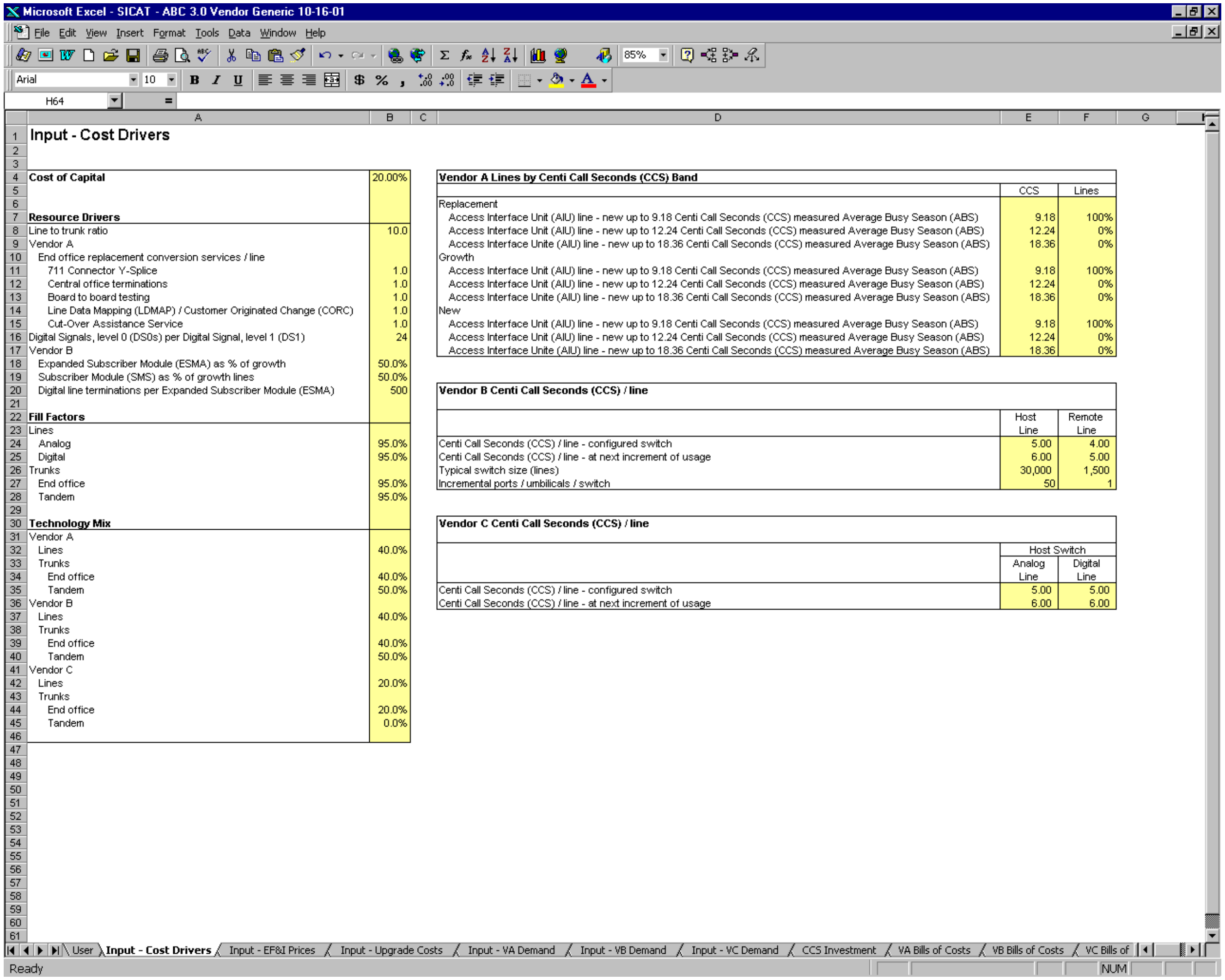
Input data are obtained from several sources, such as vendor contracts, the procurement organization of SBC Services and SBC Network Planning and Engineering. Once data have been gathered and entered in the input spreadsheets, the data remain constant until significant changes occur in the vendor contracts. Users can perform sensitivity analyses of SICAT output by modifying input data.

Cells in the input spreadsheets requiring user-supplied information are shaded light yellow.

3.1.1 Input - Cost Drivers

The *Input - Cost Drivers* spreadsheet contains a variety of data referred to as "cost drivers." These are numerical values or factors used in the SICAT bills of costs for various calculations. For example, the cost of capital is used in computing present values. There are other factors used to compute annual demand for switch components based on forecasts of line additions. Figure 3.1 is a copy of the Input – Cost Drivers spreadsheet.

Figure 3.1



Microsoft Excel - SICAT - ABC 3.0 Vendor Generic 10-16-01

Input - Cost Drivers

Cost of Capital	20.00%
Resource Drivers	
Line to trunk ratio	10.0
Vendor A	
End office replacement conversion services / line	
711 Connector Y-Splice	1.0
Central office terminations	1.0
Board to board testing	1.0
Line Data Mapping (LDMAP) / Customer Originated Change (CORC)	1.0
Cut-Over Assistance Service	1.0
Digital Signals, level 0 (DS0s) per Digital Signal, level 1 (DS1)	24
Vendor B	
Expanded Subscriber Module (ESMA) as % of growth	50.0%
Subscriber Module (SMS) as % of growth lines	50.0%
Digital line terminations per Expanded Subscriber Module (ESMA)	500
Fill Factors	
Lines	
Analog	95.0%
Digital	95.0%
Trunks	
End office	95.0%
Tandem	95.0%
Technology Mix	
Vendor A	
Lines	40.0%
Trunks	
End office	40.0%
Tandem	50.0%
Vendor B	
Lines	40.0%
Trunks	
End office	40.0%
Tandem	50.0%
Vendor C	
Lines	20.0%
Trunks	
End office	20.0%
Tandem	0.0%

Vendor A Lines by Centi Call Seconds (CCS) Band

	CCS	Lines
Replacement		
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	9.18	100%
Access Interface Unit (AIU) line - new up to 12.24 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	12.24	0%
Access Interface Unite (AIU) line - new up to 18.36 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	18.36	0%
Growth		
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	9.18	100%
Access Interface Unit (AIU) line - new up to 12.24 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	12.24	0%
Access Interface Unite (AIU) line - new up to 18.36 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	18.36	0%
New		
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	9.18	100%
Access Interface Unit (AIU) line - new up to 12.24 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	12.24	0%
Access Interface Unite (AIU) line - new up to 18.36 Centi Call Seconds (CCS) measured Average Busy Season (ABS)	18.36	0%

Vendor B Centi Call Seconds (CCS) / line

	Host Line	Remote Line
Centi Call Seconds (CCS) / line - configured switch	5.00	4.00
Centi Call Seconds (CCS) / line - at next increment of usage	6.00	5.00
Typical switch size (lines)	30,000	1,500
Incremental ports / umbilicals / switch	50	1

Vendor C Centi Call Seconds (CCS) / line

	Host Switch	
	Analog Line	Digital Line
Centi Call Seconds (CCS) / line - configured switch	5.00	5.00
Centi Call Seconds (CCS) / line - at next increment of usage	6.00	6.00

The *cost of capital* is used as the discount rate for present value calculations. The value used is the weighted average of SBC's forward-looking cost of equity and interest on debt based on the mix of equity and debt capital anticipated in the future. The current cost of capital is 0.00%.

The cost of capital is followed by six factors specific to Vendor A end office switches. These factors are used in the bills of costs to compute the volume of various replacement and conversion services performed by Vendor A when an existing switching system is replaced with a new Vendor A switch.

> A *711 Connector Y-Splice* is a connector used to splice a replacement switch to the cabling on line and trunk termination frames attached to the existing switch being replaced. In the example shown in Figure 3.1, approximately 0% of lines installed on replacement switches require the Y-splice. This factor is used to compute the quantity of splices purchased each year of the planning period.
>
> The *CO-Termination Per Line* is a charge for vendor labor to install the 711 connector Y-splice and to perform associated switch cut-over wiring.
>
> *Boards to Board Conversion Services provide* for testing between the existing and replacement switches before service is converted to the replacement switch. Line translations, which are call processing instructions contained in the switching system, are tested to assure the replacement switch is correctly matching customer lines with appropriate telephone numbers.
>
> *Line Data Mapping (LDMAP) and Customer Originated Change (CORC) Conversion Services* are for entering call processing information in the replacement switch and for transferring to the replacement switch information containing customer-requested changes in service previously stored in the existing switch.
>
> *Cut-Over Assistance Service (CAS)* is for Vendor A to electronically retrieve information to be converted from the existing switch, translating the information to a usable format for the new switch, and returning the information to SBC for uploading to the replacement switch.

Each of these services are priced by Vendor A on a per line basis. The factors represent the percentage of lines to which the charges apply. Since the services apply to all lines, the factors are set at 1.0.

The next two cost drivers, Expanded Subscriber Module (ESMA) and Subscriber Carrier Module (SMS) as % of growth lines, are used in calculating Vendor B digital line costs. Vendor B switches provide digital lines using one of two arrangements. An ESMA is hardware added to a switch that increases the capacity of digital lines that can be terminated on the switch. ESMA equipment increases the number of digital links from

20 to 48 DS-1 ports. ESMAs are capable of terminating 1,920 digital lines. SMS equipment also increases the number of digital lines that can be terminated on a switch to 24 DS-1 ports. The factors provided in the input data are used to determine the mix of the two arrangements and the weighting given to the cost of each. The values should total to 100%.

The *line to trunk ratio* is a key cost driver. This represents the average number of analog and digital lines per interoffice trunk.[6] In Figure 3.1, the line to trunk ratio is 0.0, which indicates there are five lines per trunk. Five lines can share one trunk, because not all lines will be making calls at the same time and not all calls require transport to other switching systems. The line to trunk ratio is used to compute the number of interoffice trunks given demand for analog and digital lines on replacement and new switches.[7] The line to trunk ratio is obtained from the vendor contracts.

Another important cost driver is the ratio of *DS0s per DS1*. Some switch components, such as digital trunk units and carrier terminations for digital lines, transmit or receive traffic at the DS1 level (1.566 million bits per second). They are capable of handling multiple voice grade channels or DS0s. The DS0s per DS1 ratio is used to calculate the number of these components required to handle demand for lines and trunks.

The ratio typically is set at 24:1, indicating that one digital trunk unit is required for every 24 interoffice trunks, or one digital carrier termination unit is required for every 24 digital lines. The ratio can be set at a lower value to allow for spare capacity to meet future demand, testing, maintenance and administrative requirements.

Fill factors are required for analog and digital lines and end office and tandem trunks. They represent either the engineering fill for line and trunk equipment or the expected average utilization of this equipment. SICAT users have the option of using engineering fills or average utilization depending on whether marginal or average switch investments are to be measured.

Fill factors are mid-contract period estimates of capacity utilization provided by SBC Network Planning and Engineering. Section 2.3.2 describes fill factors and their use in calculating switch costs. Also, see Section 4.1.1 for a description of the use of the factors in cost calculations.

The *vendor technology mix* represents the percentages of total lines, end office trunks, and tandem trunks provided by the three vendors in a particular state. The figures are used to weight vendor switch investments to determine statewide averages.

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[6] An interoffice trunk is a voice grade channel connecting one switch to another. The trunk has the capacity to transport traffic equivalent to a single voice conversation, or 64,000 bits per second. This is referred to as DS0 level transmission. Trunks are provided over digital transmission facilities capable of simultaneously transmitting many DS0 channels. A DS1 transmission facility has the nominal capacity of 24 DS0 channels or trunks. A DS3 facility has the capacity of 672 trunks. OC3 has up to 2,016 trunks. Actual trunk capacity and utilization depend upon the engineering design of trunk groups.

[7] Trunks for growth in existing switches are forecast separately. The line to trunk ratio for growth additions differs somewhat from the 0.0 line to trunk ratio for switch replacements and new switches.

This spreadsheet also contains information used to measure CCS investment; i.e., switch EF&I cost attributable to usage.[8] For Vendor A switches, prices for lines (Access Interface Units) are provided at three possible usage levels – a basic level of up to 9.18 CCS per line, a second level of 12.24 CCS and the highest level of 18.36 CCS. Usage is measured during peak periods of switch utilization (the Average Busy Season (ABS) busy hour (BH)). The percentages of lines to be served at each level of usage are required input and are subsequently used in the CCS Investment spreadsheet.

For Vendor B switches, the CCS per line for a switch configured for a basic level of usage and the CCS per line for usage at the next, higher increment are required. These figures are required for both host and remote switches. In Figure 3.1, CCS values are shown for analog switches. Values for digital lines are the same as analog lines because it is assumed a digital line would not utilize more of the switch to process a call than an analog line.

In addition to the CCS per line for basic and higher usage levels, two other Vendor B cost drivers are required. The incremental ports per umbilical is the additional capacity required by a switch of approximately twenty-two thousand analog lines to satisfy the usage requirements at the higher usage level.[9] These data are used in the CCS Investment spreadsheet to calculate the Vendor B investment per CCS.

The Vendor C CCS data are similar to those of Vendor B. The engineered CCS per line for a basic host switch and for a switch engineered for a higher level of calling are required. Different values may be used for analog and digital lines, although the example shown in Figure 3.1 uses the same values for the two line types.

3.1.2 Input-EF&I Prices

The *Input-EF&I Prices* spreadsheet contains prices for switch components from contracts between SBC and its switch vendors. It is important to note that SICAT models switch costs based on the price structure inherent in the vendor contracts. Changes in vendor contracts or contracts with new switch vendors alter the cost structure. When this occurs, it is necessary to modify the Input – EF&I prices and Bills of Costs spreadsheets, accordingly.

References to contract pages, exhibits or sections are provided for each price element. This allows prices to be verified against the contracts and provides a source for additional information on a price element. Appendix A lists the various contracts, letters, and amendments from which prices are drawn.

Figure 3.2 provides an example of the Input – EF&I Prices spreadsheet.

