STATE OF MISSOURI
PUBLIC SERVICE COMMISSION

At a session of the Public Service Commission held at its office in Jefferson City on the 31st day of July, 1997.

In the Matter of AT&T Communications of the Southwest, Inc.'s Petition for Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Southwestern Bell Telephone Company.	Case No. TO-97-40
In the Matter of the Petition of MCI Telecommunications Corporation and Its Affiliates, Including MCImetro Access Transmission Services, Inc., for Arbitration and Mediation Under the Federal Telecommunications Act of 1996 of Unresolved Interconnection Issues With Southwestern Bell Telephone Company.	Case No. TO-97-67

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FINAL ARBITRATION ORDER

I. Procedural History

On December 11, 1996, the Commission issued its Arbitration Order in this case. Within that order the Commission established the basis upon which prices and discounts would be established. In response to that order, numerous motions were filed requesting various forms of relief, rehearing, reconsideration or clarification.

On January 22, 1997, the Commission issued its Order Granting Clarification And Modification And Denying Motion To Identify And Motions For Rehearing. This order modified approximately eight items from the Arbitration Order and, inasmuch as the Commission's Arbitration Order identified the rates as interim, this order set a schedule for the development of permanent rates. That schedule established a complex list of weekly tasks for the Commission's Arbitration Advisory Staff to undertake beginning February 10 with a targeted concluding date of June 30 for the issuance of permanent rates.

The complexity of the issues which were being reviewed by the Arbitration Advisory Staff and the depth of information which was available on each issue compelled the Commission to extend its own deadline in order to ensure a complete and thorough review of all cost, pricing and rate issues. As a result, on June 9 the Commission issued a Notice Regarding Schedule For Development Of Permanent Rates. At that time the Commission reiterated its original intent to announce proposed permanent rates and to allow the parties 30 days in which to respond to those proposed rates.

The Commission finds it appropriate to establish permanent rates at this time so that this matter may be resolved in such a way as to maximize the opportunities for these parties to move Missouri toward local competition. Rather than delay this matter by an additional 30 days for comment, the Commission will make this its final order. However, in the interests of due process, the Commission will allow the parties twenty days to move for reconsideration or clarification.

The process of reviewing the costs, discounts and proposed rates was designed so that Southwestern Bell Telephone Company (SWBT), AT&T Communications of the Southwest, Inc. (AT&T) and MCI Telecommunications Corporation (MCI) could designate the appropriate subject matter expert (SME) or provide documentation in support of its position. As a result, the process led to a remarkable level of open communication and cooperation between SWBT, AT&T, MCI and the Arbitration Advisors. The work which has resulted from this effort consumes several hundred pages and constitutes a thorough and exhaustive review of each and every cost factor which the Commission finds relevant to this arbitration. This "Costing and Pricing Report" is Attachment C. A similar document containing highly confidential information has been filed and provided to the parties pursuant to the Commission's procedures set out in its Protective Order.

II. Discussion and Findings

The Commission finds that the discount rate for resold services should be reduced from 20.32 percent to 19.2 percent for all services except operator services and 13.91 percent for operator services only. In light of the extensive review and analysis by the Commission's Advisory Staff (*see* Attachment C), the Commission finds that a 19.2 percent discount rate for all services except operator services and a 13.91 percent for operator services only results in just and reasonable rates for resold basic local telecommunications services. The parties shall prepare an interconnection agreement that incorporates the rates selected in Attachment A to this Final Arbitration Order which is entitled "Resale Study for SWBT."

The Commission finds that, in light of the extensive review and analysis by the Commission's Advisory Staff (*see* Attachment C), certain modifications should be made to the interim rates previously ordered for unbundled network elements (UNEs). The Commission finds that the permanent rates for UNEs, included with this Final Arbitration Order as Attachment B entitled "Permanent Prices for Unbundled Network Elements," result in just and reasonable rates. The parties shall prepare an interconnection agreement that incorporates the rates in Attachment B.

Prices for the unbundled network elements include the full functionality of each element. No additional charges for any such element, the functionalities of the element, or the activation of the element or its functionalities shall be permitted.

The Commission will direct the parties to complete interconnection agreements in full conformance with the attached document in 60 days.

The Commission finds that the attachments to this order constitute a final reconciliation of all pending issues from the original Arbitration Order as issued on December 11, 1996. The original Arbitration Order shall remain effective to the extent that it is not inconsistent with this order.

In this regard, the Commission rejects all proposed interconnection agreements previously tendered by any party. It also denies SWBT's motion to strike, AT&T's motion to establish a procedural schedule and OPC's motion agreeing to AT&T's as moot.

IT IS THEREFORE ORDERED:

1. That the issues set out by the parties shall be resolved consistent with this order and the attachments hereto. Southwestern Bell Telephone Company, AT&T Communications of the Southwest, Inc. and MCI Telecommunications Corporation shall negotiate a final interconnection agreement for submission to the Missouri Public Service Commission consistent with this order.

2. That the rate schedules attached to this Final Arbitration Order as Attachments A and B shall be the approved permanent rates for all the elements and services listed therein.

3. That the parties shall have until August 20, 1997 to move for reconsideration or clarification.

4. That the parties shall prepare and submit to the Commission for approval an interconnection agreement reflecting the findings embodied in this order and the permanent rates embodied in Attachments A and B.

5. That the agreement described in Ordered Paragraph 4 shall be submitted to the Commission no later than September 30, 1997.

6. That the parties shall comply with the Commission's findings on each and every issue.

7. That the Arbitration Order issued in this case on December 11, 1996 shall remain effective to the extent that it is not inconsistent with this order.

8. That any proposed interconnection agreements filed herein are rejected and all pending motions which have not been previously addressed are hereby denied.

9. That this Final Arbitration Order shall become effective on August 20, 1997.

BY THE COMMISSION

(S E A L)

Cecil I. Wright
Executive Secretary

Crumpton, Drainer, Murray and Lumpe, CC., concur.
Zobrist, Chm., concurs, with concurring opinion to follow.

CASE NO. TO-97-40
and
CASE NO. TO-97-67

Final Arbitration Order

ATTACHMENT A

Calculation Detail by Account of Development of Wholesale Discount - All Services Except Operator Services

Resale Study for SWBT

Avoided Cost Study, 1996 ARMIS Data

	Costs:	Total Missouri Regulated ($000)	% Avoided	SWBT Avoided ($000)
	Direct:			
6611	Product Management	7206	50%	3603
6612	Sales	22214	90%	19993
6613	Product Advertising	11022	90%	9920
6621	Call Completion services	11181	100%	11181
6622	Number Services	34145	100%	34145
6623	Customer Services	95206	90%	85685
	Indirect:			
5301	Uncollectible Revenue	16669	15.67%	2612
6112	Motor Vehicle Exp.	826	0.00%	0
6113	Aircraft Exp.	0	0.00%	0
6114	Spec Purpose Vehicle	0	0.00%	0
6115	Garage Work Equipment	14	0.00%	0
6116	Other Work Equipment	141	0.00%	0
6121	Land & Buld Exp.	-9877	15.67%	-1548
6122	Furniture & Artwork	-219	15.67%	-34
6123	Office Exp.	2552	15.67%	400
6124	Gen Purpose Computers	-23693	15.67%	-3713
6211	Analog Electronic Exp.	15021	0.00%	0
6212	Digital Electronic Exp.	42980	0.00%	0
6215	Electro-mech Exp.	93	0.00%	0
6220	Operators Exp.	300	0.00%	0
6231	Radio System Exp.	358	0.00%	0
6232	Circuit System Exp.	19641	0.00%	0
6311	Station Apparatus Exp.	1	0.00%	0
6341	Lg PBX/Exp.	201	0.00%	0
6351	Public Tel Term Eq Exp.	4163	0.00%	0
6362	Other Terminal Eq Exp.	20051	0.00%	0
6411	Poles Exp.	1684	0.00%	0
6421	Aerial Cable Exp.	47185	0.00%	0
6422	Underground Cable Exp.	6641	0.00%	0
6423	Buried Cable Exp.	66906	0.00%	0

6424	Submarine Cable Exp.	0	0.00%	0
6425	Deep Sea Cable Exp.	0	0.00%	0
6426	Intrabuilding Network Cabl	36	0.00%	0
6431	Aerial Wire Exp.	27	0.00%	0
6441	Conduit Systems Exp.	806	0.00%	0
6511	Telecomm Use Exp.	0	0.00%	0
6512	Provisioning Exp.	28	0.00%.	0
6531	Power Exp.	4598	0.00%	0
6532	Network Admin Exp.	13298	0.00%	0
6533	Testing Exp.	38402	0.00%	0
6534	Plant Operations Admin	29487	0.00%	0
6535	Engineering Exp.	17813	0.00%	0
6540	Access Exp.	53298	0.00%	0
6561	Depreciation Telecom plar	347816	0.00%	0
6562	Depreciation Future Telecc	0	0.00%	0
6563	Amortization Exp. - Tangit	683	0.00%	0
6564	Amortization Exp. - Intang	0	0.00%	0
6565	Amortization Exp. - Other	5298	0.00%	0
6711	Executive	5562	15.67%	872
6712	Planning	1727	15.67%	271
6721	Accounting & Finance	12106	15.67%	1898
6722	External Relations	19542	15.67%	3063
6723	Human Resources	16480	15.67%	2583
6724	Information Management	43707	15.67%	6851
6725	Legal	5192	15.67%	814
6726	Procurement	3682	15.67%	577
6727	Research and Developmer	5739	15.67%	900
6728	Other Gen & Admin	31882	15.67%	4997
	Total	$868,667		$185,069

Revenues:		% Included:	Included:
Local Service	807299	100%	807299
Toll Network Service	156649	100%	156649
Network Access Service	444248	0%	0
Miscellaneous	172704	0%	0
Total	$1,580,900		$963,948

Resale Percentage Discount on Revenue:

% of Resold Services Revenue (Local & Toll Network Service)	19.20%

Calculation Detail by Account of Development of Wholesale Discount - Operator Services Only

Resale Study for SWBT

Avoided Cost Study, 1996 ARMIS Data

	Costs:	Total Missouri Regulated ($000)	% Avoided	SWBT Avoided ($000)
	Direct:			
6611	Product Management	7206	50%	3603
6612	Sales	22214	90%	19993
6613	Product Advertising	11022	90%	9920
6621	Call Completion services	11181	0%	0
6622	Number Services	34145	0%	0
6623	Customer Services	95206	90%	85685
	Indirect:			
5301	Uncollectible Revenue	16669	11.35%	1893
6112	Motor Vehicle Exp.	826	0.00%	0
6113	Aircraft Exp.	0	0.00%	0
6114	Spec Purpose Vehicle	0	0.00%	0
6115	Garage Work Equipment	14	0.00%	0
6116	Other Work Equipment	141	0.00%	0
6121	Land & Buld Exp.	-9877	11.35%	-1121
6122	Furniture & Artwork	-219	11.35%	-25
6123	Office Exp.	2552	11.35%	290
6124	Gen Purpose Computers	-23693	11.35%	-2690
6211	Analog Electronic Exp.	15021	0.00%	0
6212	Digital Electronic Exp.	42980	0.00%	0
6215	Electro-mech Exp.	93	0.00%	0
6220	Operators Exp.	300	0.00%	0
6231	Radio System Exp.	358	0.00%	0
6232	Circuit System Exp.	19641	0.00%	0
6311	Station Apparatus Exp.	1	0.00%	0
6341	Lg PBX/Exp.	201	0.00%	0
6351	Public Tel Term Eq Exp.	4163	0.00%	0
6362	Other Terminal Eq Exp.	20051	0.00%	0
6411	Poles Exp.	1684	0.00%	0
6421	Aerial Cable Exp.	47185	0.00%	0
6422	Underground Cable Exp.	6641	0.00%	0
6423	Buried Cable Exp.	66906	0.00%	0

6424	Submarine Cable Exp.	0	0.00%	0
6425	Deep Sea Cable Exp.	0	0.00%	0
6426	Intrabuilding Network Cabl	36	0.00%	0
6431	Aerial Wire Exp.	27	0.00%	0
6441	Conduit Systems Exp.	806	0.00%	0
6511	Telecomm Use Exp.	0	0.00%	0
6512	Provisioning Exp.	28	0.00%	0
6531	Power Exp.	4598	0.00%	0
6532	Network Admin Exp.	13298	0.00%	0
6533	Testing Exp.	38402	0.00%	0
6534	Plant Operations Admin	29487	0.00%	0
6535	Engineering Exp.	17813	0.00%	0
6540	Access Exp.	53298	0.00%	0
6561	Depreciation Telecom plan	347816	0.00%	0
6562	Depreciation Future Telecc	0	0.00%	0
6563	Amortization Exp. - Tangit	683	0.00%	0
6564	Amortization Exp. - Intang	0	0.00%	0
6565	Amortization Exp. - Other	5298	0.00%	0
6711	Executive	5562	11.35%	632
6712	Planning	1727	11.35%	196
6721	Accounting & Finance	12106	11.35%	1375
6722	External Relations	19542	11.35%	2219
6723	Human Resources	16480	11.35%	1871
6724	Information Management	43707	11.35%	4963
6725	Legal	5192	11.35%	590
6726	Procurement	3682	11.35%	418
6727	Research and Developmer	5739	11.35%	652
6728	Other Gen & Admin	31882	11.35%	3620
	Total	$868,847		$134,081

Revenues:		% Included:	Included:
Local Service	807299	100%	807299
Toll Network Service	156649	100%	156649
Network Access Service	444248	0%	0
Miscellaneous	172704	0%	0
Total	$1,580,900		$963,948

Resale Percentage Discount on Revenue:

% of Resold Services Revenue (Local & Toll Network Service)	13.91%

CASE NO. TO-97-40
and
CASE NO. TO-97-67

Final Arbitration Order

ATTACHMENT B

Permanent Prices for Unbundled Network Elements

Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
<u>Unbundled Loops</u>				
2-Wire 8 db Loop				
Zone 1	Group D	$12.71		
Zone 2	Group B	$20.71		
Zone 3	Group A	$33.29		
Zone 4	Group C	$18.23		
	Statewide		$26.07	$11.09
4-Wire 8 db Loop				
Zone 1	Group D	$19.79		
Zone 2	Group B	$35.35		
Zone 3	Group A	$61.16		
Zone 4	Group C	$30.08		
	Statewide		$28.77	$11.09
ISDN-BRI Loop				
Zone 1	Group D	$25.79		
Zone 2	Group B	$42.10		
Zone 3	Group A	$58.44		
Zone 4	Group C	$41.44		
	Statewide		$57.77	$30.22
ISDN-PRI Loop				
Zone 1	Group D	$101.18		
Zone 2	Group B	$106.06		
Zone 3	Group A	$107.89		
Zone 4	Group C	$101.39		
	Statewide		$136.63	$53.94
DS 1 Digital Loop				
Zone 1	Group D	$101.18		
Zone 2	Group B	$106.06		
Zone 3	Group A	$107.89		
Zone 4	Group C	$101.39		
	Statewide		$136.63	$53.94
dB Loop Loss Conditioning		$6.63	$22.76	$8.58
<u>Cross Connects</u>				
Cross - Connects with Test Equipment, Same Central Office				
2-Wire Analog		$1.89	$35.83	$29.44
4-Wire Analog		$3.77	$41.63	$35.73
2-Wire Digital ISDN-BRI		$1.89	$35.83	$29.44
4-Wire Digital DS-1/ISDN-PRI		$9.00	$60.04	$41.06
Cross - Connects without Test Equipment, Same Central Office				
2-Wire Analog		$0.31	$19.96	$12.69
4-Wire Analog		$0.63	$25.38	$17.73
2-Wire Digital ISDN-BRI		$0.31	$19.96	$12.69
4-Wire Digital DS-1/ISDN-PRI		$0.00	$34.48	$28.57
Cross-Connects to Different CO or SWBT Multiplexor				
2-Wire Analog		$4.03	$52.24	$45.85
4-Wire Analog		$5.19	$60.47	$54.57
2-Wire Digital ISDN-BRI		$6.31	$52.24	$45.85

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the Interim and SWBT proposed 3 rate zones by combining tariffed rate zones C and D into one zone.

Permanent Prices for Unbundled Network Elements

Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
Local Switching Port Charges				
2-Wire Analog Line-Side Port				
Zone 1	Group D	$1.74		
Zone 2	Group B	$1.97		
Zone 3	Group A	$2.47		
Zone 4	Group C	$2.25		
	Statewide		$39.37	$35.27
ISDN-BRI Port				
Zone 1	Group D	$5.56		
Zone 2	Group B	$5.56		
Zone 3	Group A	$5.56		
Zone 4	Group C	$5.56		
	Statewide		$6.47	$3.53
ISDN-PRI Port				
Zone 1	Group D	$165.85		
Zone 2	Group B	$165.85		
Zone 3	Group A	$165.85		
Zone 4	Group C	$165.85		
	Statewide		$214.53	$98.53
DS-1 Trunk Port				
Zone 1	Group D	$132.14	$162.38	$24.76
Zone 2	Group B	$126.71	$162.44	$24.83
Zone 3	Group A	$58.04	$160.47	$22.86
Zone 4	Group C	$140.35	$164.98	$27.36
2-Wire Analog Trunk Port (DID)				
Zone 1	Group D	$13.55	$64.00	
Zone 2	Group B	$14.45	$69.47	
Zone 3	Group A	$10.60	$59.76	
Zone 4	Group C	$15.12	$62.01	
Usage - per Minute of Use				
Zone 1	Group D	$0.001988		
Zone 2	Group B	$0.002391		
Zone 3	Group A	$0.003444		
Zone 4	Group C	$0.002934		
	Statewide		na	

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the Interim and SWBT proposed 3 rate zones by combining tariffed rate zones C and D into one zone.

Permanent Prices for Unbundled Network Elements

Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
Dedicated Interoffice Transport				
DS 1 Dedicated Transport I/O First Mile, per month				
Zone 1	Group D	$57.49	$184.84	$118.14
Zone 2	Group B	$86.96	$184.84	$118.14
Zone 3	Group A	$92.07	$184.84	$118.14
Zone 4	Group C	$48.70	$184.84	$118.14
InterZone		$100.36	$184.84	$118.14
DS 1 Dedicated Transport I/O Additional Mile, per month				
Zone 1	Group D	$0.62	$184.84	$118.14
Zone 2	Group B	$1.67	$184.84	$118.14
Zone 3	Group A	$1.60	$184.84	$118.14
Zone 4	Group C	$0.19	$184.84	$118.14
InterZone		$0.97	$184.84	$118.14
DS 3 Dedicated Transport I/O First Mile, per month				
Zone 1	Group D	$925.21	$203.10	$135.06
Zone 2	Group B	$1,824.14	$203.10	$135.06
Zone 3	Group A	$2,052.06	$203.10	$135.06
Zone 4	Group C	$789.13	$203.10	$135.06
InterZone		$2,361.66	$203.10	$135.06
DS 3 Dedicated Transport I/O Additional Mile, per month				
Zone 1	Group D	$15.64	$203.10	$135.06
Zone 2	Group B	$56.45	$203.10	$135.06
Zone 3	Group A	$97.60	$203.10	$135.06
Zone 4	Group C	$17.32	$203.10	$135.06
InterZone		$25.87	$203.10	$135.06
Transport Cross-Connects				
DS 3		$30.08	$54.98	$42.90

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the Interim and SWBT proposed 3 rate zones by combining tariffed rate zones C and D into one zone.