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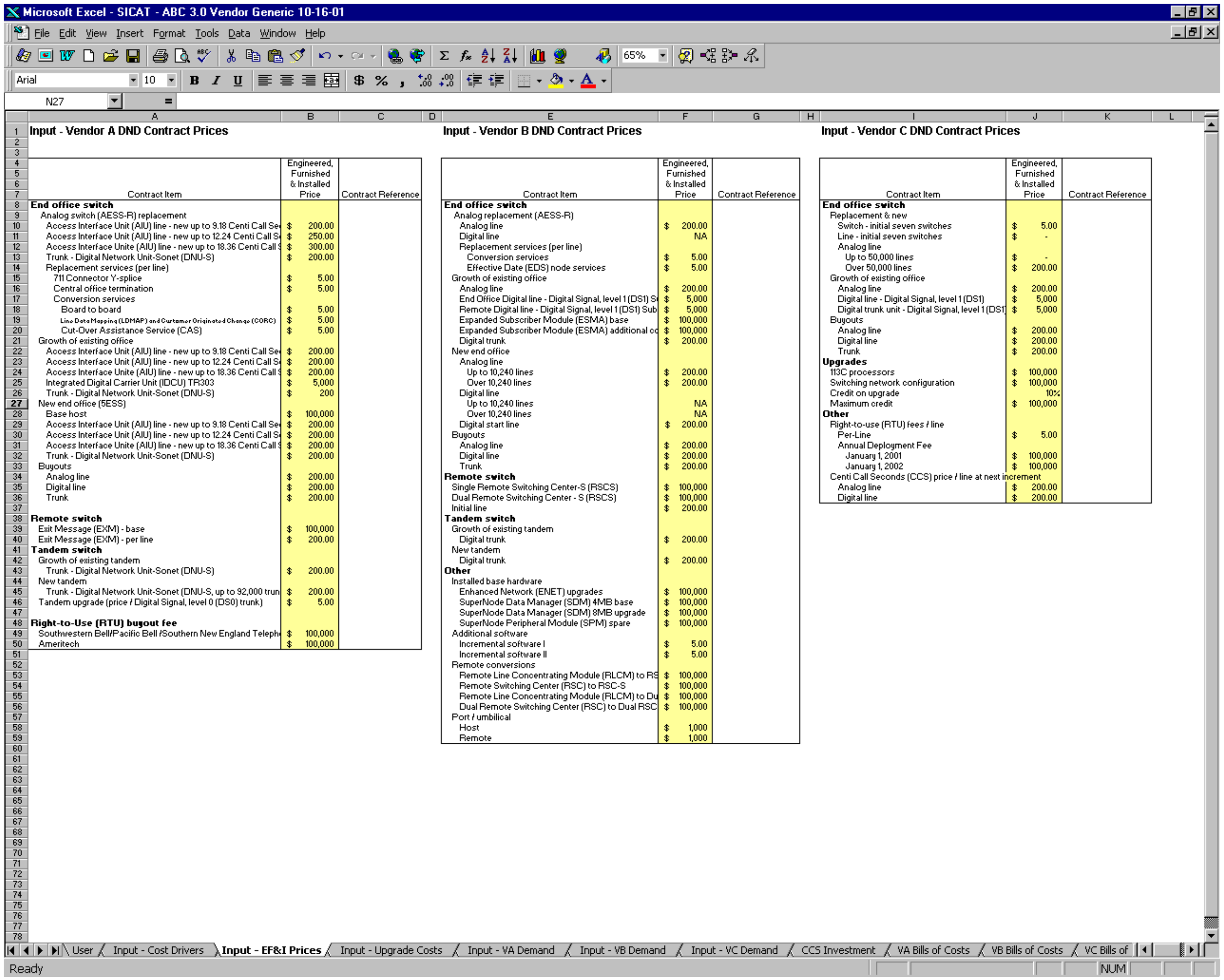
[8] See Section 2.1 for a description of switch usage and CCS as a measure of usage.
[9] An umbilical is the digital transmission facility interconnecting a host office to its remote switches.

Figure 3.2



Input - Vendor A DND Contract Prices

Contract Item	Engineered, Furnished & Installed Price	Contract Reference
End office switch		
Analog switch (AESS-R) replacement		
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Se	$ 200.00	
Access Interface Unit (AIU) line - new up to 12.24 Centi Call S	$ 250.00	
Access Interface Unite (AIU) line - new up to 18.36 Centi Call S	$ 300.00	
Trunk - Digital Network Unit-Sonet (DNU-S)	$ 200.00	
Replacement services (per line)		
711 Connector Y-splice	$ 5.00	
Central office termination	$ 5.00	
Conversion services		
Board to board	$ 5.00	
Line Data Mapping (LDMAP) and Customer Originated Change (CORC)	$ 5.00	
Cut-Over Assistance Service (CAS)	$ 5.00	
Growth of existing office		
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Se	$ 200.00	
Access Interface Unit (AIU) line - new up to 12.24 Centi Call S	$ 200.00	
Access Interface Unite (AIU) line - new up to 18.36 Centi Call S	$ 200.00	
Integrated Digital Carrier Unit (IDCU) TR303	$ 5,000	
Trunk - Digital Network Unit-Sonet (DNU-S)	$ 200	
New end office (5ESS)		
Base host	$ 100,000	
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Se	$ 200.00	
Access Interface Unit (AIU) line - new up to 12.24 Centi Call S	$ 200.00	
Access Interface Unite (AIU) line - new up to 18.36 Centi Call S	$ 200.00	
Trunk - Digital Network Unit-Sonet (DNU-S)	$ 200.00	
Buyouts		
Analog line	$ 200.00	
Digital line	$ 200.00	
Trunk	$ 200.00	
Remote switch		
Exit Message (EXM) - base	$ 100,000	
Exit Message (EXM) - per line	$ 200.00	
Tandem switch		
Growth of existing tandem		
Trunk - Digital Network Unit-Sonet (DNU-S)	$ 200.00	
New tandem		
Trunk - Digital Network Unit-Sonet (DNU-S, up to 92,000 trun	$ 200.00	
Tandem upgrade (price / Digital Signal, level 0 (DS0) trunk)	$ 5.00	
Right-to-Use (RTU) buyout fee		
Southwestern Bell/Pacific Bell /Southern New England Teleph	$ 100,000	
Ameritech	$ 100,000	

Input - Vendor B DND Contract Prices

Contract Item	Engineered, Furnished & Installed Price	Contract Reference
End office switch		
Analog replacement (AESS-R)		
Analog line	$ 200.00	
Digital line	NA	
Replacement services (per line)		
Conversion services	$ 5.00	
Effective Date (EDS) node services	$ 5.00	
Growth of existing office		
Analog line	$ 200.00	
End Office Digital line - Digital Signal, level 1 (DS1) S	$ 5,000	
Remote Digital line - Digital Signal, level 1 (DS1) Sub	$ 5,000	
Expanded Subscriber Module (ESMA) base	$ 100,000	
Expanded Subscriber Module (ESMA) additional c	$ 100,000	
Digital trunk	$ 200.00	
New end office		
Analog line		
Up to 10,240 lines	$ 200.00	
Over 10,240 lines	$ 200.00	
Digital line		
Up to 10,240 lines	NA	
Over 10,240 lines	NA	
Digital start line	$ 200.00	
Buyouts		
Analog line	$ 200.00	
Digital line	$ 200.00	
Trunk	$ 200.00	
Remote switch		
Single Remote Switching Center-S (RSCS)	$ 100,000	
Dual Remote Switching Center - S (RSCS)	$ 100,000	
Initial line	$ 200.00	
Tandem switch		
Growth of existing tandem		
Digital trunk	$ 200.00	
New tandem		
Digital trunk	$ 200.00	
Other		
Installed base hardware		
Enhanced Network (ENET) upgrades	$ 100,000	
SuperNode Data Manager (SDM) 4MB base	$ 100,000	
SuperNode Data Manager (SDM) 8MB upgrade	$ 100,000	
SuperNode Peripheral Module (SPM) spare	$ 100,000	
Additional software		
Incremental software I	$ 5.00	
Incremental software II	$ 5.00	
Remote conversions		
Remote Line Concentrating Module (RLCM) to RS	$ 100,000	
Remote Switching Center (RSC) to RSC-S	$ 100,000	
Remote Line Concentrating Module (RLCM) to Du	$ 100,000	
Dual Remote Switching Center (RSC) to Dual RSC	$ 100,000	
Port / umbilical		
Host	$ 1,000	
Remote	$ 1,000	

Input - Vendor C DND Contract Prices

Contract Item	Engineered, Furnished & Installed Price	Contract Reference
End office switch		
Replacement & new		
Switch - initial seven switches	$ 5.00	
Line - initial seven switches	$ -	
Analog line		
Up to 50,000 lines	$ -	
Over 50,000 lines	$ 200.00	
Growth of existing office		
Analog line	$ 200.00	
Digital line - Digital Signal, level 1 (DS1)	$ 5,000	
Digital trunk unit - Digital Signal, level 1 (DS1)	$ 5,000	
Buyouts		
Analog line	$ 200.00	
Digital line	$ 200.00	
Trunk	$ 200.00	
Upgrades		
113C processors	$ 100,000	
Switching network configuration	$ 100,000	
Credit on upgrade	10%	
Maximum credit	$ 100,000	
Other		
Right-to-use (RTU) fees / line		
Per-Line	$ 5.00	
Annual Deployment Fee		
January 1, 2001	$ 100,000	
January 1, 2002	$ 100,000	
Centi Call Seconds (CCS) price / line at next increment		
Analog line	$ 200.00	
Digital line	$ 200.00	

The prices for each vendor are grouped according to those applicable to end offices, remote switches and tandem switches.[10] End office prices are charges for switch replacements, growth in switching systems, the placement of entirely new switches and the buyout of previously placed capacity.

In the case of a switch replacement, the pricing structure varies considerably among the three vendors. SICAT accounts for these differences in calculating line, trunk and usage investments.

> *Vendor A* replacement line charges cover all replacement switch hardware - line and trunk peripherals, the switch matrix, processors and memory, etc. Three different line prices are provided for the different usage levels. Vendor A replacement costs are incurred for both analog and digital lines.
>
> A price is shown for a trunk on a replacement switch, although trunks are already covered by the line price. The trunk price is used in SICAT to remove the trunk costs implicit in the line price so that trunk costs can be separately identified. Line termination and trunk access are two different switching functions.
>
> Prices per line also are provided for replacement and conversion services provided by Vendor A. These services are described in Section 3.1.1.
>
> *Vendor B* has single analog line and digital line charges for replacement switches. As with Vendor A, the line price covers line termination, usage and trunks. Since Vendor B does not provide a trunk price for replacement switches, SICAT uses the price for growth trunks to remove the implicit trunk costs covered by the line price.
>
> To identify the switch costs for usage or CCS, SICAT takes a different approach for Vendor B switches. When lines are expected to have higher usage, Vendor B engineers and places additional switch ports to increase the call handling capacity of the switch. Prices for each port are provided for Vendor B end offices and hosts. These are shown at the bottom of the Vendor B price list. The prices are used in the CCS investment spreadsheet to measure CCS investment.
>
> *Vendor C* pricing for replacement and new switches is quite different from the other two vendors. Vendor C offers its first seven replacement and new switches at a nominal price. This pricing provides for approximately 75 thousand lines of switch capacity, and covers line terminations, usage, and trunks. Vendor C provides another fifty thousand lines of replacement or new switching capacity at no charge. Beyond this, a price per analog line applies. There is no separate charge for replacement or new digital lines.

The next group of vendor prices is for growth additions to existing digital switches.

---

[10] SBC's current vendor contracts are referred to as Digital Network Deployment (DND) contracts.

Vendor A provides prices for analog lines (at three usage levels) and trunks. In addition, a price is included for the Integrated Digital Carrier Unit (IDCU), used to terminate digital lines in the switching system.[11] The IDCU price is for a DS1 channel termination.

Vendor B also has charges for growth analog lines and trunks, but its pricing for digital lines is different from Vendor A. As described in Section 3.1.1, there are two options available for providing digital lines – one using ESMAs and the other SMSs. The first ESMA price applies until SBC purchases a certain number of units. After this, a lower ESMA price applies. ESMAs are capable of terminating 1,920 digital lines. For the SMS option, a single price applies for all units purchased. A SMS terminates 24 digital lines. These prices are used to develop an average price per digital line.

Vendor C simply has charges for growth analog lines, digital lines, and trunks. The digital line and trunk prices are per DS1.

New line prices apply to new digital switching systems. New lines can be either analog or digital.

Vendor A price elements are the same as before, except there is an additional base charge of $000,000 for each new switch purchased. This price is applied to the forecast of new switches during the planning period.

Vendor B has different analog line prices depending on whether the new switch has less than or greater than 10,240 lines. Smaller switching systems carry a higher line price. Demand forecasts for Vendor B new switch lines are separated between those terminated on switches with less than or greater than 10,240 lines. Vendor B has only one digital line price for new switching systems. The price does not vary with the number of digital lines.

Vendor C' pricing structure for new lines is the same as replacement lines.

Buyout lines and trunks represent capacity that is currently installed, but not yet activated or purchased. Forecasts of buyout lines and trunks to be activated are included in the Input – Demand spreadsheets. Applicable prices for these capacity buyouts are entered in the EF&I Price spreadsheets. All buyout prices are expressed on a per line or trunk basis.

Following the end office pricing are prices for remote switches. Typically, remote switches are located in rural areas of SBC territory where populations remain constant over time. Remote switches generally do not grow for this reason. Consequently, vendor

[11] An IDCU enables digital access channels to be terminated directly on the switching system without conversion to analog signals. The IDCU terminates a DS1 channel with the capacity for 24 DS0, voice grade channels or access lines.

contracts contain prices for new remote switches, while end office replacement and growth prices are used as surrogates.

> *Vendor A's* Exit Message (EXM) remote switch has a base price of $000,000 or a per line price of $00.00, whichever is greater. SBC did not forecast any new Vendor A remotes at the time the current contracts were negotiated.
>
> *Vendor B's* Remote Switching Center - S (RSCS) is the current remote switch provided to SBC. It comes as either a single or dual RSCS, where the dual RSCS is capable of supporting a greater number of umbilical trunks between the remote and host office. The base prices for the single and dual RSCS are $000,000 and $000,000, respectively. SBC also did not forecasted any new Vendor B RSCSs at the time the current contracts were negotiated.
>
> SBC does not plan to purchase *Vendor C* remote switches at this time; therefore, no prices are required by SICAT for Vendor C remote switches.

Note that remote switch prices cover line terminations and switch usage. The trunks between remotes and host switches are part of the end office investment.

Vendor pricing for tandem trunks is provided for Vendor A and Vendor B. SBC does not acquire tandem switches from Vendor C. All tandem trunk prices are expressed at the DS0-level.

At the end of each vendor price list are one or more miscellaneous price elements. These are charges identified in the various vendor contracts, agreement letters and amendments.

> *Vendor A* pricing includes a one-time right-to-use fee for capitalized feature software costs expected in the second year of the planning period. These costs are used in the calculation of the Vendor A feature costs per line. See Section 4.1.6.
>
> *Vendor B* also has several other miscellaneous price elements. Installed base hardware includes items that will be purchased to upgrade the switching network. These items are included in the network upgrade costs. Remote conversions are costs for converting older remote switches to single or dual RSCSs. Additional software charges are per-line charges for software, which is expensed. SICAT does not include these costs for this reason. The ports per umbilical prices are used in computing the incremental cost of switch usage.
>
> *Vendor C'* other miscellaneous elements include capitalized RTU fees, which are included in SICAT's costs. The vendor has provided the CCS price per line at the next increment of capacity for analog and digital lines. These items are used in computing the incremental cost of switch usage. See Section 4.2.

3.1.3 Input-Upgrade Costs

Over the planning period, SBC will incur substantial costs to upgrade switching system hardware and software. This is to maintain their call processing capabilities. These costs are not based on unit prices applied to line and trunk volumes. Instead, they are quarterly or annual charges. The capitalized costs of network upgrades and software are provided in the spreadsheet Input – Upgrade Costs, which is illustrated in Figure 3.3.

Note that several of the upgrade costs are aggregate annual amounts. Others, such as Vendor A remote upgrades and Vendor B ENET upgrades, have charges per switch, which are applied to the number of upgrades to be performed each year of the planning period.

Since upgrade costs are shared by both lines in service at the beginning of the planning period and line additions, SICAT assigns a portion to each. In addition, the portion of upgrade line costs assigned to line additions is further divided among lines, trunks, usage, and features. Each of the unit investments calculated by SICAT includes a portion of these costs. The bills of costs for each switching component separately identify upgrade costs.

Following is a general description of the network upgrades and software. For more information, refer to the various vendor agreements listed in Appendix A.