** The rate for an entrance facility should only apply when this element is actually utilized.

Permanent Prices for Unbundled Network Elements

		Staff Proposed Price	NRCs First	NRCs Additional
<u>Tandem Switching</u>				
per Minute Of Use		$0.00151	na	na
<u>Signaling and Call Related Databases</u>				
Signal Transfer Point (STP) Port		$480.61	$217.14*	
SS7 Transport		$0.0000007	na	na
Toll Free Calling Database Query				
Simple		$0.000254	na	na
Complex		$0.000288	na	na
Calling Name Delivery Query		$0.000304	na	na
Line Information Database Query		$0.000449	$108.55	
<u>Dark Fiber</u>				
Fiber Termination				
Statewide		$4.50	$42.52	$28.41
Fiber, per strand, per mile				
Zone 1	Group D	$0.002085		
Zone 2	Group B	$0.003156		
Zone 3	Group A	$0.004752		
Zone 4	Group C	$0.002085		
<u>Unbundled Common Transport</u>				
Facility Cost per Minute, per Mile				
Zone 1- Group D		$0.000002	na	na
Zone 2 - Group B		$0.000007		
Zone 3 - Group A		$0.000015		
Zone 4 - Group C		$0.000001		
InterZone		$0.000003		
Termination Cost Per Minute of Use				
Zone 1- Group D		$0.000190	na	na
Zone 2 - Group B		$0.000285		
Zone 3 - Group A		$0.000302		
Zone 4 - Group C		$0.000162		
InterZone		$0.000332		
<u>Directory Assistance and Operator Services</u>				
Directory Assistance		1	na	na
Directory Assistance Call Completion		1		
Directory Assistance Listing		1		
Local Operator Assistance		1		
IntraLATA Operator Assistance		1		
Operator Work Seconds		1		

1 Lowest Existing Intercompany Compensation Arrangement

* Includes NRC for STP port termination, signaling point code, and global title translation.

Permanent Prices for Unbundled Network Elements

Service Charge	$5.00
CLEC Conversion	No Additional Charge other than Service Order

Permanent Prices for Unbundled Network Elements

	Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
<u>Subloop Unbundling**</u>					
8dB Feeder					
	Zone 1	Group D	$4.81		
	Zone 2	Group B	$6.60		
	Zone 3	Group A	$6.87		
	Zone 4	Group C	$9.90		
		Statewide		$22.88	$10.55
BRI Feeder					
	Zone 1	Group D	$20.18		
	Zone 2	Group B	$32.17		
	Zone 3	Group A	$30.89		
	Zone 4	Group C	$39.13		
		Statewide		$54.02	$27.26
DS1 Feeder					
	Zone 1	Group D	$67.05		
	Zone 2	Group B	$67.27		
	Zone 3	Group A	$67.17		
	Zone 4	Group C	$70.79		
		Statewide		$88.78	$39.97
8dB Distribution					
	Zone 1	Group D	$6.69		
	Zone 2	Group B	$10.68		
	Zone 3	Group A	$12.92		
	Zone 4	Group C	$22.78		
		Statewide		$113.44	$47.28
BRI Distribution					
	Zone 1	Group D	$9.63		
	Zone 2	Group B	$13.63		
	Zone 3	Group A	$15.86		
	Zone 4	Group C	$25.70		
		Statewide		$115.68	$51.43
DS1 Distribution					
	Zone 1	Group D	$4.68		
	Zone 2	Group B	$6.23		
	Zone 3	Group A	$10.05		
	Zone 4	Group C	$22.41		
		Statewide		$175.77	$69.44

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the Interim and SWBT proposed 3 rate zones by combining tariffed rates zones C and D into one zone.

** The cost of concentration is included in both the feeder and distribution segments.

Missouri Public Service Commission

Costing and Pricing Report

In re AT&T's Petition for Arbitration to Establish an Interconnection Agreement with Southwestern Bell Telephone Co., Case No. TO-97-40.

In re MCI's Petition for Arbitration to Establish an Interconnection Agreement with Southwestern Bell Telephone Co., Case No. TO-97-67.

Attachment C

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REPORT OVERVIEW

On December 11, 1996, the Commission issued the Arbitration Order for Case No. TO-97-40 - TO-97-67. Included in the Order was the establishment of interim rates for unbundled network elements and an interim resale discount. Subsequently, on January 22, 1997, the Commission issued an Order Granting and Clarification and Modification and Denying Motion to Identify and Motions for Rehearing establishing a procedure to set permanent prices for unbundled network elements and a discount rate for resale. The Commission designated a cost study team to review each parties' cost studies and models and make recommendations to the Commission based on its findings. Specifically, the Commission designated Dan Gordon, Matt Kohly, and Anthony Zerillo to review the cost studies and models. David Birenbaum of the Depreciation Department was assigned responsibility for depreciation issues. Ben Childers, Ph.D. provided assistance on the resale issue. Over a period of approximately four months, Arbitration Advisory Staff (Staff) investigated Southwestern Bell Telephone's (SWBT) Total Element Long Run Incremental Cost (TELRIC) studies and the Hatfield Cost Model sponsored by AT&T Communications of the Southwest Inc. (AT&T) and MCI Communications Inc. (MCI).

This report describes Staff's findings and proposed modifications. The report is divided into three main sections. Section I. Summary of Cost Review and Proposed Prices provides an overview of Staff's findings. Included are brief summaries of the focus of the cost review, the costing standard, and model selection. This section also identifies permanent prices that Staff proposes and a very brief summary of Staff's proposed modifications to SWBT's cost studies.

Section II. Unbundled Elements contains the review of SWBT's cost studies as well as a detailed description of Staff's proposed modifications and the rationale for making the modifications. Also in this section, is the detailed review of the Hatfield Model 3.1. The review of the model includes an analysis of the inputs and the structure of the model. Included in the review are the results from the Hatfield Model using inputs supplied by AT&T, SWBT, and Staff.

The final section is devoted to Resale. This section describes the proposed resale discount and the methodology used to calculate the discount.

SECTION I.
SUMMARY OF COST REVIEW
AND PROPOSED PRICES

This section describes the focus of the cost review, the costing standard Staff proposes and the model selection process and result. This section also includes the prices for Unbundled Network Elements proposed by Staff and a brief summary of Staff's proposed modifications to SWBT's cost studies.

Focus of Cost Review

The Commission's Arbitration Order contained interim prices as well as an interim resale discount. Those interim rates were based upon several sources including SWBT's Total Element Long Run Incremental Cost (TELRIC) studies, Modified SWBT TELRIC studies, Hatfield Model 2.2, and existing interstate rates. Between the time the Arbitration Order was issued and this cost review began, many of SWBT's TELRIC studies were modified and resubmitted to the Commission. Also in that time, the Hatfield Model 2.2 presented in the arbitration proceedings evolved into Hatfield Model 3.1. Because of these changes, the interim rates were no longer supported by some of the underlying studies and models. For this reason, Staff focused the review process on the studies and models submitted by the parties. Staff did not address any issues surrounding the interim prices.

Costing Standard

A major point of contention between the parties is the issue of which costing standard to use. SWBT believes the appropriate costing standard to use is the historical, embedded network costs. However, SWBT did submit TELRIC studies it believed were forward-looking economic studies. These studies based costs upon the most current technology deployed in the existing network recognizing the existing network design and topography. No consideration was given the possibility that the existing network may be "over-built" or that the current layout was not the most efficient. Finally, no consideration was given to future demand or utilization levels.

AT&T and MCI propose using forward-looking economic costs incurred if one were to assume the network was completely rebuilt today. AT&T and MCI's cost standard would assume a "scorched-earth" approach and design the network from the ground-up. Using this standard, the network design would definitely be different from that of the existing network. Done properly, this might be an appropriate costing standard. However, this standard, as calculated by the Hatfield Model does not consider the use of existing rights-of-way or physical limitations such as topography or the locations of existing infrastructure and buildings. Ignoring these factors will likely lead to understatement of the economic costs of the network.

Staff believes the most appropriate cost standard is the use of forward-looking economic costs assuming the existing network were being rebuilt today to meet forward-looking levels of demand. The approach includes the use of the latest technology currently deployed in the existing network. This approach also recognizes the use of existing rights-of-way and physical constraints that dictate how and where the network must be placed. Staff believes this costing standard will most closely resemble the costs that an efficient competitor would face if entering the market today. Finally, by recognizing forward-looking demand, this approach focuses the network design and cost recovery on the users of the network. Staff believes this more appropriately allocates the network costs to the cost-causer.

Model Selection

During the cost review process, Staff analyzed both SWBT's TELRIC studies and the Hatfield Model 3.1. After reviewing both models, Staff recommends the use of SWBT's TELRIC studies with modifications as the basis for determining the cost of unbundled network elements.

The Hatfield Model makes a notable attempt at modeling the forward-looking economic costs of a telephone network. However, Staff has several concerns that suggest the Hatfield is not the correct cost-determining model for Missouri. These concerns are based on the Hatfield Model being a work in progress, weaknesses in the data, assumptions about Census Block Groups, how the network is built, assumptions about switching and wire centers, certain area specific variables that cannot be geographically deaveraged, and that the model does not account for growth. Finally, the Hatfield Model does not provide costs for items such as trunk ports and other unbundled network elements necessary to provide local services.

SWBT's TELRIC cost studies with modifications are Missouri specific and more closely calculate the forward-looking economic costs incurred in SWBT territory. The studies use input pricing and labor cost data specific to Missouri. SWBT's cost studies with modifications also produce prices for every element needed to provide local service. Utilizing SWBT's TELRIC studies will allow the Commission to use one set of studies in setting interconnection rates rather than relying on several models or sources.

Staff Proposed Prices

The table on the following pages contain Staff's proposed prices for UNE's. These proposed prices include both monthly recurring and non-recurring charges for the UNE's. Where appropriate, Staff has geographically deaveraged the monthly recurring rates into four zones to reflect the differences in costs.

Proposed Pricing for Unbundled Network Elements

Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
Unbundled Loops				
2-Wire 8 db Loop				
Zone 1	Group D	$12.71		
Zone 2	Group B	$20.71		
Zone 3	Group A	$33.29		
Zone 4	Group C	$18.23		
	Statewide		$26.07	$11.09
4-Wire 8 db Loop				
Zone 1	Group D	$19.79		
Zone 2	Group B	$35.35		
Zone 3	Group A	$61.16		
Zone 4	Group C	$30.08		
	Statewide		$28.77	$11.09
ISDN-BRI Loop				
Zone 1	Group D	$25.79		
Zone 2	Group B	$42.10		
Zone 3	Group A	$58.44		
Zone 4	Group C	$41.44		
	Statewide		$57.77	$30.22
ISDN-PRI Loop				
Zone 1	Group D	$101.18		
Zone 2	Group B	$106.06		
Zone 3	Group A	$107.89		
Zone 4	Group C	$101.39		
	Statewide		$136.63	$53.94
DS 1 Digital Loop				
Zone 1	Group D	$101.18		
Zone 2	Group B	$106.06		
Zone 3	Group A	$107.89		
Zone 4	Group C	$101.39		
	Statewide		$136.63	$53.94
dB Loop Loss Conditioning		$6.63	$22.76	$8.58
Cross Connects				
Cross - Connects with Test Equipment, Same Central Office				
2-Wire Analog		$1.89	$35.83	$29.44
4-Wire Analog		$3.77	$41.63	$35.73
2-Wire Digital ISDN-BRI		$1.89	$35.83	$29.44
4-Wire Digital DS-1/ISDN-PRI		$9.00	$60.04	$41.06
Cross - Connects without Test Equipment, Same Central Office				
2-Wire Analog		$0.31	$19.96	$12.69
4-Wire Analog		$0.63	$25.38	$17.73
2-Wire Digital ISDN-BRI		$0.31	$19.96	$12.69
4-Wire Digital DS-1/ISDN-PRI		$0.00	$34.48	$28.57
Cross-Connects to Different CO or SWBT Multiplexor				
2-Wire Analog		$4.03	$52.24	$45.85
4-Wire Analog		$5.19	$60.47	$54.57
2-Wire Digital ISDN-BRI		$6.31	$52.24	$45.85

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the interim ar SWBT proposed 3 rate zones by combining tariffed rate zones C and D into one zone.

Proposed Pricing for Unbundled Network Elements

Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
Local Switching Port Charges				
2-Wire Analog Line-Side Port				
Zone 1	Group D	$1.74		
Zone 2	Group B	$1.97		
Zone 3	Group A	$2.47		
Zone 4	Group C	$2.25		
	Statewide		$39.37	$35.27
ISDN-BRI Port				
Zone 1	Group D	$5.56		
Zone 2	Group B	$5.56		
Zone 3	Group A	$5.56		
Zone 4	Group C	$5.56		
	Statewide		$6.47	$3.53
ISDN-PRI Port				
Zone 1	Group D	$165.85		
Zone 2	Group B	$165.85		
Zone 3	Group A	$165.85		
Zone 4	Group C	$165.85		
	Statewide		$214.53	$98.53
DS-1 Trunk Port				
Zone 1	Group D	$132.14	$162.38	$24.76
Zone 2	Group B	$126.71	$162.44	$24.83
Zone 3	Group A	$58.04	$160.47	$22.86
Zone 4	Group C	$140.35	$164.98	$27.36
2-Wire Analog Trunk Port (DID)				
Zone 1	Group D	$13.55	$64.00	
Zone 2	Group B	$14.45	$69.47	
Zone 3	Group A	$10.60	$59.76	
Zone 4	Group C	$15.12	$62.01	
Usage - per Minute of Use				
Zone 1	Group D	$0.001988		
Zone 2	Group B	$0.002391		
Zone 3	Group A	$0.003444		
Zone 4	Group C	$0.002934		
	Statewide		na	

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the Interim and SWBT proposed 3 rate zones by combining tariffed rate zones C and D into one zone.

Proposed Pricing for Unbundled Network Elements

Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
<u>Dedicated Interoffice Transport</u>				
DS 1 Dedicated Transport I/O First Mile, per month				
Zone 1	Group D	$57.49	$184.84	$118.14
Zone 2	Group B	$86.96	$184.84	$118.14
Zone 3	Group A	$92.07	$184.84	$118.14
Zone 4	Group C	$48.70	$184.84	$118.14
InterZone		$100.36	$184.84	$118.14
DS 1 Dedicated Transport I/O Additional Mile, per month				
Zone 1	Group D	$0.62	$184.84	$118.14
Zone 2	Group B	$1.67	$184.84	$118.14
Zone 3	Group A	$1.60	$184.84	$118.14
Zone 4	Group C	$0.19	$184.84	$118.14
InterZone		$0.97	$184.84	$118.14
DS 3 Dedicated Transport I/O First Mile, per month				
Zone 1	Group D	$925.21	$203.10	$135.06
Zone 2	Group B	$1,824.14	$203.10	$135.06
Zone 3	Group A	$2,052.06	$203.10	$135.06
Zone 4	Group C	$789.13	$203.10	$135.06
InterZone		$2,361.66	$203.10	$135.06
DS 3 Dedicated Transport I/O Additional Mile, per month				
Zone 1	Group D	$15.64	$203.10	$135.06
Zone 2	Group B	$56.45	$203.10	$135.06
Zone 3	Group A	$97.60	$203.10	$135.06
Zone 4	Group C	$17.32	$203.10	$135.06
InterZone		$25.87	$203.10	$135.06
Transport Cross-Connects				
DS 3		$30.08	$54.98	$42.90

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the Interim and SWBT proposed 3 rate zones by combining tariffed rate zones C and D into one zone.

** The rate for an entrance facility should only apply when this element is actually utilized.

Proposed Pricing for Unbundled Network Elements

	Staff Proposed Price	NRCs First	NRCs Additional
Tandem Switching			
per Minute Of Use	$0.00151	na	na
Signaling and Call Related Databases			
Signal Transfer Point (STP) Port	$480.61	$217.14*	
SS7 Transport	$0.0000007	na	na
Toll Free Calling Database Query			
Simple	$0.000254	na	na
Complex	$0.000288	na	na
Calling Name Delivery Query	$0.000304	na	na
Line Information Database Query	$0.000449	$108.55	
Dark Fiber			
Fiber Termination			
Statewide	$4.50	$42.52	$28.41
Fiber, per strand, per mile			
Zone 1 Group D	$0.002085		
Zone 2 Group B	$0.003156		
Zone 3 Group A	$0.004752		
Zone 4 Group C	$0.002085		
Unbundled Common Transport			
Facility Cost per Minute, per Mile			
Zone 1- Group D	$0.000002	na	na
Zone 2 - Group B	$0.000007		
Zone 3 - Group A	$0.000015		
Zone 4 - Group C	$0.000001		
InterZone	$0.000003		
Termination Cost Per Minute of Use			
Zone 1- Group D	$0.000190	na	na
Zone 2 - Group B	$0.000285		
Zone 3 - Group A	$0.000302		
Zone 4 - Group C	$0.000162		
InterZone	$0.000332		
Directory Assistance and Operator Services			
Directory Assistance	1	na	na
Directory Assistance Call Completion	1		
Directory Assistance Listing	1		
Local Operator Assistance	1		
IntraLATA Operator Assistance	1		
Operator Work Seconds	1		

1 Lowest Existing Intercompany Compensation Arrangement

* Includes NRC for STP port termination, signaling point code, and global title translation.

Proposed Pricing for Unbundled Network Elements

Service Charge	$5.00
CLEC Conversion	No Additional Charge other than Service Order

Proposed Pricing for Unbundled Network Elements

Rate Zone*	Tariffed Rate Group	Staff Proposed Price	NRCs First	NRCs Additional
Subloop Unbundling**				
8dB Feeder				
Zone 1	Group D	$4.81		
Zone 2	Group B	$6.60		
Zone 3	Group A	$6.87		
Zone 4	Group C	$9.90		
	Statewide		$22.88	$10.55
BRI Feeder				
Zone 1	Group D	$20.18		
Zone 2	Group B	$32.17		
Zone 3	Group A	$30.89		
Zone 4	Group C	$39.13		
	Statewide		$54.02	$27.26
DS1 Feeder				
Zone 1	Group D	$67.05		
Zone 2	Group B	$67.27		
Zone 3	Group A	$67.17		
Zone 4	Group C	$70.79		
	Statewide		$88.78	$39.97
8dB Distribution				
Zone 1	Group D	$6.69		
Zone 2	Group B	$10.68		
Zone 3	Group A	$12.92		
Zone 4	Group C	$22.78		
	Statewide		$113.44	$47.28
BRI Distribution				
Zone 1	Group D	$9.63		
Zone 2	Group B	$13.63		
Zone 3	Group A	$15.86		
Zone 4	Group C	$25.70		
	Statewide		$115.68	$51.43
DS1 Distribution				
Zone 1	Group D	$4.68		
Zone 2	Group B	$6.23		
Zone 3	Group A	$10.05		
Zone 4	Group C	$22.41		
	Statewide		$175.77	$69.44

* Staff proposed 4 rate zones corresponding to SWBT's tariffed rate groups while the Interim and SWBT proposed 3 rate zones by combining tariffed rates zones C and D into one zone.

** The cost of concentration is included in both the feeder and distribution segments.

Summary of Staff's Proposed Modifications to SWBT Cost Studies

The following table summarizes each of the Staff's modification to SWBT cost studies. Theses modifications were made to calculate the Staff proposed prices for UNEs.

Issue	Staff's Recommended Modifications
Modifications Affecting All Elements	
Cost of Capital	Use 10.36%.
Depreciation	Use the economic asset lives proposed by Staff. These economic lives are based predominantly upon bench-marking a composite of SWBT's proposed depreciation rates against implied depreciation rates of 19 likely competitors and other companies using similar technologies as SWBT. While the implied rates indicate a large range, SWBT's economic depreciation rates put SWBT sixth from the lowest in the pool of 19 benchmarked companies and 28 implied depreciation rates. Staff also recommends the use of MO-specific salvage values and the use of the Vintage Group (VG) method of depreciation recovery.
Income Tax	Use of the effective rate without the Investment Tax Credit (ITC) Amortization - 38.36%. Staff believes this is the appropriate tax rate for a forward-looking firm. The ITC is no longer available and represents historic tax assessments.
Geographic Deaveraging	Use four rate zones instead of three. The four rate zones are based upon exchanges and match SWBT's existing rate groups. Staff believes this more closely reflects the geographic differences in costs.
Inflation Factors	Staff believes there is no justification to warrant the use of an inflation factor without also using a productivity factor. When the two are used together, they basically offset one another. Therefore Staff recommends that no inflation factor and no productivity factor be used.
Productivity Factor	Staff believes there is no justification to warrant the use of an inflation factor without also using a productivity factor. When the two are used together, they basically offset one another. Therefore Staff recommends that no inflation factor and no productivity factor be used.