Vendor A

- *IIIC2 - 3B21, CM1/2 & DLN30 Hardware* is for upgrades to the hardware and software associated with 3B21, CM1, and DLN30 switch equipment. Similarly, *IIIC1 – Peripheral Processor Hardware* is for upgrades to peripheral processor equipment.
- *IIIB – Generic Hardware* is for upgrades to generic gating hardware that is associated with generic software issued during the contract term.
- *IVB1 – Generic Operating Software Upgrades* and *Application Software Upgrades* are for upgrades to switch operating system software and application software.
- *Remote Upgrades* are upgrades to remote switching systems.
- *DLN30 Software Licenses* are fees paid to utilize software associated with DLN30 processors.
- *SNET Technology Upgrades* are for peripheral and infrastructure upgrades in the Southern New England Telephone region. *SNET Generic Hardware Upgrades* are similar hardware upgrades.
- *AIT Generic Hardware Upgrades* are hardware upgrades to be performed in the Ameritech region.
- *Discounts* are credits applied to the purchase of hardware.

Figure 3.3

Microsoft Excel - SICAT - ABC 3.0 Vendor Generic 10-16-01

Input - Network Upgrade and Software Costs

Vendor A

Network Upgrade or Software Item	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
IIIC2 - Processor (3B21), Communication Module (CM1/2) & Data Link Node (DLN30) Hardware	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IIIC1 - Peripheral Processor Hardware	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IIIB - Generic Hardware	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IVB1 - Generic Operating Software Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IVB1 - Generic Application Software Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Southern New England Technology Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Data Link Node (DLN30) Software Licenses	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Discounts	Lot							$ (100,000)	$ (100,000)	$ (100,000)	$ (100,000)	$ (100,000)
Remote Upgrades	Each	$ 50,000	-	-	-	-	-					
Southern New England Generic Hardware Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Ameritech Generic Hardware Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000

Vendor B

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
Baseline Software I - Generic Software	Lot							$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
Baseline Software I - Feature Software								$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
Baseline Software II	Lot							$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
Service Ready	Lot							$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
SuperNode Peripheral Module (SPM) spare	Each	$ 100,000	20	20	20	20	20					
SuperNode Data Manager (SDM) 4MB base	Each	$ 100,000	20	20	20	20	20					
SuperNode Data Manager (SDM) 8MB upgrade	Each	$ 100,000	20	20	20	20	20					
Enhanced Network (ENET) upgrade	Each	$ 100,000	20	20	20	20	20					
Remote Line Concentrating Module (RLCM) to RSC-S	Each	$ 100,000	20	20	20	20	20					
Remote Switching Center (RSC) to RSC-S	Each	$ 100,000	20	20	20	20	20					
Remote Line Concentrating Module (RLCM) to Dual RSC-S	Each	$ 100,000	20	20	20	20	20					
Dual Remote Switching Center (RSC) to Dual RSC-S	Each	$ 100,000	20	20	20	20	20					
Discounts	Lot							$ (10,000)	$ (10,000)	$ (10,000)	$ (10,000)	$ (10,000)

Vendor C

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
Network upgrades												
113C processors	Each	$ 100,000	10	10	10	10	10					
Switching network configuration	Each	$ 100,000	10	10	10	10	10					
Right-to-use	Lot											
Capitalized right-to-use fees	Lines											

Vendor B

- *Baseline Software I* is for the purchase of generic software loads LEC002 – LEC017 in the Southwestern Bell and Pacific Bell regions.
- *Baseline Software II* is for the purchase of incremental software for loading NA008- NA012 for the entire SBC territory.
- *Service Ready* elements include core processors, memory cards, PCL gating hardware, engineering start-ups, installation start-ups, load insertions, technical support, software maintenance and query tool (SMQT) and documentation.
- *SPM spare* is spare capacity for SuperNode Peripheral Modules.
- *SDMs 4MB base* are SuperNode Data Manager equipment with 4MB of memory.
- *SDMs 8MB upgrade* is an upgrade to the SDM 4MB base, which increases the memory capacity to 8MB.
- *ENET upgrade* is an upgrade to the Enhanced Network.
- *RLCM to RSC-S conversion* is an upgrade from a Remote Line Concentrating Module to a Remote Switching Center-S.
- *RSC to RSC-C conversion* is an upgrade from a Remote Switching Center to a Remote Switching Center-C.
- *RLCM to dual RSC-S conversion* is an upgrade from a Remote Line Concentrating Module to a dual Remote Switching Center-S.
- *Dual RSC to dual RSC-S conversion* is an upgrade from a dual Remote Switching Center to a dual Remote Switching Center-S.
- *Discounts* are credits applied to the purchase of hardware.

Vendor C

- *113C Processors* are upgrades to host office processors.
- *Upgrades to Switching Networks* are generic hardware and software upgrades.

3.1.4 Input-Demand

SICAT requires demand forecasts for lines, trunks and other volumes that determine switch capacity additions and costs over the five-year planning period. The planning period is assumed to begin on ************. Figures 3.4, 3.5 and 3.6 illustrate demand data required for Vendor A, Vendor B and Vendor C.

Figure 3.4

Microsoft Excel - SICAT - ABC 3.0 Vendor Generic 10-16-01

Input - Vendor A Demand Forecast

Item	Contract Year Quantities 1	2	3	4	5
End office switches					
Analog replacements (AESS-R) - lines					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
Growth of existing offices					
Lines					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
Trunks					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
New end offices					
Switches					
Southwestern Bell Telephone	-	-	1	-	-
Pacific Bell	-	-	1	-	-
Nevada Bell	-	-	1	-	-
Southern New England Telephone	-	-	1	-	-
Ameritech	-	-	1	-	-
Lines					
Southwestern Bell Telephone	-	-	35,000	-	-
Pacific Bell	-	-	35,000	-	-
Nevada Bell	-	-	35,000	-	-
Southern New England Telephone	-	-	35,000	-	-
Ameritech	-	-	35,000	-	-
Buyout lines - SBC Total					
Analog lines	-	-	25,000	-	-
Digital lines	-	-	25,000	-	-
Digital trunks	-	-	25,000	-	-

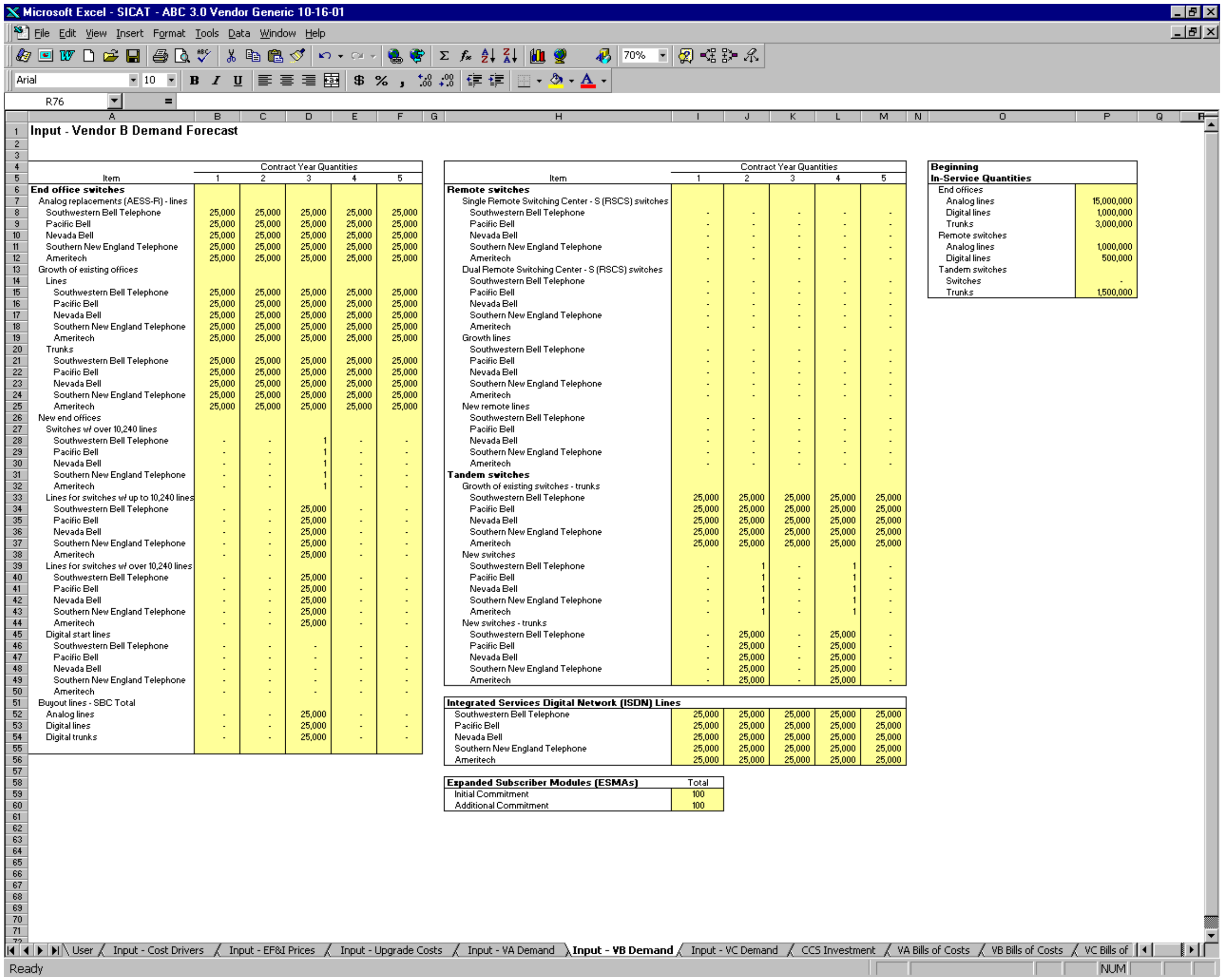
Item	Contract Year Quantities 1	2	3	4	5
Remote switches					
Growth lines					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
New Switches					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
New Lines					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
Tandem switches					
Growth of existing switches - trunks					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
New switches					
Southwestern Bell Telephone	-	1	-	1	-
Pacific Bell	-	1	-	1	-
Nevada Bell	-	1	-	1	-
Southern New England Telephone	-	1	-	1	-
Ameritech	-	1	-	1	-
New switches - trunks					
Southwestern Bell Telephone	-	25,000	-	25,000	-
Pacific Bell	-	25,000	-	25,000	-
Nevada Bell	-	25,000	-	25,000	-
Southern New England Telephone	-	25,000	-	25,000	-
Ameritech	-	25,000	-	25,000	-

Integrated Services Digital Network (ISDN) Lines					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000

Beginning In-Service Quantities	
End offices (incl. Remotes)	
Analog lines	15,000,000
Digital lines	1,000,000
Trunks	3,000,000
Tandem switches	
Switches	100
Trunks	1,500,000

User / Input - Cost Drivers / Input - EF&I Prices / Input - Upgrade Costs / **Input - VA Demand** / Input - VB Demand / Input - VC Demand / CCS Investment / VA Bills of Costs / VB Bills of Costs / VC Bills of

Figure 3.5



Item	Contract Year Quantities 1	2	3	4	5
End office switches					
Analog replacements (AESS-R) - lines					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
Growth of existing offices					
Lines					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
Trunks					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
New end offices					
Switches w/ over 10,240 lines					
Southwestern Bell Telephone	-	-	1	-	-
Pacific Bell	-	-	1	-	-
Nevada Bell	-	-	1	-	-
Southern New England Telephone	-	-	1	-	-
Ameritech	-	-	1	-	-
Lines for switches w/ up to 10,240 lines					
Southwestern Bell Telephone	-	-	25,000	-	-
Pacific Bell	-	-	25,000	-	-
Nevada Bell	-	-	25,000	-	-
Southern New England Telephone	-	-	25,000	-	-
Ameritech	-	-	25,000	-	-
Lines for switches w/ over 10,240 lines					
Southwestern Bell Telephone	-	-	25,000	-	-
Pacific Bell	-	-	25,000	-	-
Nevada Bell	-	-	25,000	-	-
Southern New England Telephone	-	-	25,000	-	-
Ameritech	-	-	25,000	-	-
Digital start lines					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
Buyout lines - SBC Total					
Analog lines	-	-	25,000	-	-
Digital lines	-	-	25,000	-	-
Digital trunks	-	-	25,000	-	-

Item	Contract Year Quantities 1	2	3	4	5
Remote switches					
Single Remote Switching Center - S (RSCS) switches					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
Dual Remote Switching Center - S (RSCS) switches					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
Growth lines					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
New remote lines					
Southwestern Bell Telephone	-	-	-	-	-
Pacific Bell	-	-	-	-	-
Nevada Bell	-	-	-	-	-
Southern New England Telephone	-	-	-	-	-
Ameritech	-	-	-	-	-
Tandem switches					
Growth of existing switches - trunks					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000
New switches					
Southwestern Bell Telephone	-	1	-	1	-
Pacific Bell	-	1	-	1	-
Nevada Bell	-	1	-	1	-
Southern New England Telephone	-	1	-	1	-
Ameritech	-	1	-	1	-
New switches - trunks					
Southwestern Bell Telephone	-	25,000	-	25,000	-
Pacific Bell	-	25,000	-	25,000	-
Nevada Bell	-	25,000	-	25,000	-
Southern New England Telephone	-	25,000	-	25,000	-
Ameritech	-	25,000	-	25,000	-

Integrated Services Digital Network (ISDN) Lines					
Southwestern Bell Telephone	25,000	25,000	25,000	25,000	25,000
Pacific Bell	25,000	25,000	25,000	25,000	25,000
Nevada Bell	25,000	25,000	25,000	25,000	25,000
Southern New England Telephone	25,000	25,000	25,000	25,000	25,000
Ameritech	25,000	25,000	25,000	25,000	25,000

Expanded Subscriber Modules (ESMAs)	Total
Initial Commitment	100
Additional Commitment	100

Beginning In-Service Quantities	
End offices	
Analog lines	15,000,000
Digital lines	1,000,000
Trunks	3,000,000
Remote switches	
Analog lines	1,000,000
Digital lines	500,000
Tandem switches	
Switches	-
Trunks	1,500,000

Figure 3.6

Microsoft Excel - SICAT - ABC 3.0 Vendor Generic 10-16-01

Input - Vendor C Demand Forecast

Item	Contract Year Quantities 1	2	3	4	5
End office switches					
Replacement & new end offices					
Switches					
Southwestern Bell Telephone	-	-	1	-	-
Pacific Bell	-	-	1	-	-
Nevada Bell	-	-	1	-	-
Southern New England Telephone	-	-	1	-	-
Ameritech	-	-	1	-	-
Lines on first seven switches					
Southwestern Bell Telephone	-	-	1,000	-	-
Pacific Bell	-	-	1,000	-	-
Nevada Bell	-	-	1,000	-	-
Southern New England Telephone	-	-	1,000	-	-
Ameritech	-	-	1,000	-	-
Next 50,000 lines					
Southwestern Bell Telephone	-	-	1,000	-	-
Pacific Bell	-	-	1,000	-	-
Nevada Bell	-	-	1,000	-	-
Southern New England Telephone	-	-	1,000	-	-
Ameritech	-	-	1,000	-	-
Additional lines					
Southwestern Bell Telephone	-	-	25,000	-	-
Pacific Bell	-	-	25,000	-	-
Nevada Bell	-	-	25,000	-	-
Southern New England Telephone	-	-	25,000	-	-
Ameritech	-	-	25,000	-	-
Trunks					
Southwestern Bell Telephone	-	-	10,000	-	-
Pacific Bell	-	-	10,000	-	-
Nevada Bell	-	-	10,000	-	-
Southern New England Telephone	-	-	10,000	-	-
Ameritech	-	-	10,000	-	-

Item	Contract Year Quantities 1	2	3	4	5
End office switches (continued)					
Growth of existing offices					
Analog lines					
Southwestern Bell Telephone	-	-	25,000	25,000	25,000
Pacific Bell	-	-	25,000	25,000	25,000
Nevada Bell	-	-	25,000	25,000	25,000
Southern New England Telephone	-	-	25,000	25,000	25,000
Ameritech	-	-	25,000	25,000	25,000
Digital lines					
Southwestern Bell Telephone	-	-	5,000	5,000	5,000
Pacific Bell	-	-	5,000	5,000	5,000
Nevada Bell	-	-	5,000	5,000	5,000
Southern New England Telephone	-	-	5,000	5,000	5,000
Ameritech	-	-	5,000	5,000	5,000
Trunks					
Southwestern Bell Telephone	-	-	5,000	5,000	5,000
Pacific Bell	-	-	5,000	5,000	5,000
Nevada Bell	-	-	5,000	5,000	5,000
Southern New England Telephone	-	-	5,000	5,000	5,000
Ameritech	-	-	5,000	5,000	5,000
Buyout lines - SBC Total					
Analog lines	-	-	5,000	-	-
Digital lines	-	-	5,000	-	-
Digital trunks	-	-	5,000	-	-

Integrated Services Digital Network (ISDN) Lines					
Southwestern Bell Telephone	1,000	1,000	1,000	1,000	1,000
Pacific Bell	1,000	1,000	1,000	1,000	1,000
Nevada Bell	1,000	1,000	1,000	1,000	1,000
Southern New England Telephone	1,000	1,000	1,000	1,000	1,000
Ameritech	1,000	1,000	1,000	1,000	1,000

Beginning In-Service Quantities	
End offices (incl. Remotes)	
Analog lines	5,000,000
Digital lines	1,000,000
Trunks	500,000

User / Input - Cost Drivers / Input - EF&I Prices / Input - Upgrade Costs / Input - VA Demand / Input - VB Demand / **Input - VC Demand** / CCS Investment / VA Bills of Costs / VB Bills of Costs / VC Bills of

Ready NUM

Forecasts of demand are provided for each SBC operating company. SICAT totals these forecasts and uses the company-wide demand in developing the switch bills of costs. Quantities are at contract year-end. A contract year runs from ********************.