Issue	Staff's Recommended Modifications
Building Factor	Remove the CC/BC ratio from both the numerator and denominator to reflect the historic building and switching investment. SWBT's building factor was intended to be forward-looking. The use of the CC/BC ratio simply inflates the booked costs of the existing buildings and assumes exactly the number, size, and type of buildings would be put in exactly the same location. The FCC's use of existing wire centers was never intended to be a forward-looking assumption. A truly forward-looking building factor would have to recognize that fewer and smaller buildings would be used if the network were totally replaced. SWBT's building factor also fails to recognize the revenues for collocation and double recovers building investment. For these reasons, Staff recommends using the historic building investment in developing the cost factor.
Building and Grounds Maintenance	The investment used in developing this factor must be the historic building investment. This adjustment is made to be consistent with the modification to the building factor.
Loop Modifications	
Distance Bands used in Loop Sample	Eliminate distance bands or use the average length in each band. Staff believes this more accurately reflects the loop lengths in the sample.
Loop Specific Samples	Use a separate DS-1 sample for DS-1 loops, entrance facilities, and any other elements that uses a DS-1 loop. To be consistent, remove the DS-1 loops from the 8 db loop sample. Staff believes there are physical differences between 8 db loops and DS-1 loops. To reflect these differences, the sample needs to be specific to each type of loop.

Issue	Staff's Recommended Modifications
Fill Factor	Distribution - all zones use 40%. Feeder - Rate Group A - 69.58% Rate Group B - 77.90% Rate Group C - 76.80% Rate Group D - 75.70% Fiber Feeder, Feeder Stub, and DLC - all zones use 85%. There will be no additional fill on unused fiber feeder segments. Staff notes that SWBT never included a fiber strand fill factor in the loop cost studies. Staff believes the use of a forward-looking utilization level that is expected to occur over the life of the contract is most appropriate. Staff also believes the utilization levels need to reflect the shorter economic asset lives that SWBT will be using. Finally, Staff believes there is an inherent inconsistency in SWBT's proposal to utilize forward-looking loop characteristics and investment without the associated forward-looking utilization levels.
Distribution to Code	SWBT's model should reflect a distribution to code that recognizes the forward-looking trend away from aerial feeder. The distribution to code used in the LPVST model should have 2% aerial feeder. This is based upon conversations with SWBT's network personnel.
Feeder Stub	Subtract the feeder stub from feeder for any loop over 15 kft. SWBT's treatment of the feeder stub results in a double recovery of its investment.
Pole and Conduit Sharing	Reflect 6.41% pole sharing and .09% conduit sharing. This is in addition to the approximately 45% of the poles SWBT shares with Union Electric that is already reflected in the pole investment.
Pole and Conduit Investment	Calculate investment outside the LPVST model. The method used in making this calculation will be similar to the method used in Texas with one exception. The number of poles will be calculated by dividing the Average Aerial Copper Span by the Average Pole Spacing. No additional rounding or inclusion of additional poles is allowed.
Switching - Ports and MOU	
Hardware Factor	Use a hardware factor that is specific to each type of switch. SWBT does not have any data to justify a hardware factors on AXE-10 and the DMS-10 so no hardware factors will be applied to these switches. Staff believes making the costs specific to each type of switch more accurately reflects the underlying costs.

Issue	Staff's Recommended Modifications
Minutes of Use	The minutes of use used in the switching cost studies must be forward-looking and reflect 10% growth per year. Staff believes this represents the utilization levels that will occur over the life of the contract. The 10% per year forecast is based upon historical data and conversations with SWBT network personnel.
Discounts	Staff's proposed discounts apply only to materials. Staff believes these are conservative estimates of the discounts SWBT receives on switching. Staff's proposed discounts are based upon growth jobs which typically have less of a discount than new switch purchases.
Analog Replacement	Replace analog switches with DMS-100 or 5ESS switches. Staff believes that simply removing analog switches from the study results in a biased sample.
Lines and Trunks	Use forward-looking line counts. Staff believes this represents the utilization levels that will occur over the life of the contract
Cost of Capital Used in Switching Studies	Use Staff's recommended 10.36% in all switching studies.
Tandem Double Counting	SWBT's local switching and tandem studies count Class 4/5 switches that serve as both end office and tandem switches in each study. This overstates the amount of investment. To correct this, multiply the ratio of local minutes divided by the total minutes by the getting started investment and SS7 investment for Class 4/5 switches used in the local switching studies. Eliminate the total tandem trunk CCS investments from the local switching studies. This methodology is based upon conversations with SWBT's Subject Matter Experts.
Weighting	Weight all switch port costs (except ISDN-BRI and ISDN-PRI) by the number of lines served by the switch. All switch types including AXE-10 and DMS-10 that use a particular port must be included in the cost. ISDN services are not included because, on a forward-looking basis, SWBT will provision these services with only one type of switch.
Intra office Calls Adjustment	SWBT's cost studies inappropriately counted Intra office minutes of use twice. To account for this, 9% of the total minutes of use should be removed.
Incomplete Calls	SWBT's cost studies do not include the cost for incomplete calls. No adjustment was recommended because sufficient data is not available.

Issue	Staff's Recommended Modifications
Signaling	
STP Utilization	A link - 46.13125% C link - 12.9% D link - 40.47% SCP link - 18.76% 800 DB Queries - 286 LIDB queries - 30.25 CNAM queries - 359.37 10% port growth per year Factors can be rounded Staff believes this forward-looking utilization is appropriate. This usage level recognizes the trend of increasing utilization and the implementation of local number portability (LNP) that will occur during this contract period. These usage levels are based upon conversations with SWBT's subject matter expert who does agree with these proposed usage levels.
Interoffice Transport	
Interoffice Transport Fiber Fill	90% fiber strand fill High Speed Side electronics - 50% Slow Speed Side electronics - 85% Staff believes a fill of 90% would allow for the actual and near term use of the fiber, allow for a breakage factor (fibers that are unusable) and recognize that the investment in fiber can be recovered through the dark fiber rate element. Finally, unused or dark interoffice fiber can be used to provision different services. Staff feels it is not appropriate to assume it will be used for interoffice transport and allocate its costs to that rate element.
Dark Fiber	
Dark Fiber Fill	Staff believes SWBT's use of a 60% fill factor is too low. This fill factor would recover 40% of the fiber investment without SWBT ever having to use the facilities or make them available to other carriers. Staff believes this fill factor would create little incentive for SWBT to make dark fiber available to other carriers. Staff recommends a 95% fill factor for dark fiber strands. The 5% spare capacity will allow for breakage (unusable fiber). SWBT can recover the investment in dark fiber by leasing it to other carriers or through its own use. Staff notes that the interoffice transport has a 90% fill factor on dark fiber. When the two are combined, SWBT has 15% of its unlit fiber reserved for breakage and near term use.

Issue	Staff's Recommended Modifications
Connectivity of Dark Fiber	Staff recommends that fiber termination charges be applied per termination rather than on a per mile basis. Fiber termination costs are not distance sensitive. Where possible, costs should be recovered in the manner in which they occur. Fiber termination costs are incurred each time a fiber cable is terminated. Therefore, the corresponding rate should apply per termination.
Miscellaneous Modifications	
In-Place Factors	All changes made to ACES must be made to in-place factors.
In-Place Factors	BRI, DS-1, and PRI must remove the power factor from the ACES run. SWBT's cost studies included this factor in two places, leading to a double recovery of investment.
Non-Recurring Charges	Service Order - $5.00 Simple Conversion - no charge other than the Service Order charge. CLEC must specify which UNE's it needs to provide service. All other NRC's should be half of those proposed by SWBT. Staff is concerned that the primary source of the cost data for the NRCs is based upon the opinion of Subject Matter Experts not on actual time and motion studies or cost information. Additionally Staff is concerned that these charges present significant barriers to entry for local competition.

SECTION II.
UNBUNDLED NETWORK ELEMENTS

This section presents Staff's findings and recommendations for SWBT's specific cost studies. For each cost study, its purpose, proposed recommendations, and a summary of the study is presented. The summary of the cost study presents a discussion of inputs, models used, and methodology for determining incremental investment. This section is divided into three sub-sections. The first address cost studies specific to a particular unbundled network element (UNE) or group of UNEs. The second section addresses the model, namely the ACES cost model, and the inputs that affect the costs for all UNEs. These include common costs, cost of capital, depreciation, income tax, inflation and productivity factors and geographic deaveraging. Also included in the section is an analysis of the non-recurring charges for Service Orders and for provisioning UNEs. Finally, the last subsection address the Hatfield Model.

Loop Cost Studies

Purpose

The purpose of this study is to identify the investment and the TELRIC associated with the local loop for a standard 8 db loop as well as Integrated Services Digital Network-Basic Rate Interface (ISDN-BRI), Digital Service-1 (DS-1), and Integrated Services Digital Network-Primary Rate Interface (ISDN-PRI) loops. The study utilizes the Loopvest model which calculates the cable, pole and conduit costs associated with each type of loop. The second part of the study identifies the cost associated with the feeder stub, feeder distribution interface (FDI), Digital Loop Carrier Equipment (DLC), network interface device (NID), drop, and other network components.

Concerns and Proposed Modifications

The following section identifies the primary areas of concern with the study SWBT used to calculate the costs of each type of loop. Where possible, Staff recommends certain modifications to rectify or reduce problem areas. In the instances where a modification is not possible , Staff explains the concerns and attempts to estimate the impact or implications of the problem.

Mid-Point Distance Used in Loop Sample - The loop sample is divided into distance bands to capture the costs of different design standards for different loop lengths. SWBT was calculating the cost for each distance band using the mid-point of each band. Our analysis showed that the mid-point distance was statistically different from the average distance in the distance band. In total, the difference between the average and the mid-point led to a significant overstatement of the cable actually in the loop.

DS-1 & ISDN-PRI Loop Sample - SWBT uses the same loop sample drawn from all types of loop for calculating the cost of each type of loop. The predominant loop in the sample is an 8 db residential loop. Because of the dominance of the sample by one type of loop, the loop sample tended to reflect the characteristics of that type of loop. On average, an 8 db loop is longer than a DS-1 or an ISDN-PRI loop which causes the cost studies to overstate the length and cost of these two types of loops. That difference is substantial, especially in rural areas.

To resolve the problem, SWBT made the sample specific to each type of loop. To accomplish this, SWBT will remove the DS-1 and ISDN-PRI loops from the overall sample. Since the DS-1 and ISDN-PRI loops are shorter, on average, removing them from the loop sample may increase the average sample length for 8 db loops. Because of the dominance of the 8 db loops, this increase should be minimal.

Fill Factors

Fill Factors are applied to cable and DLC electronics used in the loop to recover the investment for unused capacity. SWBT proposed using their actual fill factors in the TELRIC studies. Staff believes the use of actual fill factors is not forward-looking and does not correspond to other forward-looking assumptions made by SWBT. The fill factors and the proposed modifications for each loop component that utilize fill factors are described below. Section I applies to all components using fill factors and the following subsections propose modifications and rationale for fill factors for specific loop components.

SWBT opposes the use of forward-looking fill factors. SWBT contends that its actual fills are the best representation of utilization in a rapidly changing competitive environment. Staff submitted multiple data requests asking SWBT to provide forward-looking fill factors or estimates of future usage. In each instance, SWBT responded that it did not have data to make a forward-looking usage projection.

I. All Fill Factors - One reason for proposing forward-looking fill factors is the use of economic depreciation rates. SWBT's current utilization levels are based upon a capital recovery period that is almost twice as long as the capital recovery period resulting from the use of economic depreciation rates. The following table compares the FCC Ordered asset lives to the Staff proposed economic lives for the major copper cable accounts which comprise the bulk of the loop. Clearly, the Staff proposed economic lives are much

Comparison of FCC Ordered Lives and Staff Proposed Economic Lives for Copper Cable Accounts			
Type of Copper Cable	SWBT Current Asset Lives (yr.)	Staff Proposed Economic Lives (yr.)	Difference
Aerial	26	13.7	- 47.3%
Underground	30	15	- 50.0%
Buried	25	16.3	- 34.8%

shorter than the lives SWBT currently operates under. It seems reasonable that a company would try to match the utilization of the network with its useful economic life. For this reason, increased fill factors that reflect a shorter capital recovery period should be used.

II. Distribution - SWBT utilizes the following fill factors for distribution:

Zone 1	**______**
Zone 2	**______**
Zone 3	**______**
Total State	**______**

SWBT's fill factors for each zone are the ratio of actual working lines to available lines. Because of the use of economic depreciation rates and trends in network utilization, Staff believes that utilization of SWBT's proposed fill factors is not appropriate.

One trend that Staff believes will greatly impact the fill factors in the distribution segment of the network is the increased utilization of second lines. When SWBT provides a second lines to a customer, SWBT does not physically build new facilities to the customer, Instead, one of the customer's allotted distribution pairs is used to provision the service. Therefore, if a customer orders a second line, this will have the effect of increasing fill in the distribution segment of the loop. Below is a table that identifies the percentage of households from 1988 to 1995 which have second lines:

Additional Residential Lines For Households with Telephone Service[1]

Year	% Households with Second Lines
1988	2.7
1989	3.0
1990	4.4
1991	7.3
1992	9.2
1993	9.5
1994	12.3
1995	14.7

As the table indicates, the number of second lines for residential customers is increasing. Staff believes this trend will have a significant impact on the fill factors used in the distribution portion of the network.

Finally, the Hatfield model utilizes a statewide average fill factor of 50.2%. Although Staff is not recommending the use of the Hatfield model, it is worth noting that the model's fill factors are higher than either of those proposed by SWBT or Staff.

Staff proposes a 40% fill factor for the distribution segment of the loop for all geographic zones. Staff believes that this is a conservative forward-looking estimate, as SWBT currently utilizes distribution fills as high as **______** (fill in geographic zone 1).

[1] Federal Communications Commission, Trends in Telephone Service, March 1997.

III. Copper Feeder - SWBT utilizes the following fill factors for copper feeder:

Zone 1	**______**
Zone 2	**______**
Zone 3	**______**
Total State	**______**

Again, SWBT's copper feeder fill factors are based on actual working lines to available pairs. Because of the use of economic depreciation rates, Staff believes that utilization of SWBT's proposed fill factors is not appropriate. Additionally Staff believes that because of other forward-looking assumptions made by SWBT in the loop cost models, it is not appropriate to use SWBT's current utilization levels.

One of the forward-looking assumptions SWBT makes in its TELRIC loop studies is that there will be 100% Feeder Distribution Interface (FDI) placement. An FDI is simply a cross connect box located in the field, which allows any pair of distribution cables to be connected to any pair of feeder cables. SWBT's FDI assumption means that every loop will be provisioned with an FDI. From testimony of SWBT witness Bill Deere, it is known that approximately 60% of existing loops use an FDI.

SWBT's forward-looking assumption that all loops will be instantaneously provisioned with an FDI should also be accompanied by an assumption that feeder fill will increase. Because FDI's provide an additional cross connect point and increased flexibility, feeder fill will be higher for loops with an FDI than loops without an FDI. SWBT does not dispute that copper fill will increase with the addition of FDIs.

In light of the fact that feeder fill will undisputedly increase as a result of SWBT's 100% FDI placement, and because of the proposed asset lives which are much shorter than lives under which SWBT currently operates, Staff proposes the following fill factors for the copper feeder segment of the loop:

Zone 1	76.80%
Zone 2	77.90%
Zone 3	69.58%
Total State	75.70%

IV. Fiber Feeder - With regard to the fiber feeder segment of the loop, SWBT has proposed the same fill factors used in the DLC equipment which is **______**. Under SWBT's forward-looking assumptions, fiber and DLC technology will be used in the feeder segment of the loop whenever the loop is greater than 15,000 feet. These loops will be provisioned via DLC technology using fiber in the feeder segment of the loop, a copper feeder stub connecting the DLC remote terminal to the FDI, and copper facilities in the distribution segment of the loop.

Utilization of fiber should have a fill factor much higher than SWBT proposes. As electronics can be added to increase capacity on fiber, a fiber segment of the loop should almost never reach its capacity. Staff acknowledges that SWBT should be allowed to set some fiber strands aside for administrative and breakage purposes. As a result of the fact that the capacity of fiber is enormous, and for reasons such as 100% FDI placement and shorter asset lives, Staff believes that the proposed 85% fiber feeder fill is appropriate

V. Feeder Stub - SWBT uses a fill factor of **______** for the feeder stub segment for all geographic zones. Feeder stub is the copper facility which connects the DLC equipment to the FDI. Because feeder stub is part of the feeder plant, fill should be the same as that used in the feeder facility. For this reason, Staff recommends an 85% fill factor for feeder stub.

VI. DLC - In matters concerning the DLC equipment, SWBT utilizes a fill factor of **______**. As stated previously, DLC is a piece of multiplexing/demultiplexing equipment that is housed in a remote terminal at the end of a feeder facility. DLC equipment does not need to have a large amount of spare capacity, as the existing capacity can be increased due to its modularity. Specifically, additional line cards can be added to the DLC to increase capacity. The DLCs' modularity certainly warrants a fill factor higher than that proposed by SWBT. In light of these considerations, Staff recommends an 85% fill on DLC equipment. Staff believes this allows sufficient capacity for administration and breakage while still recognizing the modularity of the equipment.

Distribution to Code Percentages - SWBT used its existing distribution to code instead of a forward-looking distribution to code. The distribution to code identifies the percentage of aerial, buried, underground cable for each type of cable placement. SWBT is currently replacing as much aerial copper feeder as possible with buried copper feeder cable in its network. In addition, SWBT does not use any aerial fiber in its existing network and will not use aerial fiber on a forward-looking basis. To reflect this conversion, it seemed appropriate to use a forward-looking distribution to code that accounted for the reduction in aerial feeder and an increase in buried feeder.

Staff discussed the modification of feeder distribution to code with SWBT. SWBT stated that even though they were reducing the amount of aerial copper feeder, it would never be zero because of physical conditions that required its use. To accomplish this Staff recommends a distribution to code for feeder that contains no more than 2% aerial copper feeder. The forward-looking distribution to code for fiber was adjusted to reflect the fact that SWBT does not use any aerial fiber cable. The buried and underground cable accounts were adjusted to reflect the reduction in aerial cable. The following table shows the existing and Staff proposed distribution to code.

Feeder Distribution to Code Percentages

Current Distribution to Code				
Rate Zone	**Aerial**	**Underground**	**Buried**	**Total**
Rural	**___**	**___**	**___**	**___**
Suburban	**___**	**___**	**___**	**___**
Urban	**___**	**___**	**___**	**___**
Staff Proposed Forward-Looking Copper Feeder Distribution to Code				
Rate Zone	**Aerial**	**Underground**	**Buried**	**Total**
Rural	2.00%	17.32%	80.68%	100.00%
Suburban	2.00%	42.87%	55.13%	100.00%
Urban	2.00%	83.76%	14.24%	100.00%
Staff Proposed Forward-Looking Fiber Feeder Distribution to Code				
Rate Zone	**Aerial**	**Underground**	**Buried**	**Total**
Rural	0.00%	19.81%	80.68%	100.00%
Suburban	0.00%	44.95%	55.13%	100.00%
Urban	0.00%	85.69%	14.24%	100.00%

Feeder Stub - The methodology that SWBT used to calculate the amount of feeder cable resulted in a double counting of the feeder stub. The feeder stub is a section of copper cable that connects the DLC to the FDI. To correct this problem, SWBT will subtract the length of feeder stub from the current segment on any loop that uses DLC.

Pole and Conduit Sharing - The loop cost models ignore pole and conduit sharing. SWBT provided data that indicated that currently about one percent of the conduit space and approximately six percent of the available pole space is shared with other entities. SWBT also stated that it and Union Electric regularly share poles but that sharing is not reflected in the **___** calculation. Instead, that sharing is implicitly contained in the pole investment report by SWBT. SWBT does not report pole investment as if it owned 100% of the poles in the network but instead reports an amount that reflects the fact the pole sharing exists with Union Electric. SWBT's inputs into the Hatfield Model 3.1 reflected 60% of the poles are shared with other companies. A similar amount of sharing is implicitly contained in SWBT's cost studies. The **__** pole sharing reported by SWBT accounts for sharing in addition to the sharing with Union Electric.