Vendor A demand forecasts.

- Annual line additions are provided for 1A ESS replacements, growth in existing switches, new switches and buyouts of capacity, ready but not yet in service. Growth trunk additions and buyout trunks are separately forecast. Replacement and new trunks will be computed from the line additions based on the line to trunk ratio.

- The forecast also includes any new switches expected during the planning period. In the example, there are no Vendor A remote additions.

- Also note there is no separate digital line forecast for switch replacements, growth or new switches. Analog and digital lines are included in the forecast shown. SICAT applies the proportions of analog and digital lines at the beginning of the planning period to line additions to derive analog and digital lines. The only digital lines explicitly identified in the Vendor A forecast are for buyout lines.

- Similar forecasts are required for growth in existing tandem trunks and new tandem switches and trunks.

- Finally, the Vendor A forecasts include annual quantities of ISDN line additions and beginning in-service quantities. The ISDN line additions are required in the feature investment bill of costs. Beginning in-service quantities are used in apportioning network upgrade and software costs between the installed base of lines and future line additions.

Vendor B demand forecasts.

The demand forecast requirements for Vendor B switches are basically the same as those for Vendor A. It should be noted that the replacement, growth and new line additions are for both analog and digital lines. SICAT applies the proportions of analog and digital lines at the beginning of the planning period to line additions to derive analog and digital lines.

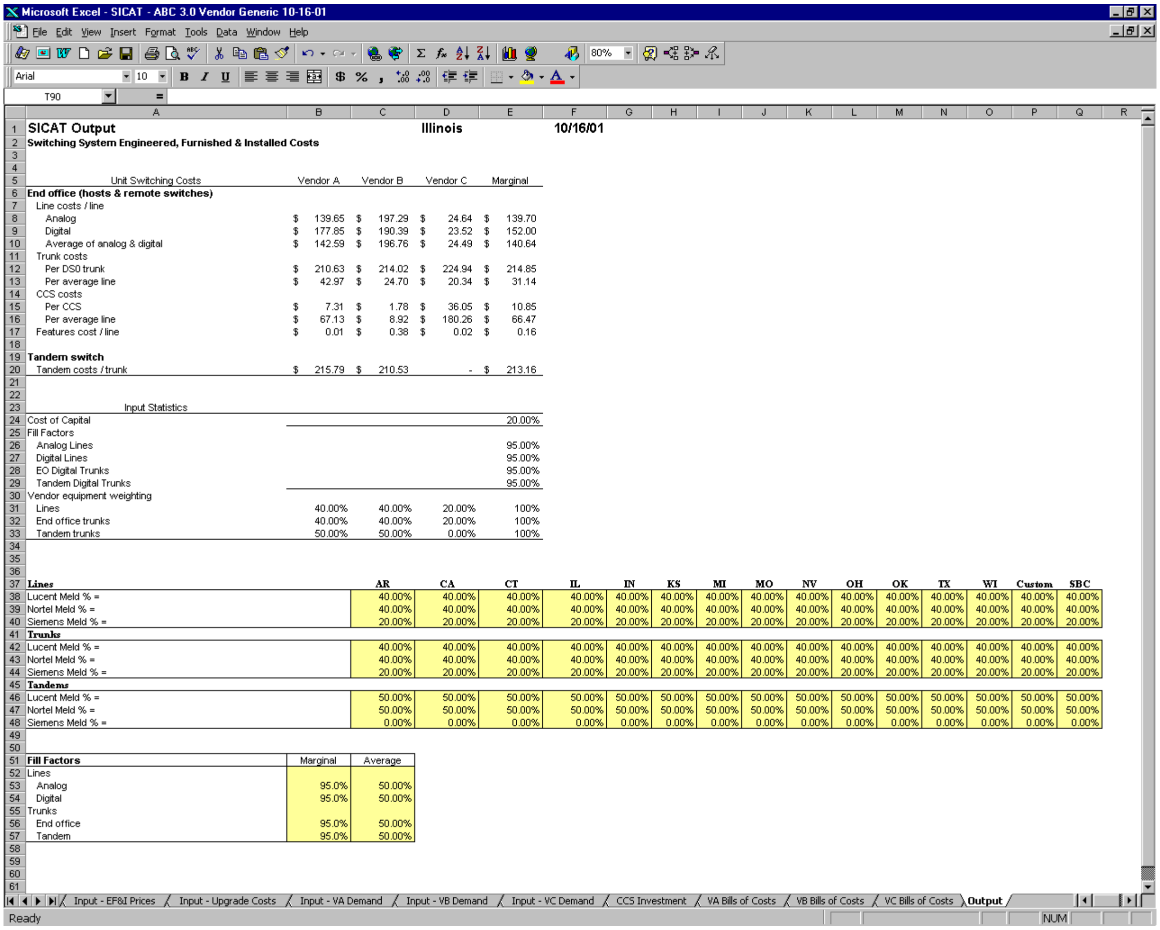
Vendor C demand forecasts.

The demand forecast requirements for Vendor C switches are basically the same as those for Vendor A and Vendor B. However, SICAT does not require Vendor C tandem or remote data.

3.2 SICAT Output

SICAT provides nine switching system *unit investments* for each of the vendors. In addition, average unit investments are computed based upon vendor equipment weightings specific to a state. These results are illustrated in Figure 3.7.

Figure 3.7



SICAT Output Illinois 10/16/01

Switching System Engineered, Furnished & Installed Costs

Unit Switching Costs	Vendor A	Vendor B	Vendor C	Marginal
End office (hosts & remote switches)				
Line costs / line				
Analog	$ 139.65	$ 197.29	$ 24.64	$ 139.70
Digital	$ 177.85	$ 190.39	$ 23.52	$ 152.00
Average of analog & digital	$ 142.59	$ 196.76	$ 24.49	$ 140.64
Trunk costs				
Per DS0 trunk	$ 210.63	$ 214.02	$ 224.94	$ 214.85
Per average line	$ 42.97	$ 24.70	$ 20.34	$ 31.14
CCS costs				
Per CCS	$ 7.31	$ 1.78	$ 36.05	$ 10.85
Per average line	$ 67.13	$ 8.92	$ 180.26	$ 66.47
Features cost / line	$ 0.01	$ 0.38	$ 0.02	$ 0.16
Tandem switch				
Tandem costs / trunk	$ 215.79	$ 210.53	-	$ 213.16

Input Statistics				
Cost of Capital				20.00%
Fill Factors				
Analog Lines				95.00%
Digital Lines				95.00%
EO Digital Trunks				95.00%
Tandem Digital Trunks				95.00%
Vendor equipment weighting				
Lines	40.00%	40.00%	20.00%	100%
End office trunks	40.00%	40.00%	20.00%	100%
Tandem trunks	50.00%	50.00%	0.00%	100%

Lines	AR	CA	CT	IL	IN	KS	MI	MO	NV	OH	OK	TX	WI	Custom	SBC
Lucent Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Nortel Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Siemens Meld % =	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Trunks															
Lucent Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Nortel Meld % =	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
Siemens Meld % =	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Tandems															
Lucent Meld % =	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
Nortel Meld % =	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
Siemens Meld % =	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Fill Factors	Marginal	Average
Lines		
Analog	95.0%	50.00%
Digital	95.0%	50.00%
Trunks		
End office	95.0%	50.00%
Tandem	95.0%	50.00%

- *Analog and digital costs per line* are the amounts of switch investment attributable to terminating access lines. The investments are used in developing wholesale prices for switch ports and in computing the costs of retail services requiring line terminations, such local telephone services. An *average cost for analog and digital lines* also is provided.

- *End office trunk costs per trunk and average line* represent the portion of switching investment attributable to trunk equipment providing interoffice transport. End office trunk investments are used in cost studies for retail services requiring switched, interoffice transport. These include local telephone services, toll and 800 services and others.

- *CCS costs per CCS and average line* represent the switching system investment attributable to processing call attempts and providing call paths among lines and trunks. The investment per CCS is used in all cost studies for retail services requiring end office and remote switch usage.

- *Feature costs per line* are the capitalized costs of feature right-to-use fees expressed per line.

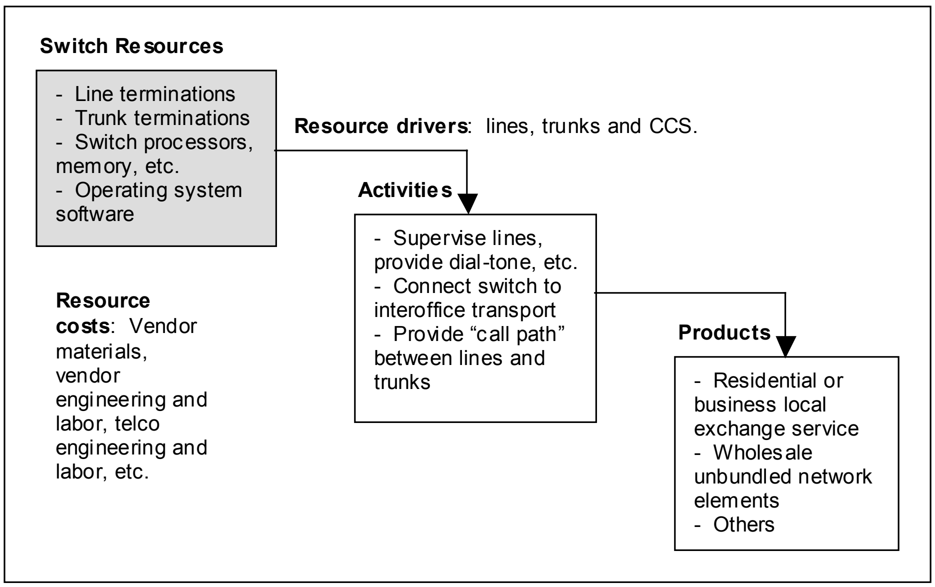
- *Tandem costs per trunk* equal the forward-looking investment in tandem switching per trunk. Tandem investments are used in wholesale and retail product cost studies in which transport via tandem switches is required. This includes local services, toll and 800 services and others.

4.0 Description of SICAT Methodology

SICAT computes switch unit investments using *activity-based costing*.[12] The tool also reflects *forward-looking, incremental costs*.

Activity-based costing or ABC measures the costs of products by identifying the business activities necessary to provide products and determining the cost of these activities. Activity costs are measured based on the resources consumed in performing activities and the costs of the resources. Resources include plant, labor, etc. The ABC approach as it relates to switching systems is illustrated in Figure 4.1.

Figure 4.1



A product, such as residential local exchange service, requires certain activities performed by end office and tandem switching systems. These include supervising lines to detect call attempts, providing dial tone, connecting lines to other lines and trunks, etc. A switch consists of line terminating equipment, trunk equipment, processors and other resources that enable these activities or functions to be performed. As switch functions are performed resource capacity is consumed. There is a direct relationship between a product and switch resources consumed.

[12] Activity-based costing is a common cost accounting technique used in the telecommunications and other industries for product costing and cost management.

Switch resources, of course, have costs, including vendor EF&I charges, telco engineering and labor costs and others. When expressed as costs per unit of capacity, costs are attributable to activities and products that consume them.

SICAT focuses on the shaded box shown in Figure 4.1. The following sections describe the methods for computing unit investments per line, trunk, etc.

4.1 Bills of Costs

Switching costs are calculated in a series of "bills of costs," similar to a bill a consumer or business receives for purchased goods or services. The bill of costs summarizes vendor contract items, prices, quantities, and total costs each year of the planning period. Costs are summarized on separate bills for lines, trunks, call, and feature usage. Separate bills are provided for each vendor. The bills of costs also capture the costs of major hardware and software upgrades during the planning period necessary to keep switching systems up-to-date.

4.1.1 Investment Per Analog Line

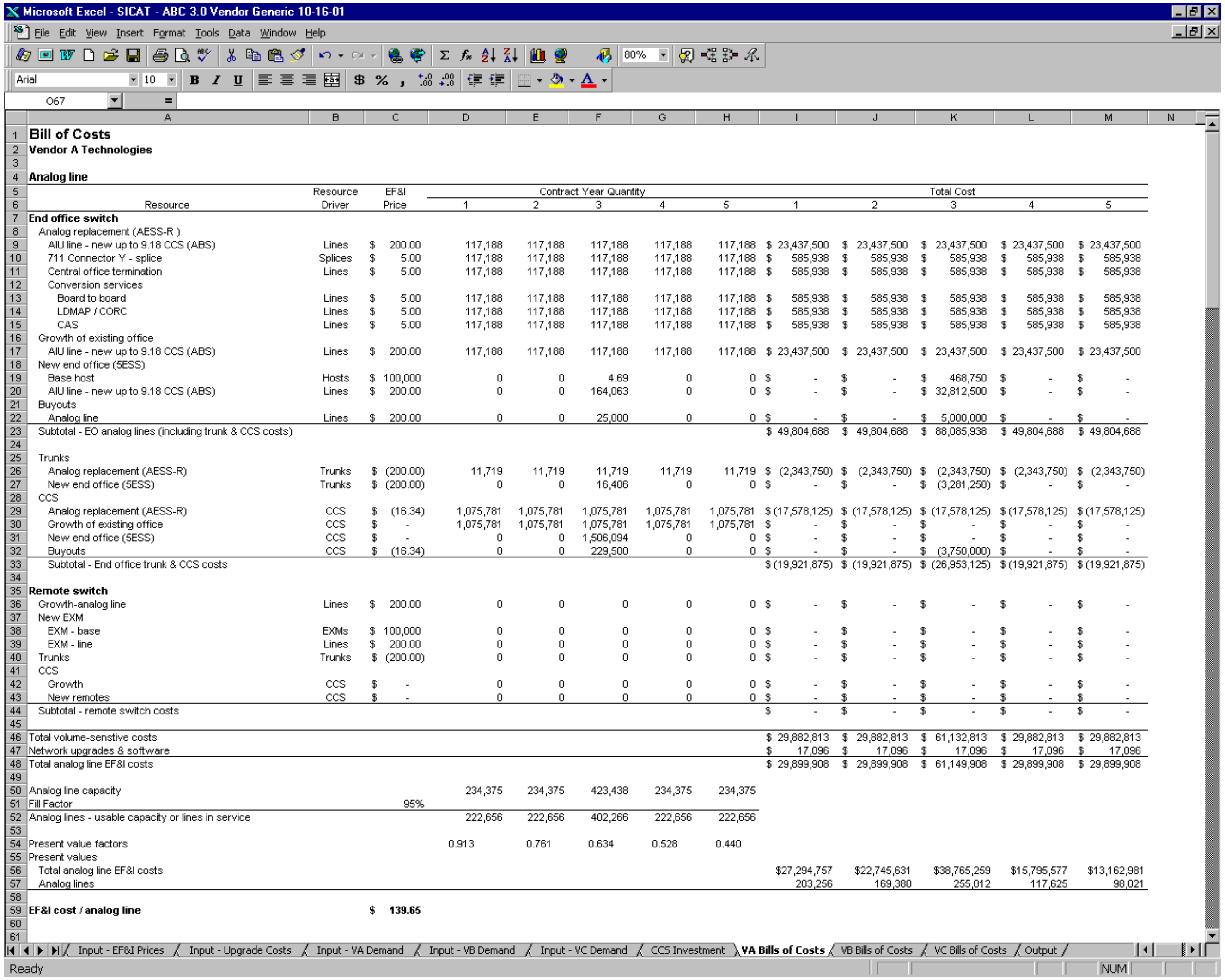
Figure 4.2 shows the bill of cost for the Vendor A analog line. Vendor price and demand forecast data are from SICAT Input spreadsheets. The bill tallies all EF&I charges associated with analog line additions over the planning period, and then computes the unit investment by dividing total EF&I costs by total analog lines. The bill also removes trunk and usage costs from the analog line charges.

The first column of the bill lists the switch resources SBC obtains from the vendor to provide for switch replacements, growth and new switches. These include access interface units, replacement and conversion services and others. These are identified in the switch contracts between SBC and the vendor. A resource driver is specified for each item. This is a measure of the quantity of the item to be purchased. The measure is defined in terms of the units actually specified in the vendor contract.

In the third column EF&I prices are shown. The values are taken from the Inputs – EF&I spreadsheet. They can be referenced to the vendor contract, as necessary.

The next five columns are the annual quantities of each contract item to be purchased. The values are the sum of the SBC regional quantities entered on the Input – Demand spreadsheets. These are the plant additions forecast by SBC's procurement organization at the time vendor contracts were negotiated. They are the same switch volumes used by the vendor in setting prices.

Figure 4.2



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Bill of Costs**												
2	**Vendor A Technologies**												
3													
4	**Analog line**												
5		Resource	EF&I	Contract Year Quantity					Total Cost				
6	Resource	Driver	Price	1	2	3	4	5	1	2	3	4	5
7	**End office switch**												
8	Analog replacement (AESS-R)												
9	AIU line - new up to 9.18 CCS (ABS)	Lines	$ 200.00	117,188	117,188	117,188	117,188	117,188	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500
10	711 Connector Y - splice	Splices	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
11	Central office termination	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
12	Conversion services												
13	Board to board	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
14	LDMAP / CORC	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
15	CAS	Lines	$ 5.00	117,188	117,188	117,188	117,188	117,188	$ 585,938	$ 585,938	$ 585,938	$ 585,938	$ 585,938
16	Growth of existing office												
17	AIU line - new up to 9.18 CCS (ABS)	Lines	$ 200.00	117,188	117,188	117,188	117,188	117,188	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500	$ 23,437,500
18	New end office (5ESS)												
19	Base host	Hosts	$ 100,000	0	0	4.69	0	0	$ -	$ -	$ 468,750	$ -	$ -
20	AIU line - new up to 9.18 CCS (ABS)	Lines	$ 200.00	0	0	164,063	0	0	$ -	$ -	$ 32,812,500	$ -	$ -
21	Buyouts												
22	Analog line	Lines	$ 200.00	0	0	25,000	0	0	$ -	$ -	$ 5,000,000	$ -	$ -
23	Subtotal - EO analog lines (including trunk & CCS costs)								$ 49,804,688	$ 49,804,688	$ 88,085,938	$ 49,804,688	$ 49,804,688
24													
25	Trunks												
26	Analog replacement (AESS-R)	Trunks	$ (200.00)	11,719	11,719	11,719	11,719	11,719	$ (2,343,750)	$ (2,343,750)	$ (2,343,750)	$ (2,343,750)	$ (2,343,750)
27	New end office (5ESS)	Trunks	$ (200.00)	0	0	16,406	0	0	$ -	$ -	$ (3,281,250)	$ -	$ -
28	CCS												
29	Analog replacement (AESS-R)	CCS	$ (16.34)	1,075,781	1,075,781	1,075,781	1,075,781	1,075,781	$ (17,578,125)	$ (17,578,125)	$ (17,578,125)	$ (17,578,125)	$ (17,578,125)
30	Growth of existing office	CCS	$ -	1,075,781	1,075,781	1,075,781	1,075,781	1,075,781	$ -	$ -	$ -	$ -	$ -
31	New end office (5ESS)	CCS	$ -	0	0	1,506,094	0	0	$ -	$ -	$ -	$ -	$ -
32	Buyouts	CCS	$ (16.34)	0	0	229,500	0	0	$ -	$ -	$ (3,750,000)	$ -	$ -
33	Subtotal - End office trunk & CCS costs								$ (19,921,875)	$ (19,921,875)	$ (26,953,125)	$ (19,921,875)	$ (19,921,875)
34													
35	**Remote switch**												
36	Growth-analog line	Lines	$ 200.00	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
37	New EXM												
38	EXM - base	EXMs	$ 100,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
39	EXM - line	Lines	$ 200.00	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
40	Trunks	Trunks	$ (200.00)	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
41	CCS												
42	Growth	CCS	$ -	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
43	New remotes	CCS	$ -	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
44	Subtotal - remote switch costs								$ -	$ -	$ -	$ -	$ -
45													
46	Total volume-senstive costs								$ 29,882,813	$ 29,882,813	$ 61,132,813	$ 29,882,813	$ 29,882,813
47	Network upgrades & software								$ 17,096	$ 17,096	$ 17,096	$ 17,096	$ 17,096
48	Total analog line EF&I costs								$ 29,899,908	$ 29,899,908	$ 61,149,908	$ 29,899,908	$ 29,899,908
49													
50	Analog line capacity			234,375	234,375	423,438	234,375	234,375					
51	Fill Factor		95%										
52	Analog lines - usable capacity or lines in service			222,656	222,656	402,266	222,656	222,656					
53													
54	Present value factors			0.913	0.761	0.634	0.528	0.440					
55	Present values												
56	Total analog line EF&I costs								$27,294,757	$22,745,631	$38,765,259	$15,795,577	$13,162,981
57	Analog lines								203,256	169,380	255,012	117,625	98,021
58													
59	**EF&I cost / analog line**		**$ 139.65**										
60													
61													

Some volume quantities, such as lines and new host and remote switches, are SICAT input values. Others are derived values based on cost drivers in the Input – Cost Drivers spreadsheet. For example, the number of Y-splices is calculated by applying 0 to the number of replacement lines. The number of replacement trunks is the line quantity divided by a 0:0 line to trunk ratio. Algorithms for computing annual contract item quantities are contained in cells of the spreadsheet.

It is important to note that the annual quantities represent total capacities to be purchased from the vendor. They are not engineered fills or in-service amounts. An adjustment is made at the bottom of the bill of costs to compute these quantities.

In the last five columns EF&I prices are applied to the annual resource quantities to compute total annual EF&I charges. About midway down the bill of costs, annual charges are summed *before removal of trunk and CCS costs*. These are amounts actually to be paid to the vendor. The charges cover not only switch line terminating equipment, but also trunks and switch usage-driven equipment. These costs must be removed to identify only switch costs attributable to line terminations.

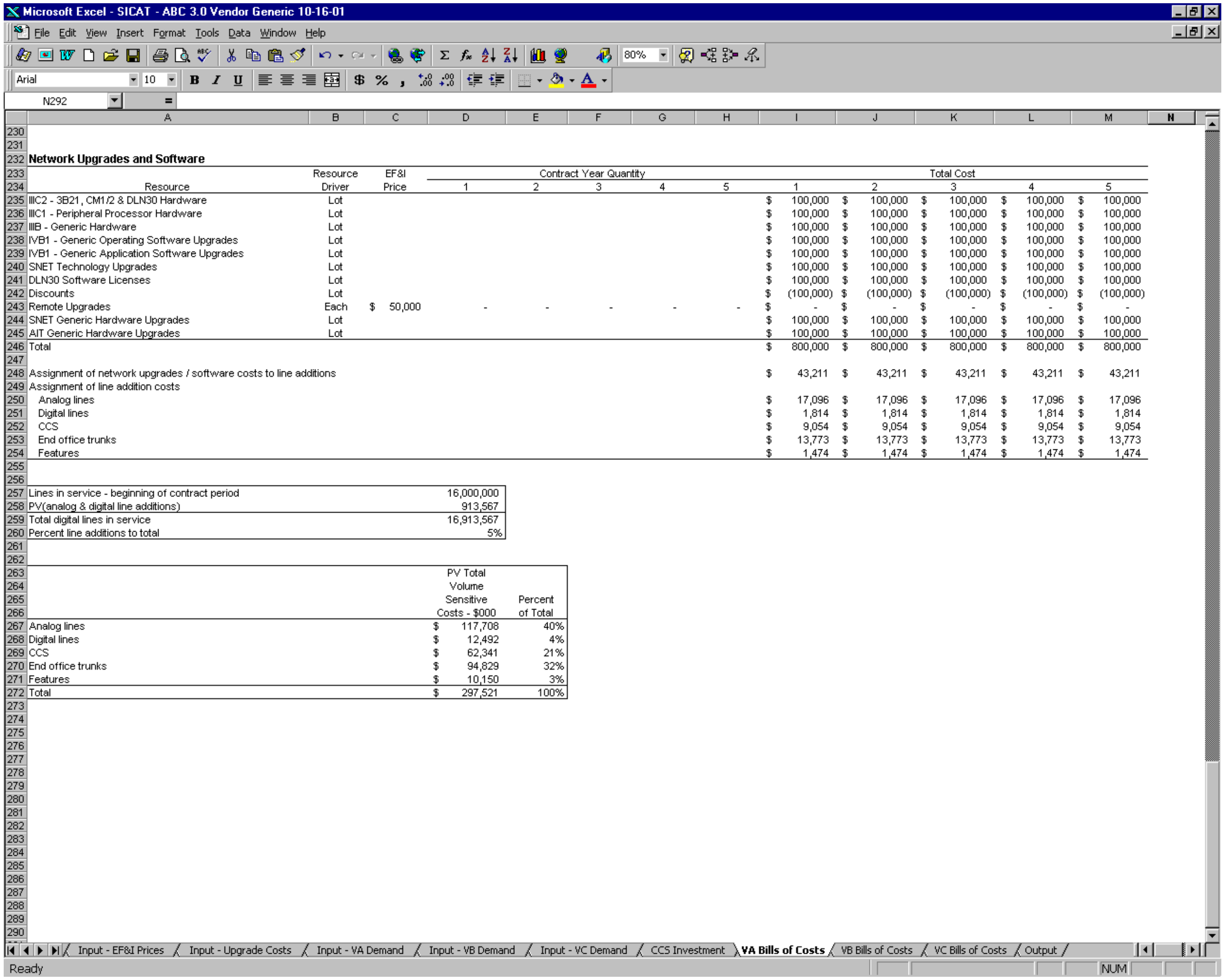
In the next section of the bill, trunk costs implicit in the line charges are computed. This is done by applying the appropriate price per trunk to the quantities of trunks for replacement and new switches. Since growth trunks are separately priced (and not covered by growth line charges), it is not necessary to remove growth trunk costs from the line EF&I charge.

Following the trunk cost adjustment are adjustments to remove switch costs for usage-related equipment. An incremental switch cost per CCS is applied to the CCS capacity provided by line additions each year of the planning period. The CCS cost is derived on the CCS Investment spreadsheet and is described in Section 4.2. The CCS capacity figures equal the product of line additions and the amount of usage or CCS for switches configured for a basic level of usage. For Vendor A, the basic usage level is 9.18 CCS per line.

After these adjustments, analog line EF&I charges are totaled for end office and remote switches. To this point, all costs are sensitive to volume forecasts. In the next step, the portion of volume insensitive, network upgrade and software costs are added. The amount attributed to analog lines is computed at the bottom of the LU Bill of Costs spreadsheet. The calculations are shown in Figure 4.3.

Network upgrade and software costs are summarized by year of the planning period. The costs are apportioned between the installed base of lines in service at the beginning of the planning period and future line additions. Then, upgrade costs attributed to future line additions are assigned to lines, trunks, CCS and features in proportion to their volume sensitive costs. In the example, 0% of lines are future additions, and 0% of volume sensitive switch costs are attributable to analog lines. Therefore, ten percent of upgrade costs are assigned to analog lines.

Figure 4.3



Network Upgrades and Software

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
IIIC2 - 3B21, CM1/2 & DLN30 Hardware	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IIIC1 - Peripheral Processor Hardware	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IIIB - Generic Hardware	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IVB1 - Generic Operating Software Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
IVB1 - Generic Application Software Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
SNET Technology Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
DLN30 Software Licenses	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Discounts	Lot							$ (100,000)	$ (100,000)	$ (100,000)	$ (100,000)	$ (100,000)
Remote Upgrades	Each	$ 50,000	-	-	-	-	-	$ -	$ -	$ -	$ -	$ -
SNET Generic Hardware Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
AIT Generic Hardware Upgrades	Lot							$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
Total								$ 800,000	$ 800,000	$ 800,000	$ 800,000	$ 800,000
Assignment of network upgrades / software costs to line additions								$ 43,211	$ 43,211	$ 43,211	$ 43,211	$ 43,211
Assignment of line addition costs												
Analog lines								$ 17,096	$ 17,096	$ 17,096	$ 17,096	$ 17,096
Digital lines								$ 1,814	$ 1,814	$ 1,814	$ 1,814	$ 1,814
CCS								$ 9,054	$ 9,054	$ 9,054	$ 9,054	$ 9,054
End office trunks								$ 13,773	$ 13,773	$ 13,773	$ 13,773	$ 13,773
Features								$ 1,474	$ 1,474	$ 1,474	$ 1,474	$ 1,474

Lines in service - beginning of contract period	16,000,000
PV(analog & digital line additions)	913,567
Total digital lines in service	16,913,567
Percent line additions to total	5%

	PV Total Volume Sensitive Costs - $000	Percent of Total
Analog lines	$ 117,708	40%
Digital lines	$ 12,492	4%
CCS	$ 62,341	21%
End office trunks	$ 94,829	32%
Features	$ 10,150	3%
Total	$ 297,521	100%

Returning to the bill of costs, the next step is to compute the present value of the total analog line costs and the present value of analog line additions. First, line additions must be adjusted for spare capacity.