In considering the forward-looking pole and conduit sharing, it seems likely that in the near future, pole and conduit sharing will not increase dramatically. In the near term, most entrants into the local markets are expected to enter through resale or unbundled elements and provision their own loops using SWBT's poles and conduits. Therefore, Staff recommend that the investment in poles and conduits be adjusted to account for the current amount of sharing.

Pole and Conduit Investment - The methodology used by SWBT to determine the investment in poles and conduits is based upon historical investment ratios not the physical characteristics of the pole itself. The pole and conduit expense factors are based upon the historical investment in poles vs. aerial cable and conduit vs. underground cable to arrive at a factor that represents the investment in poles and conduit per dollar of investment in aerial and underground cable. This allocates more pole investment to cables with a higher pair/ft investment. Since cable size and installed pair/ft investment are inversely correlated, this factor applies more pole investment to smaller cables. This clearly does not match reality.

The modification that Staff proposes would be to determine the per pole investment, less any sharing, and multiply that times the average number of poles per aerial span to arrive at the average pole investment per aerial span. Once this cost is known, multiply it times a factor representing the number of working loops per pole to arrive at an average pole investment per cable pair. Multiplying the average pole investment times the number of working lines accounts for the space required for unused cable pairs on the pole. The pole investment per working cable pair is then input into the ACES model to arrive at the pole cost per month.

The adjustment for the conduit factor is identical to the pole modification. Like the pole calculation, the fiber fill factor would be built into the conduit factor to allow SWBT to recover the conduit investment associated with unused fiber. This would raise some concerns since the unused fiber is dark fiber and the investment associated with dark fiber can be recovered separately. A review of the dark fiber cost studies indicated that no conduit costs are being recovered through dark fiber so the issue of double recovery does not apply.

Additional Model Concerns That Cannot Be Modified At This Time

Feeder and FDI Termination - SWBT's loop models assume that each feeder segment terminates to only one FDI. SWBT determines the size of the feeder cable by the size of the FDI and then assumes the feeder segments has the same number of cable pairs because it connects directly to the FDI. In reality, a feeder segment may originate as a very large cable and taper as the cable terminates to multiple FDIs. SWBT's assumption will increase the cost of the feeder segment because it precludes the use of large size cable at the beginning of the feeder segment and fails to recognize the tapering of the feeder cable. SWBT's methodology would increase the number of smaller cables which have a higher cost per pair.

SWBT stated that it did not have any data related to the cable tapering and could not incorporate the tapering into the loop cost study. Given that no data exists, no modifications are possible. It is important to remember that SWBT's assumption of a single feeder cable terminating to an FDI will overstate the cable costs and overstate the cost of the loop.

Identical Distribution to Code for All Loop Types - The loop model assumes that all types of loops have the same percentage of buried, underground, and aerial cable. Since SWBT assumes DS-1 and ISDN-PRI loops have a copper/fiber cross-over at 6 kft and SWBT assumes that no fiber is aerial, it does not seem reasonable to assume the same percentage of aerial cable for a DS-1 loop and an 8 db loop.

SWBT stated that it did not have distribution to code data specific to each type of loop. Until such data is reported, no modification can be made. It is not clear what type of impact, if any, this modification would have on loop costs.

Summary of Loop Study

The loop cost study calculates the cost for 8 db loop, ISDN-BRI, DS-1 and ISDN-PRI loops. The study relies on the Loopvest model to calculate the investment for cable and the uses investment additives to calculate the investment for additional hardware necessary to provision each type of loop. Each of these items is discussed in more detail below.

Loopvest Model - Cable, Pole, and Conduit Section

Loopvest relies on a sample of loops by geographic zone to calculate the cost of the loop for that zone. Once the loop characteristics of the sample are identified, cost factors are applied to calculate the total installed cable investment for the loop. Once the installed investment for cable is determined, the investment required for poles and conduits is calculated by applying historic investments to the installed value of the cable.

Loop Sample - A sample for each rate zone is drawn by wire center for a total of three random samples. The size of the sample varies by geographic zone but is based upon the size necessary for a 95% confidence level. A sample is drawn from all loops and the same sample is used to determine the costs of all different types of loops: 8 db, ISDN-BRI, ISDN-PRI, and DS-1. Since the most prevalent loop is the 8 db loop, a random sample will tend to reflect the loop characteristics of an 8 db loop.

Sampling Implications - The sample is drawn from all loops and the same sample is used to determine the costs of all different types of loops: 8 db, ISDN-BRI, DS-1 and ISDN-PRI. Because the most prevalent loop is the 8 db loop, a random sample from all loops will tend to reflect the characteristics of an 8 db loop. To the extent that different types of loops have different physical characteristics than an 8 db loop, the costs of each type of loop will be incorrectly portrayed by SWBT's model. While there might not be a significant difference in the loop length for an 8 db loop and an ISDN-BRI loop, it is expected that, in general, DS-1 and ISDN-PRI loops tend to be shorter than a regular 8 db loop. SWBT recognizes the quality difference between 8 db loops and DS-1 loops by adjusting the copper/fiber cross-over point to 6 kft for DS-1 and ISDN-PRI loops. Since SWBT stated that it was uneconomical to use a 6 kft cross-over point for 8 db loops, the use of the 6 kft cross-over combined with a sample that reflects the length of a regular 8 db loop would overstate the true cost of DS-1 and ISDN-PRI loops. Since both DS-1 and ISDN-PRI loops are 4-wire loops, this overstatement is compounded when SWBT doubles the cost of a 2-wire loop to arrive at the cost of a 4-wire loop.

Identification of Cable Type - Once the sample is chosen, the total cable in each loop is divided into three categories; copper feeder, fiber feeder, and distribution cable. The distinction between each category is important because each has a different cost per foot as a result of different cable costs, fill factors and design and sizing criteria. In general, distribution cable has a higher investment per pair/foot than feeder cable.

Feeder Cable - Feeder cable is the cable that is placed between the Central Office and an FDI. The feeder is identified through engineering records by one of two methods. On 60% of loops, the feeder terminates to an FDI box and easily distinguished between feeder and distribution. The other 40% of the loops contain hard-splices that directly connect the feeder and distribution cable. In these cases, SWBT's engineering records place a theoretical FDI to identify points where feeder and distribution are joined. The placement of the theoretical FDI is subjectively determined by a facilities engineer at the time the loop is provisioned. One of SWBT's forward-looking assumptions is that in the future an FDI will always be used in joining feeder and distribution cable. Therefore, SWBT's cost studies reflect the cost of an FDI on 100% of the loops while in reality an FDI is only used in 60% of the loops. SWBT stated this assumption corresponds with SWBT current network design criteria. The assumption of 100% FDI placement will allow greater flexibility in the network and should allow SWBT to realize a higher fill factor on feeder cable.

The Loopvest model also assumes that a feeder cable will only terminate to a single FDI. In other words, there is one feeder cable running directly to every FDI. In reality, a feeder segment may originate as a very large cable and taper as the cable terminates to multiple FDIs. This assumption will increase the cost of the feeder segment because it precludes the use of large size cable at the beginning of the feeder segment and fails to recognize the possibility of tapering the feeder cable.

Once the feeder has been identified, it is separated into two groups, copper and fiber feeder cable. This is accomplished by the assumption of a 15 kft copper/fiber cross-over point for feeder cable in 8 db and ISDN-BRI loops and a 6 kft copper/fiber cross-over point for DS-1 and ISDN-PRI loops. In other words, the model assumes that all feeder runs in an 8 db and ISDN-BRI loop that are less than 15 kft are copper and that all feeder runs 15 kft or greater are fiber.

Assumed Copper/Fiber Cross-Over Point for Feeder Cable - For cost study purposes, SWBT has assumed a 15 kft copper/fiber cross-over point for 8 db and ISDN-BRI loops and a 6 kft cross-over point for DS-1 and ISDN-PRI loops. SWBT stated that this is a forward-looking assumption based upon current design criteria used by the company. SWBT has stated these points were chosen because they represent the most economical cross-over point between copper and fiber. The most economical cross-over point is based upon the trade-off between cheaper fiber optic cable and DLC equipment versus more expensive copper cable. SWBT submitted limited data to support the use of these cross-over points.

The most economical cross-over point generated by the Hatfield Model 3.1 is 9 kft. The difference between the two parties' most economical point is the price of the DLC equipment used on a fiber. SWBT reports a higher DLC cost and therefore requires a longer copper loop to offset the cost of the DLC equipment.

This assumption does represent a significant departure from the actual network in place today. For example, in the rural Rate Zone 3, this assumption results in over **___** of the feeder being provisioned with fiber optic cable while in reality only about **___** are currently provisioned with fiber.

Distribution Cable - After copper and fiber feeder cable are identified, the distribution cable is identified by subtracting the total feeder cable from the total cable in the sample. The determination of distribution cable is done by cable size so it reflects the fact that smaller cables are more prevalent in distribution cable that in feeder cable.

Inputs into Loopvest

Once the three categories and amounts of cable are identified, the installed investment per pair/foot for each category is identified for each type of placement (buried, underground, and aerial). After this has been done the inputs for fill factor, pole factor, and conduit factor are applied to the installed investment per pair foot for each cable. This is accomplished by using the following inputs into Loopvest.

Distance Distribution Bands - Because of various design criteria and requirements for different loop lengths, the loops are sorted and divided into 1 kft bands. For example, in copper cable, the wire size increases as the length of the loop increases. SWBT stated that dividing the loop into distance zones is the best way to recognize the different engineering requirements for various length loops.

Investment factors are then applied to the mid-point of the band. For example, all cable lengths between 1500 and 2499 ft. would be placed into a group and costs would be applied to the 2000 ft. mid-point. SWBT did not attempt to determine if the mid-point of each distance band was the same as the mean of the distance band. Our comparison of the mean and the mid-point indicates that the use of the mid-point overstates the length of cable in the sample. The amount of the overstatement appears to be statistically significant in a majority of the distance bands. SWBT agreed with this and proposed an adjustment to correct this problem.