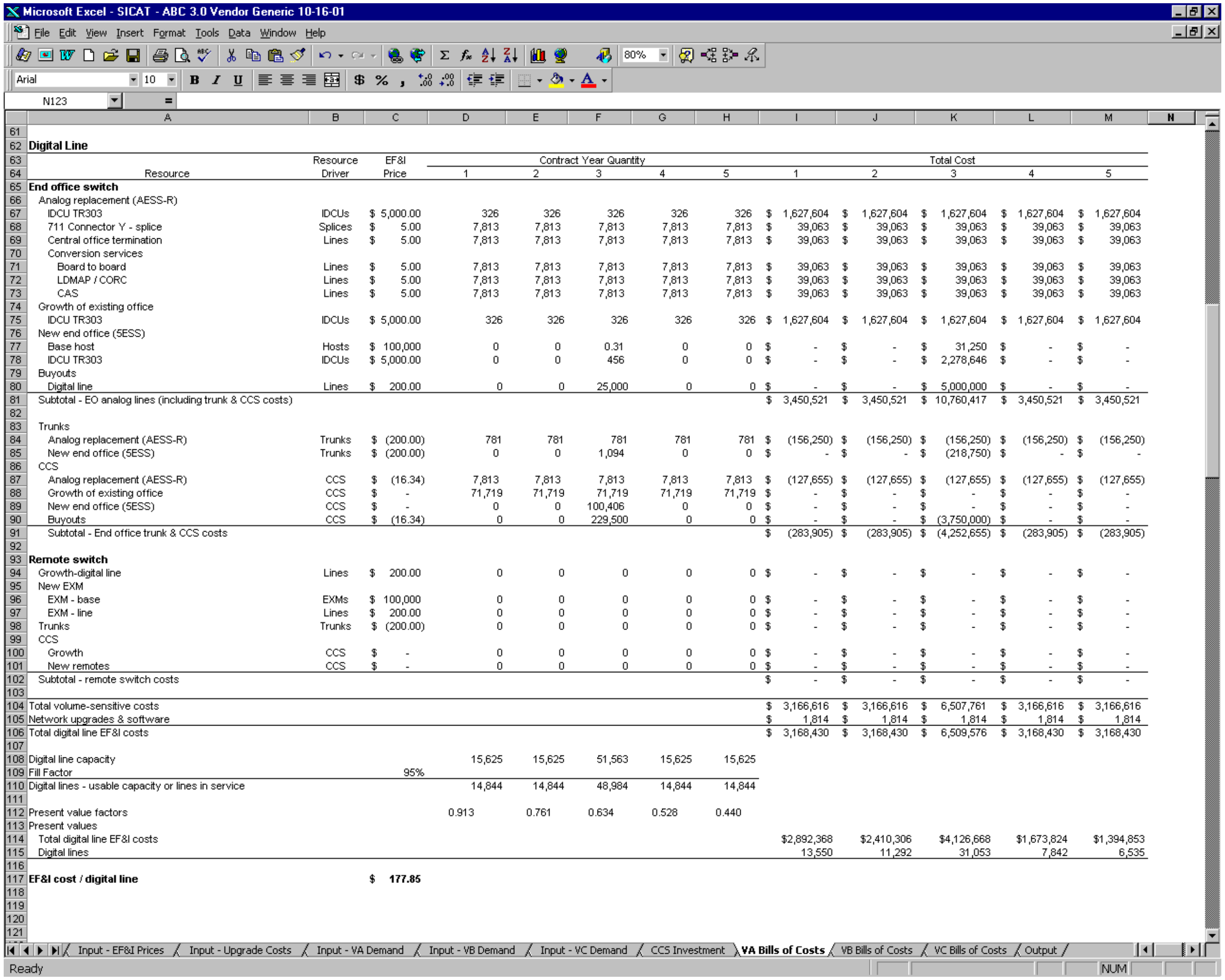
If a marginal cost per line is to be computed, the fill factor is set at engineering fill. In the example, engineering fill of 0% for analog line terminating equipment is used. If an average EF&I cost per line is to be computed, the fill factor is set at the forward-looking average utilization. The fill factor is applied to analog line capacity to determine the usable capacity of analog lines.

In the last step, the bill of costs computes the EF&I cost per analog line by dividing the sum of the present values of annual costs by the sum of the present values of analog lines. This completes the calculations for the Vendor A analog line unit investment. The bills of costs for Vendor B and Vendor C analog lines are similar to that of Vendor A.

4.1.2 Investment Per Digital Line

Figure 4.4 shows the bill of costs for the Vendor A digital line. The layout is the same as analog lines. Note that the key contract item for the Vendor A digital line is the Integrated Digital Carrier Unit (IDCU). This device provides an integrated DS1 termination on the switch. The quantities of IDCUs are computed by dividing the growth digital line forecast by the DS0s per DS1 ratio in the Input – Cost Drivers spreadsheet. This determines the number of IDCUs to be purchased for growth in digital lines during the planning period. The bills of costs for Vendor B and Vendor C analog lines are similar to that of Vendor A.

Figure 4.4



Digital Line

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
End office switch												
Analog replacement (AESS-R)												
IDCU TR303	IDCUs	$ 5,000.00	326	326	326	326	326	$ 1,627,604	$ 1,627,604	$ 1,627,604	$ 1,627,604	$ 1,627,604
711 Connector Y - splice	Splices	$ 5.00	7,813	7,813	7,813	7,813	7,813	$ 39,063	$ 39,063	$ 39,063	$ 39,063	$ 39,063
Central office termination	Lines	$ 5.00	7,813	7,813	7,813	7,813	7,813	$ 39,063	$ 39,063	$ 39,063	$ 39,063	$ 39,063
Conversion services												
Board to board	Lines	$ 5.00	7,813	7,813	7,813	7,813	7,813	$ 39,063	$ 39,063	$ 39,063	$ 39,063	$ 39,063
LDMAP / CORC	Lines	$ 5.00	7,813	7,813	7,813	7,813	7,813	$ 39,063	$ 39,063	$ 39,063	$ 39,063	$ 39,063
CAS	Lines	$ 5.00	7,813	7,813	7,813	7,813	7,813	$ 39,063	$ 39,063	$ 39,063	$ 39,063	$ 39,063
Growth of existing office												
IDCU TR303	IDCUs	$ 5,000.00	326	326	326	326	326	$ 1,627,604	$ 1,627,604	$ 1,627,604	$ 1,627,604	$ 1,627,604
New end office (5ESS)												
Base host	Hosts	$ 100,000	0	0	0.31	0	0	$ -	$ -	$ 31,250	$ -	$ -
IDCU TR303	IDCUs	$ 5,000.00	0	0	456	0	0	$ -	$ -	$ 2,278,646	$ -	$ -
Buyouts												
Digital line	Lines	$ 200.00	0	0	25,000	0	0	$ -	$ -	$ 5,000,000	$ -	$ -
Subtotal - EO analog lines (including trunk & CCS costs)								$ 3,450,521	$ 3,450,521	$ 10,760,417	$ 3,450,521	$ 3,450,521
Trunks												
Analog replacement (AESS-R)	Trunks	$ (200.00)	781	781	781	781	781	$ (156,250)	$ (156,250)	$ (156,250)	$ (156,250)	$ (156,250)
New end office (5ESS)	Trunks	$ (200.00)	0	0	1,094	0	0	$ -	$ -	$ (218,750)	$ -	$ -
CCS												
Analog replacement (AESS-R)	CCS	$ (16.34)	7,813	7,813	7,813	7,813	7,813	$ (127,655)	$ (127,655)	$ (127,655)	$ (127,655)	$ (127,655)
Growth of existing office	CCS	$ -	71,719	71,719	71,719	71,719	71,719	$ -	$ -	$ -	$ -	$ -
New end office (5ESS)	CCS	$ -	0	0	100,406	0	0	$ -	$ -	$ -	$ -	$ -
Buyouts	CCS	$ (16.34)	0	0	229,500	0	0	$ -	$ -	$ (3,750,000)	$ -	$ -
Subtotal - End office trunk & CCS costs								$ (283,905)	$ (283,905)	$ (4,252,655)	$ (283,905)	$ (283,905)
Remote switch												
Growth-digital line	Lines	$ 200.00	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
New EXM												
EXM - base	EXMs	$ 100,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
EXM - line	Lines	$ 200.00	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
Trunks	Trunks	$ (200.00)	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
CCS												
Growth	CCS	$ -	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
New remotes	CCS	$ -	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
Subtotal - remote switch costs								$ -	$ -	$ -	$ -	$ -
Total volume-sensitive costs								$ 3,166,616	$ 3,166,616	$ 6,507,761	$ 3,166,616	$ 3,166,616
Network upgrades & software								$ 1,814	$ 1,814	$ 1,814	$ 1,814	$ 1,814
Total digital line EF&I costs								$ 3,168,430	$ 3,168,430	$ 6,509,576	$ 3,168,430	$ 3,168,430
Digital line capacity			15,625	15,625	51,563	15,625	15,625					
Fill Factor		95%										
Digital lines - usable capacity or lines in service			14,844	14,844	48,984	14,844	14,844					
Present value factors			0.913	0.761	0.634	0.528	0.440					
Present values												
Total digital line EF&I costs								$2,892,368	$2,410,306	$4,126,668	$1,673,824	$1,394,853
Digital lines								13,550	11,292	31,053	7,842	6,535
EF&I cost / digital line		**$ 177.85**										

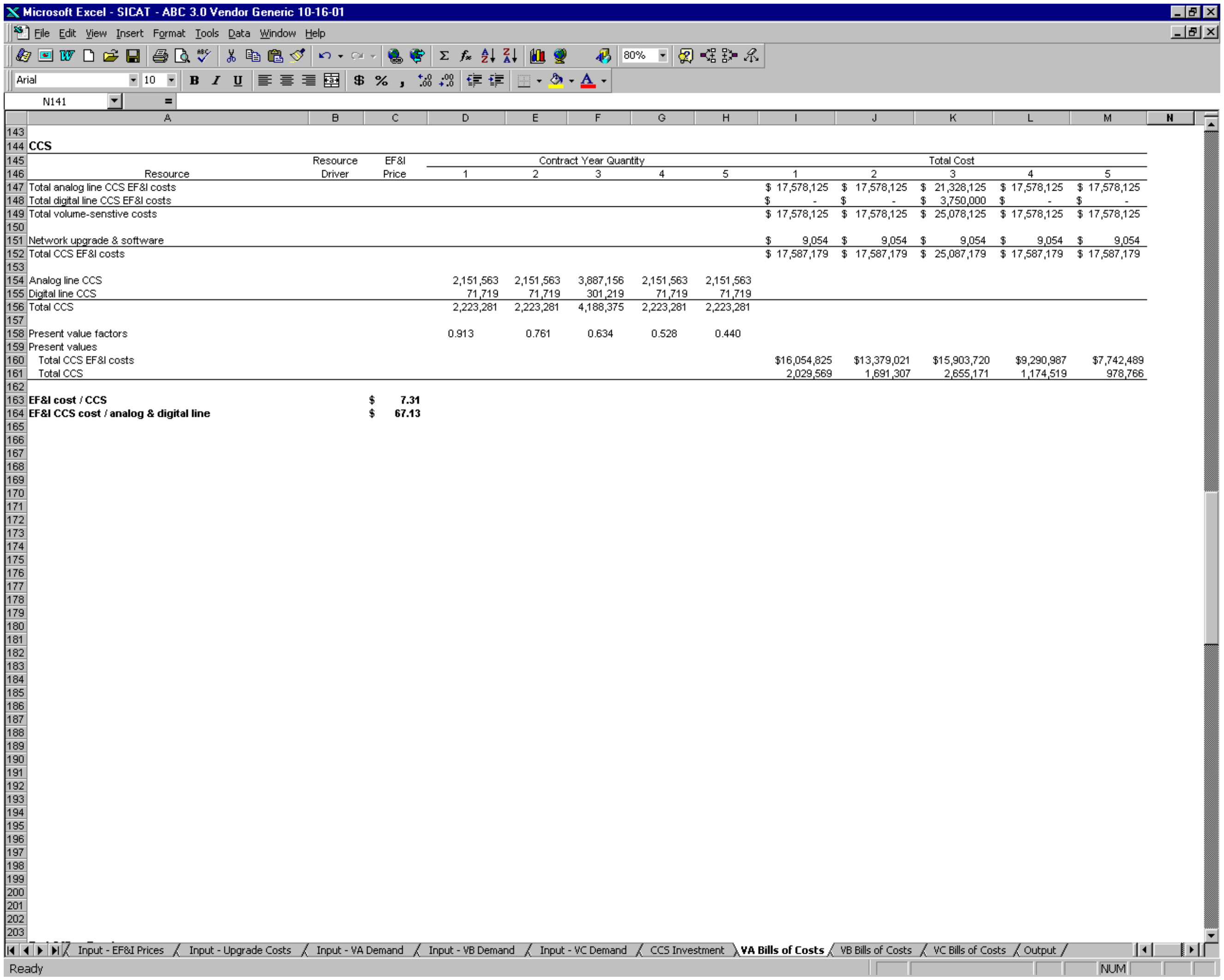
4.1.3 Average Investment Per Analog and Digital Line

SICAT computes an average investment per line reflecting a blend or weighting of the analog and digital line costs. An abbreviated bill of costs is used for this calculation. The average or blended investment per line is used in cost studies for services in which access is provided via analog and digital lines.

4.1.4 CCS Investment Per Line and Per CCS

Once CCS or usage-related costs have been removed from analog and digital line costs, they are carried to a separate bill of costs where the CCS investment per line and per CCS are calculated. The calculation is straightforward. To convert the investment per CCS to an investment per line, the investment per CCS is multiplied times the basic CCS per line. The Vendor A EF&I costs per CCS and line is shown in Figure 4.5.

Figure 4.5



CCS

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
Total analog line CCS EF&I costs								$ 17,578,125	$ 17,578,125	$ 21,328,125	$ 17,578,125	$ 17,578,125
Total digital line CCS EF&I costs								$ -	$ -	$ 3,750,000	$ -	$ -
Total volume-senstive costs								$ 17,578,125	$ 17,578,125	$ 25,078,125	$ 17,578,125	$ 17,578,125
Network upgrade & software								$ 9,054	$ 9,054	$ 9,054	$ 9,054	$ 9,054
Total CCS EF&I costs								$ 17,587,179	$ 17,587,179	$ 25,087,179	$ 17,587,179	$ 17,587,179
Analog line CCS			2,151,563	2,151,563	3,887,156	2,151,563	2,151,563					
Digital line CCS			71,719	71,719	301,219	71,719	71,719					
Total CCS			2,223,281	2,223,281	4,188,375	2,223,281	2,223,281					
Present value factors			0.913	0.761	0.634	0.528	0.440					
Present values												
Total CCS EF&I costs								$16,054,825	$13,379,021	$15,903,720	$9,290,987	$7,742,489
Total CCS								2,029,569	1,691,307	2,655,171	1,174,519	978,766
EF&I cost / CCS		**$ 7.31**										
EF&I CCS cost / analog & digital line		**$ 67.13**										

4.1.5 Investment Per End Office Trunk and Tandem Trunk

Figure 4.6 shows the bills of costs for Vendor A end office and tandem trunks. The methodology follows the same approach described for lines and CCS.

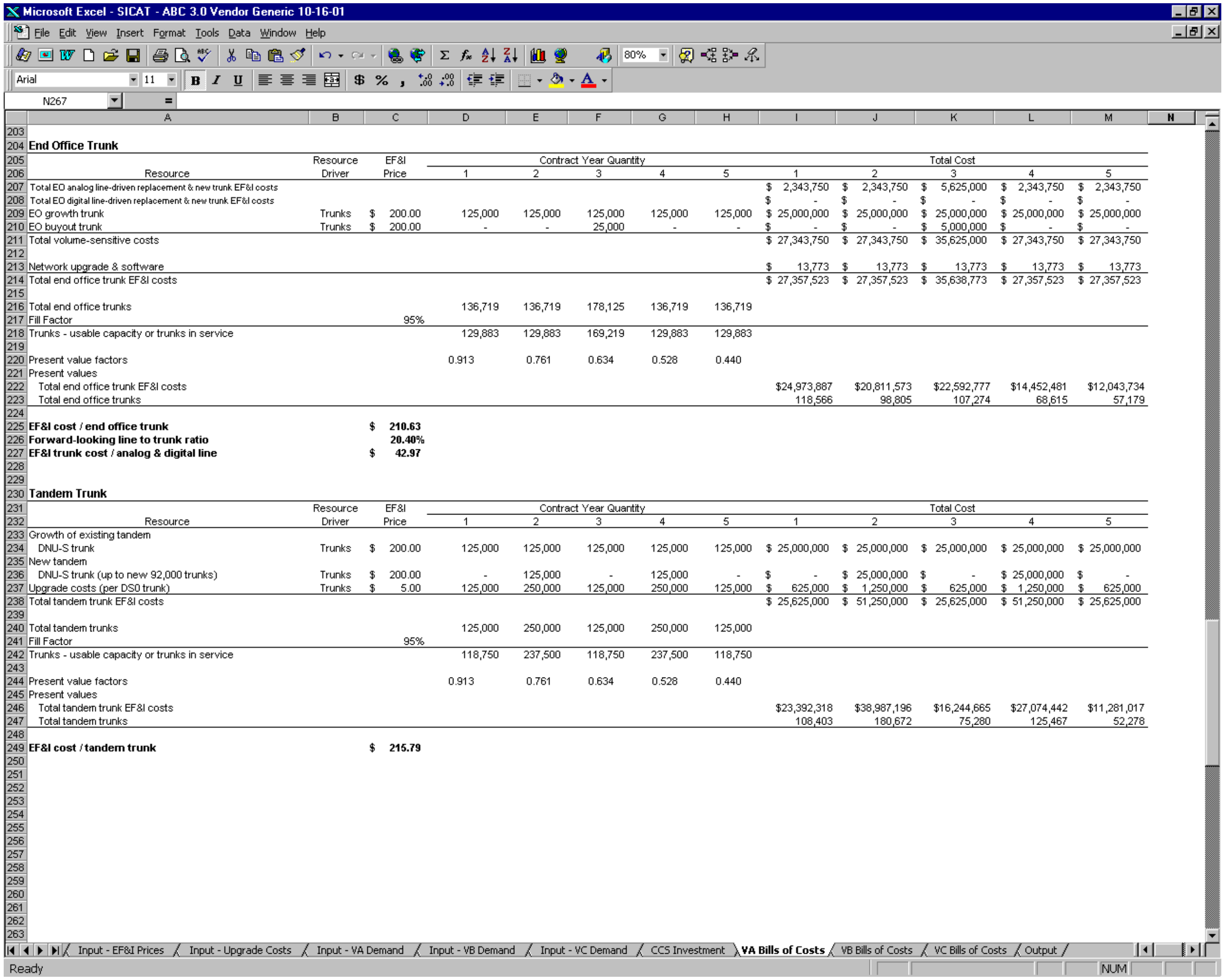
Recall that the costs of trunks associated with replacement and new switches were computed on the line bills of costs. These are carried over to the end office trunk bill of cost. Trunk costs are added for growth and buyout trunks. Prices and quantities are obtained directly from the Input spreadsheets.

Next, a share of network upgrade and software costs is added, and annual end office trunk costs are summed. After computing present values for the annual costs and usable trunk capacity (or trunks in service), the EF&I cost per trunk is calculated. This figure is divided by the forward-looking line-to-trunk ratio, which SICAT calculates, to determine the trunk cost per line. The forward-looking line to trunk ratio is different from the line to trunk ratio used to compute replacement and new switch trunks (0.0 vs. 0.0). This is because the line to trunk ratio used to compute replacement and new switch trunks is simply the number of trunks the vendor has implicitly included in the per-line prices. The forward-looking line to trunk ratio determines what the line to trunk ratio will be at the end of contract period by recognizing that SBC does not provision trunks in its switching network at this ratio.

All future tandem trunk additions are either growth additions to existing tandems or for new tandem switches. No replacements are anticipated. Consequently, the Vendor A bill of costs shown in Figure 4.6 includes annual charges for only growth and new trunks. The bill also includes tandem switch upgrade costs.

Tandem trunk costs are computed in the same fashion for Vendor B. Costs are not included for Vendor C, because SBC does not purchase tandem switches from Vendor C.

Figure 4.6



End Office Trunk

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
Total EO analog line-driven replacement & new trunk EF&I costs								$ 2,343,750	$ 2,343,750	$ 5,625,000	$ 2,343,750	$ 2,343,750
Total EO digital line-driven replacement & new trunk EF&I costs								$ -	$ -	$ -	$ -	$ -
EO growth trunk	Trunks	$ 200.00	125,000	125,000	125,000	125,000	125,000	$ 25,000,000	$ 25,000,000	$ 25,000,000	$ 25,000,000	$ 25,000,000
EO buyout trunk	Trunks	$ 200.00	-	-	25,000	-	-	$ -	$ -	$ 5,000,000	$ -	$ -
Total volume-sensitive costs								$ 27,343,750	$ 27,343,750	$ 35,625,000	$ 27,343,750	$ 27,343,750
Network upgrade & software								$ 13,773	$ 13,773	$ 13,773	$ 13,773	$ 13,773
Total end office trunk EF&I costs								$ 27,357,523	$ 27,357,523	$ 35,638,773	$ 27,357,523	$ 27,357,523
Total end office trunks			136,719	136,719	178,125	136,719	136,719					
Fill Factor		95%										
Trunks - usable capacity or trunks in service			129,883	129,883	169,219	129,883	129,883					
Present value factors			0.913	0.761	0.634	0.528	0.440					
Present values												
Total end office trunk EF&I costs								$24,973,887	$20,811,573	$22,592,777	$14,452,481	$12,043,734
Total end office trunks								118,566	98,805	107,274	68,615	57,179
EF&I cost / end office trunk		**$ 210.63**										
Forward-looking line to trunk ratio		**20.40%**										
EF&I trunk cost / analog & digital line		**$ 42.97**										

Tandem Trunk

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
Growth of existing tandem												
DNU-S trunk	Trunks	$ 200.00	125,000	125,000	125,000	125,000	125,000	$ 25,000,000	$ 25,000,000	$ 25,000,000	$ 25,000,000	$ 25,000,000
New tandem												
DNU-S trunk (up to new 92,000 trunks)	Trunks	$ 200.00	-	125,000	-	125,000	-	$ -	$ 25,000,000	$ -	$ 25,000,000	$ -
Upgrade costs (per DS0 trunk)	Trunks	$ 5.00	125,000	250,000	125,000	250,000	125,000	$ 625,000	$ 1,250,000	$ 625,000	$ 1,250,000	$ 625,000
Total tandem trunk EF&I costs								$ 25,625,000	$ 51,250,000	$ 25,625,000	$ 51,250,000	$ 25,625,000
Total tandem trunks			125,000	250,000	125,000	250,000	125,000					
Fill Factor		95%										
Trunks - usable capacity or trunks in service			118,750	237,500	118,750	237,500	118,750					
Present value factors			0.913	0.761	0.634	0.528	0.440					
Present values												
Total tandem trunk EF&I costs								$23,392,318	$38,987,196	$16,244,665	$27,074,442	$11,281,017
Total tandem trunks								108,403	180,672	75,280	125,467	52,278
EF&I cost / tandem trunk		**$ 215.79**										

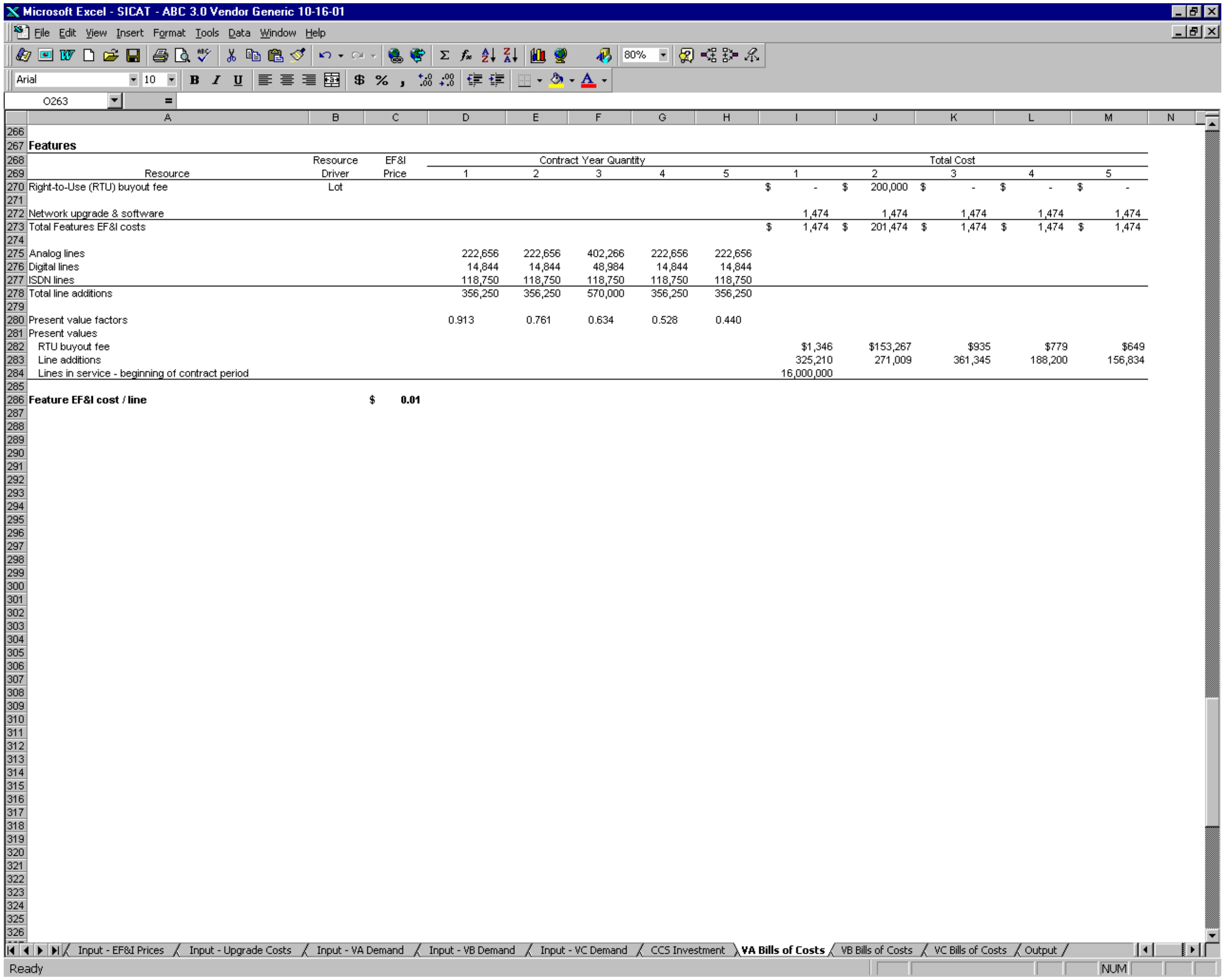
4.1.6 Feature Investment Per Line

Feature investment represents capitalized right-to-use fees for feature software installed in end office switches. In the past, feature software was purchased by paying annual right-to-use fees (RTU) per line in service. In ********* Vendor A and SBC agreed to end this fee arrangement, and instead SBC would "buyout" remaining RTU fees.

Figure 4.7 shows the calculation of the Vendor A feature investment per line. The RTU fee buyout takes place in the second year of the planning period. Present values and the unit investment are calculated as in other bills of costs. The line quantities in this case include the installed base of lines and line additions, plus ISDN line additions over the planning period. ISDN lines are added, because the feature software also supports ISDN.

The Vendor B and Vendor C bills of costs have similar calculations. The also require ISDN lines to be included in the calculations.

Figure 4.7



Microsoft Excel - SICAT - ABC 3.0 Vendor Generic 10-16-01

Features

Resource	Resource Driver	EF&I Price	Contract Year Quantity 1	2	3	4	5	Total Cost 1	2	3	4	5
Right-to-Use (RTU) buyout fee	Lot							$ -	$ 200,000	$ -	$ -	$ -
Network upgrade & software								1,474	1,474	1,474	1,474	1,474
Total Features EF&I costs								$ 1,474	$ 201,474	$ 1,474	$ 1,474	$ 1,474
Analog lines			222,656	222,656	402,266	222,656	222,656					
Digital lines			14,844	14,844	48,984	14,844	14,844					
ISDN lines			118,750	118,750	118,750	118,750	118,750					
Total line additions			356,250	356,250	570,000	356,250	356,250					
Present value factors			0.913	0.761	0.634	0.528	0.440					
Present values												
RTU buyout fee								$1,346	$153,267	$935	$779	$649
Line additions								325,210	271,009	361,345	188,200	156,834
Lines in service - beginning of contract period								16,000,000				
Feature EF&I cost / line	$	**0.01**										

4.2 CCS Investment

SICAT calculates implicit costs per CCS so costs attributable to usage-driven switch equipment can be removed from line prices. This allows line termination and switch usage costs to be separately identified. The costs per CCS calculations are found on the CCS Investment spreadsheet. Figure 4.8 illustrates the calculations.

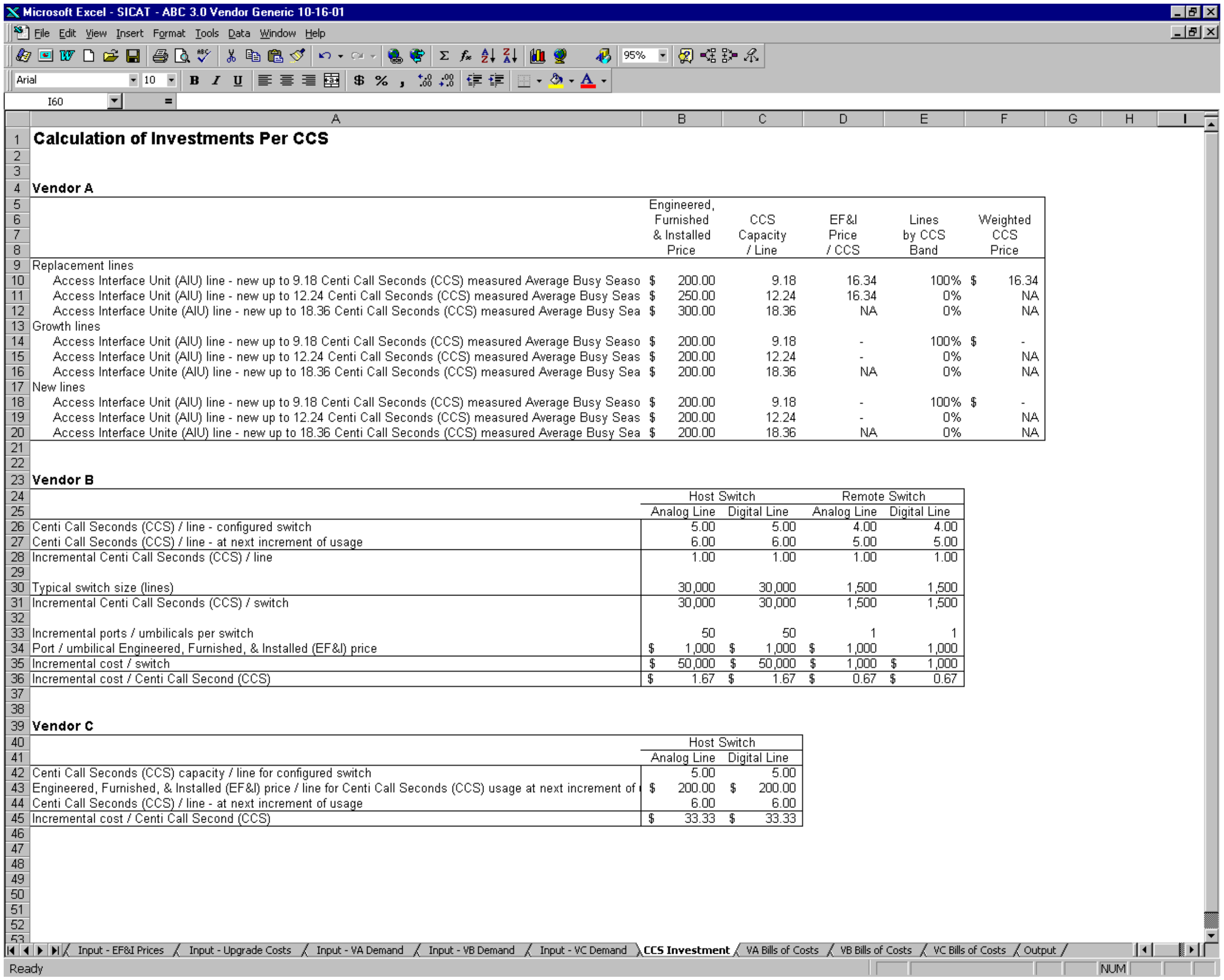
The Vendor A contract provides three line prices depending upon the CCS per line. The cost per CCS is calculated as the difference in line prices between basic usage and the first higher increment of use, divided by the difference in usage. Separate costs per CCS are calculated for replacement, growth and new lines, recognizing their different line prices.[13]

Vendor B does not vary line prices for different CCS per line. Vendor B provides additional information, which allows incremental costs per CCS to be calculated. Vendor B configures switches for basic usage of 0 CCS per line. The next higher level of use is 0 CCS per line. The typical Vendor B switch has approximately 22,000 lines. Based on this information, Vendor B determines that thirty-six additional ports per umbilical are required per switch (to handle 0 additional CCS for 00,000 lines). The CCS Investment spreadsheet uses these data along with the port price from Input – EF&I Costs to compute the cost per CCS.

Vendor C cost per CCS calculation is straightforward. The Company provides a CCS price per line at the next level over basic usage and the CCS per line at the next level. The cost per CCS is calculated from these data. (The CCS per line for basic usage is applied to the cost per CCS to determine the CCS cost per line.)

[13] SICAT can compute the incremental cost for the third level of usage. However, since 100% of lines are assumed to have usage less than or equal to the basic CCS capacity per line, the incremental cost between line prices with basic use and the first increment of use is used.

Figure 4.8



Calculation of Investments Per CCS

Vendor A

	Engineered, Furnished & Installed Price	CCS Capacity / Line	EF&I Price / CCS	Lines by CCS Band	Weighted CCS Price
Replacement lines					
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Seconds (CCS) measured Average Busy Seaso	$ 200.00	9.18	16.34	100%	$ 16.34
Access Interface Unit (AIU) line - new up to 12.24 Centi Call Seconds (CCS) measured Average Busy Seas	$ 250.00	12.24	16.34	0%	NA
Access Interface Unite (AIU) line - new up to 18.36 Centi Call Seconds (CCS) measured Average Busy Sea	$ 300.00	18.36	NA	0%	NA
Growth lines					
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Seconds (CCS) measured Average Busy Seaso	$ 200.00	9.18	-	100%	$ -
Access Interface Unit (AIU) line - new up to 12.24 Centi Call Seconds (CCS) measured Average Busy Seas	$ 200.00	12.24	-	0%	NA
Access Interface Unite (AIU) line - new up to 18.36 Centi Call Seconds (CCS) measured Average Busy Sea	$ 200.00	18.36	NA	0%	NA
New lines					
Access Interface Unit (AIU) line - new up to 9.18 Centi Call Seconds (CCS) measured Average Busy Seaso	$ 200.00	9.18	-	100%	$ -
Access Interface Unit (AIU) line - new up to 12.24 Centi Call Seconds (CCS) measured Average Busy Seas	$ 200.00	12.24	-	0%	NA
Access Interface Unite (AIU) line - new up to 18.36 Centi Call Seconds (CCS) measured Average Busy Sea	$ 200.00	18.36	NA	0%	NA

Vendor B

	Host Switch		Remote Switch	
	Analog Line	Digital Line	Analog Line	Digital Line
Centi Call Seconds (CCS) / line - configured switch	5.00	5.00	4.00	4.00
Centi Call Seconds (CCS) / line - at next increment of usage	6.00	6.00	5.00	5.00
Incremental Centi Call Seconds (CCS) / line	1.00	1.00	1.00	1.00
Typical switch size (lines)	30,000	30,000	1,500	1,500
Incremental Centi Call Seconds (CCS) / switch	30,000	30,000	1,500	1,500
Incremental ports / umbilicals per switch	50	50	1	1
Port / umbilical Engineered, Furnished, & Installed (EF&I) price	$ 1,000	$ 1,000	$ 1,000	1,000
Incremental cost / switch	$ 50,000	$ 50,000	$ 1,000	$ 1,000
Incremental cost / Centi Call Second (CCS)	$ 1.67	$ 1.67	$ 0.67	$ 0.67

Vendor C

	Host Switch	
	Analog Line	Digital Line
Centi Call Seconds (CCS) capacity / line for configured switch	5.00	5.00
Engineered, Furnished, & Installed (EF&I) price / line for Centi Call Seconds (CCS) usage at next increment of	$ 200.00	$ 200.00
Centi Call Seconds (CCS) / line - at next increment of usage	6.00	6.00
Incremental cost / Centi Call Second (CCS)	$ 33.33	$ 33.33

Appendix A

Appendix B

Electronic and Paper Copies of SICAT

An electronic copy of the Excel® workbook, containing spreadsheets used as examples, is enclosed on a 3 ½" computer disc. The electronic copy can be used to view algorithms contained in spreadsheet cells and to "audit" SICAT output and intermediate calculations.

A paper copy of the workbook also is enclosed.

Attachment 4

Shared and Common Cost Methodology

I. Introduction

Because SBC's forward-looking cost study does not include shared and common costs, a methodology was created to develop a reasonable allocation of shared and common costs that is currently recovered in the subscriber line charge (SLC). This shared and common (S & C) methodology yields a state-specific S & C factor that is applied to state-specific loop and port costs in order to determine an appropriate amount of overhead costs.

II. The Shared and Common Cost Factor

The S & C factor represents the ratio of shared and common costs relative to total operating costs. This factor is applied to the forward-looking costs produced by the direct cost studies. It is calculated on a state-by-state basis according to the following calculation:

S & C Factor = S & C Costs ÷ Total Operating Costs

III. Determination of Total Operating Costs

Total Operating Costs are a combination of Net Investment, Operating Expenses, and Shared and Common Overhead Costs. To capture the appropriate accounts, it first is necessary to determine which USOA accounts capture non-traffic sensitive costs as referenced in Part 36 of the Commission's rules. Non-traffic sensitive costs are the basis of the original costs to be recovered in the common line basket. The SLC rate element is intended to recover these costs in the common line basket. Thus, the accounts addressed in the non-traffic sensitive Part 36 procedures should be recovered in the determination of the SLC rate element.

A. Determination of Return on Net Investment & Associated Income Tax Costs

From the USOA accounts that capture non-traffic sensitive costs, the following investment (balance sheet) accounts are aggregated to provide the relevant net investment.

1220	INVENTORIES	2231	RADIO SYSTEMS
2111	LAND	2232	CIRCUIT EQUIPMENT
2112	MOTOR VEHICLES	2311	STATION APPARATUS
2114	TOOLS AND OTHER WORK EQUIPMENT	2321	CUSTOMER PREMISES WIRING
2121	BUILDINGS	2351	PUBLIC TELEPHONE TERM EQUIPMNT
2122	FURNITURE	2362	OTHER TERMINAL EQUIPMENT
2123	OFFICE EQUIPMENT	2411	POLES
2124	GENERAL PURPOSE COMPUTER	2421	AERIAL CABLE
2211	ANALOG ELECTRONIC SWITCHING	2422	UNDERGROUND CABLE
2212	DIGITAL ELECTRONIC SWITCHING	2423	BURIED CABLE
2215	ELECTRO-MECHANICAL SWITCHING	2424	SUBMARINE CABLE
2220	OPERATOR SYSTEMS	2426	INTRABUILDING NETWORK CABLE

2441	CONDUIT SYSTEMS	3420	ACCUM AMORT-LEASEHOLD IMPROV
2681	CAPITAL LEASES	3500	ACCUM AMORTIZATION-INTANGIBLE
2682	LEASEHOLD IMPROVEMENTS	3600	ACCUM AMORTIZATION-OTHER
2690	INTANGIBLE ASSETS	4040	CUSTOMER DEPOSITS
2002	PHFTU	4100	NET CURNT DEFRD OPER INCM TXS
2003	TPUC	4120	OTHER ACCRUED LIABILITIES
2005	PLANT ACQUISITION ADJUSTMENT	4310	OTHER LONG-TERM LIABILITIES
3100	ACCUMULATED DEPRECIATI	4340	NET NCRNT DEFRD OPER INCM TAXE
3200	ACUM DPRC-HLD FR FTR TELCOM US	4360	OTHER DEFERRED CREDITS
3410	ACCUM AMORT-CAPITAL LEASES	4370	OTH JURISDICT LIAB DFRD CR-NET

The net investment is then applied against the interstate rate-of-return and the tax gross up to arrive at the investment-based return and tax costs.[1] This is the first element in calculating the total operating costs.

B. Determination of Operating Expenses

The following operating expense accounts also are utilized in the development of the operating expenses that are a part of the total operating cost calculations:

6112	MOTOR VEHICLE	6421	AERIAL CABLE
6114	TOOLS AN D OTHER WORK	6422	UNDERGROUND CABLE
6117	TECHNICAL EQUIPMENT	6423	BURIED CABLE
6121	LAND AND BUIDLING	6424	SUBMARINE CABLE
6122	FURNITURE AND ARTWORKS	6426	INTRABUILDING NETWORK CABLE
6123	OFFICE EQUIPMENT	6441	CONDUIT SYSTEMS
6124	GENERAL PURPOSE COMPUTERS	6512	PROVISIONING
6211	ANALOG ELECTRONIC	6531	POWER EXPENSE
6212	DIGITAL ELECTRONIC	6532	NETWORK ADMINSTRATION
6215	ELECTRO-MECHANICAL	6533	TESTING
6220	OPERATOR SYSTEMS	6534	PLANT OPERATION
6231	PUBLIC TELEPHONE TERMINAL EQP	6535	ENGINEERING
6232	CIRCUIT EQUIPMENT	6540	ACCESS
6311	STATION APPARATUS	6561	DEPR – TELECOM PLANT IN SERVICE
6351	PUBLIC TELEPHONE TERMINAL	6563	AMORT EXPENSE - TANGIBLE
6362	OTHER TERMINAL EQUIPMENT	6564	AMORT EXPENSE - INTANGIBLE
6411	POLES	6565	AMORT EXPENSE - OTHER
6622	NUMBER SERVICES		

[1] The sum of these accounts was adjusted by 11.25% to account for the authorized rate of return. This figure was then grossed up by a factor of 58.846% (calculated as .35/.65 using the 35% Federal tax rate) to determine the associated income tax gross up.

C. Determination of Shared and Common Cost Accounts

The following non-traffic sensitive accounts remained to be recovered through a shared and common factor:[2]

5301 UNCOLLECTIBLE REVN-TELECOMMUN
5302 UNCOLLECTIBLE REVENUE-OTHER
6611 PRODUCT MANAGEMENT
6612 SALES
6613 PRODUCT ADVERTISING
6621 CALL COMPLETION SERVICES
6623 CUSTOMER SERVICES
6711 EXECUTIVE
6712 PLANNING
6721 ACCOUNTING AND FINANCE
6722 EXTERNAL RELATIONS
6723 HUMAN RESOURCES
6724 INFORMATION MANAGEMENT
6725 LEGAL
6726 PROCUREMENT
6727 RESEARCH AND DEVELOPMENT
6728 OTHER GENERAL AND ADMIN
7240 OPERATING OTHER TAXES[3]

IV. Application of the S & C Factor

The S & C factor is used to develop the portion of shared and common costs that should be recovered in common line charges. This overhead is calculated as follows:

(Loop Cost + Port Cost) x S & C Factor = S & C Cost

For example, if the loop cost is $17.50, the port cost is $2.50 and the S & C Factor for a study area is 25%, then the S & C Costs for a loop and port in that study area is $5.00.

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[2] In other words, these accounts were included in the S & C methodology because they were the remaining accounts not included in the direct cost studies for the loop and port.

[3] Because a percentage of these costs are embedded within the direct cost loop study, only a portion of Account #7240 was included in this S & C Factor calculation to avoid double-counting of these costs.

Attachment 5

SBC Communications Inc.
Subscriber Line Charge Cost Information Summary

	SWBT - AR	SWBT - KS	SWBT - MO	SWBT - OK	SWBT - TX
CMT	5.67	5.27	5.10	4.71	5.37
Study Area FLEC	7.33	8.39	6.66	7.86	7.86
Zone 1 FLEC	6.04	7.68	6.20	7.14	7.08
Zone 2 FLEC	7.46	7.97	6.75	7.72	7.64
Zone 3 FLEC	10.73	14.95	7.07	9.67	9.99
Zone 4 FLEC	n/a	n/a	7.80	n/a	n/a

Note: SWBT's filing entity CMT has been disaggregated to the state level in accordance with 47 CFR § 61.3(d)

	Pacific Bell - CA		Nevada Bell - NV		SNET - CT
CMT	4.41		6.05		5.71
Study Area FLEC	5.97		7.15		5.30
Zone 1 FLEC	5.53		6.24		4.48
Zone 2 FLEC	6.67		7.74		5.16
Zone 3 FLEC	7.76		11.59		5.46
Zone 4 FLEC	n/a		n/a		6.16

	Ameritech - IL	Ameritech - IN	Ameritech - MI	Ameritech - OH	Ameritech - WI
CMT	4.47	5.53	5.32	5.37	5.07
Study Area FLEC	5.96	6.14	6.85	6.01	6.23
Zone 1 FLEC	3.43	4.99	6.35	4.69	5.91
Zone 2 FLEC	5.33	6.14	6.87	5.82	6.25
Zone 3 FLEC	6.39	6.29	7.31	6.57	6.77
Zone 4 FLEC	n/a	6.33	n/a	n/a	n/a

Note: In this summary, the lowest cost zone in any state will uniformly be defined as "Zone 1," independent of the actual zone naming convention. Similarly, the highest-cost zone will be designated as "Zone 3" (or "Zone 4, if applicable).