Distribution to Code Percentages - This input measures the percentage of cable assigned to each type of placement. The types of placement for copper cable are aerial, buried, and underground while fiber is either buried or placed underground in conduit. The percentages used in SWBT cost studies are not forward-looking but are based upon historical placements in the existing loop. Using historical placement types may conflict with other forward-looking assumptions. SWBT's network witness, William Deere, testified that in a forward-looking network, SWBT would bury more feeder cable. This is not reflected in SWBT's cost models. An additional concern is that the same distribution to code percentages are used for all types of loops.

Once the necessary cable sizes and lengths are calculated from the distance bands and the amount of each placement type is determined the investment/pair foot is applied to compute the total cable investment.

Investment/Pair Foot - This is the average investment required for one foot of a cable pair. This is the primary investment input for the entire model. All other factors and inputs are applied to this input. The investment per pair foot is calculated for each cable segment (copper feeder, fiber feeder, and distribution) and for each type of placement (aerial, buried, underground). The investment per pair foot is weighted by the number of cable pairs of each size of cable. The source of the investment per pair/foot is the SWBT 1996 Outside Plant Broadgauge Report.

> **Investment/Pair Foot - Feeder** -The weighting for different cable sizes is based upon the size of FDIs used in the loop. Since an FDI is used only 60% of the time, the weighting is based upon 60% of the total feeder. This does not cause a problem if the distribution of cable size for feeder terminating to an FDI is the same as the distribution of cable size terminating to a hard splice. If the two distributions are different, this weighting will inaccurately reflect the weighted average investment per pair/foot.
>
> **Investment/Pair Foot - Distribution** - The weighted average investment per pair foot is calculated by subtracting the cost of feeder cable from the cost of all cable. The remaining cost per pair foot is assigned to distribution cable. The calculation is weighted by cable size and does recognize that distribution cable tends to be smaller and therefore has a higher cost per pair.

Fill Factor - The fill factor is the percentage of cable that is actually being used at the current time. In order to calculate the total cable cost per pair/foot including excess capacity realized by the fill factor, the investment per pair/foot is divided by the fill percentage to determine to the investment per pair foot including fill.

The fill factors used in SWBT's model are the actual fill factors in the existing loop. They differ by cable category (copper feeder, fiber feeder, and distribution) and by geographic zone. The following table depicts the fill by cable category and zone.

Fill Factors Used by SWBT

	Rate Zone 1	Rate Zone 2	Rate Zone 3	Statewide
Copper Feeder	**_____**	**_____**	**_____**	**_____**
Fiber Feeder	**_____**	**_____**	**_____**	**_____**
Distribution	**_____**	**_____**	**_____**	**_____**

It is important to remember that these fill factors are based upon the historical working pairs divided by the actual pairs in the loop today. They are not adjusted to be forward-looking nor do they recognize the increased utilization made possible by the use of higher depreciation rates.

Pole Factor - This factor is used to calculate the cost of poles used in aerial cable. The factor is applied to the investment per pair/foot times the total aerial pair feet in the loop segment. This factor is calculated based upon the ratio of total pole investment to the total historical aerial investment including fill. Both the pole and the aerial cable investment are adjusted to reflect the replacement cost of the investment by multiplying the book value of investment times the corresponding Current Cost/Book Cost Ratio (CC/BC Ratio). Even though the investment amounts are adjusted, this factor is based upon the replacement cost of SWBT's historic investment in poles and aerial cable.

Conduit Factor - This factor is used to calculate the cost of conduit used with underground cable. The factor is applied to the investment per pair/foot times the total underground pair/feet in the loop segment. This factor is calculated based upon the ratio of total conduit investment to the total historical underground cable investment including fill. Both the conduit and the underground cable investment are adjusted to reflect the replacement cost of the investment. Even though the investment amounts are adjusted, this factor is based upon the replacement cost of SWBT's historic investment in conduit and underground copper and fiber cable.

Like the pole factor, this method allocates the conduit investment based upon the investment in underground cable not by the physical characteristics of the cable it carriers. In addition, by including the fill factor in the equation, the same fill factor is built into the conduit investment. This is particularly troubling in the case of fiber optic cable where the fill factor is determined by the electronics on the end of fiber not by the excess fibers within the fiber optic cable. This results in all of the investment in conduit being recovered by the fibers currently in use without recognizing that the conduits also contain miles of dark fiber.

Implications of Pole and Conduit Factors - These factors allocate the conduit investment based upon the historic investment instead of by the physical characteristics of the cable it carriers. By including the fill factor in the equation, the same fill factor is built into the pole and conduit investment. This is particularly troubling in the case of fiber optic cable where the fill factor is determined by the electronics on the end of fiber not by the excess fibers within the fiber optic cable. This results in all conduit investment being recovered by the fibers currently in use without recognizing that the conduits also contain miles of dark fiber.

Additional Model Components

The additional model components are the additional equipment necessary to provision a working loop. This includes the electronics for providing digital circuits, termination equipment used to connect customers to the loop, as well as frame and other equipment used to connect the various loop segments.

Feeder Distribution Interface - As discussed earlier, one of SWBT's forward-looking assumptions is the use of a FDI in 100% of its loops. To recover the cost of the FDI, the model calculates the FDI cost per pair and assigns that to the loop investment. For 4-wire loops, the model doubles the per pair investment used in a two-wire loop.

Premise Termination - This component recovers the cost for the drop and the NID. The drop investment reflects a current mix of buried and underground drops. On a forward-looking basis, the prevalence of buried drops is expected to increase.

Feeder Stub - This component recovers the segment of feeder cable that connects the Digital Loop Carrier to the FDI. Currently, A feeder stub is used in both copper and fiber DLC. On a forward-looking basis, SWBT assumes there will not be DLC equipment used with copper.

The feeder stub costs are included in both the feeder segment and as a separate cost item. SWBT did agree that it was being counted twice and that it should be removed as a separate investment item. This is discussed in more detail in the Concerns and Suggested Modifications Section.

Digital Loop Carrier - This item recovers the costs for DLC which is a system that utilizes time-division multiplexing to combine individual channels into a common bit stream for transmission. On a forward-looking basis, DLC will only be used on fiber feeder segments greater than 15 kft. The type of DLC is specific to the geographic zone with larger systems used in dense urban areas and smaller systems used in the less dense areas.

The model assumes that on a forward-looking basis, **___** of the DLC will be integrated while the remaining **___** will be non-integrated universal DLC.

The DLC equipment used on the DS-1 and ISDN-PRI loops is also recovered through this additive.

Frame Stringer - The investment required for the Frame Stringer is recovered through this additive. It includes the investment in Frame and Lighting, Block & Riser, and the Spice [sic] and Place Cables.

ISDN-BRI Equipment - This investment is included in ISDN-BRI loops and includes the investment in loop hardware necessary to provision ISDN. It includes the Central Office Terminal and the Remote Terminal. Also included is the investment for a mid-span repeater. Because a mid-span repeater will only be necessary ** ____** of the time, only ** ____** of the investment is applied to the ISDN-BRI loop. Another option would have been to only include the investment in a mid-span repeater when it is actually used. This would be administratively harder to manage and would create the incentive for SWBT to use a mid-span repeater on every possible application. For this reason, applying a portion of the investment to each loop was chosen.

Summary

The loop cost study calculates the cost for 8 db loop, ISDN-BRI, DS-1 and ISDN-PRI loops. The study relies on the Loopvest model to calculate the investment for cable and uses the investment additives to calculate the investment for additional hardware necessary to provision each type of loop. This study generated several items of concern that warrant modification. Among those items were several that overstated the length of the loop and the use of existing fill factors and distribution to code that conflicted with other forward-looking assumptions made by SWBT. Additionally, this study calculated the cost of poles and conduits within the Loopvest model based upon historic investment relationships. Staff proposed a method for calculating pole and conduit investment outside of the Loopvest model that, while not perfect, accounts for the physical characteristics of the cables being place on poles or inside conduit. Finally, one area of concern that could not be addressed at this time was the assumption of a single feeder cable connecting to a single FDI. This assumption fails to recognize the economies of scale associated with the tapering of large cables and will overstate the investment in feeder cable.

Summary of the Cross-Connect Cost Study

Cross-connects consist of the distribution system equipment used to terminate and administer communication circuits. In a wire cross connect, copper jumper wires or patch cords are used to make circuit connections. In optical cross-connects, fiber optic patch cords are used. For SWBT's cross-connect cost studies, various scenarios are presented depending upon wire type and presence of testing equipment. The cost studies summarize the development of investment in cross-connect equipment and recurring and non-recurring costs associated with wire and optical cross-connects.

Purpose

The cross-connect cost study identifies the forward looking long run incremental recurring and non-recurring costs for the unbundled cross-connect. The study consists of the transmission equipment required to cross-connect the SWBT main distribution frame (MDF) to interconnector designated equipment.

Concerns

SWBT has agreed to provide cross-connects with and without test equipment depending upon CLEC preference. In the case a CLEC does not wish to purchase a loop with test equipment, SWBT asserts it cannot be held to the same standards as if the testing equipment were used. A standard reflecting manual testing should be developed.

Summary

Costs derived for cross-connects consist of monthly recurring costs per cross-connect and non-recurring costs for installations and disconnections. Like all other costs for SWBT's network elements, costs are derived based on investment. Recurring costs for cross-connects consist of the monthly costs of the following cross connects:

- 2 wire analog / BRI cross-connect with test equipment
- 2 wire analog / BRI cross-connect without test equipment
- 4 wire cross-connect without test equipment
- 4 wire cross-connect with test equipment
- 2 wire analog cross-connect to multiplexer plug
- 4 wire analog cross-connect to multiplexer plug
- 2 wire BRI cross-connect to multiplexer plug

- Simple DS-1 cross-connect without test equipment
- 4 wire DS-1 cross-connect with test equipment

In short, the costs are developed for cross-connects from the equipment needed to meet the technical parameters of the cross-connect element. The designs consist of transmission equipment configurations for various cross-connect scenarios. The cross-connect scenarios involve cross-connects from the MDF to a collocator's cage and cross-connects from the MDF to a SWBT multiplexer. Cross-connects for a 2-wire, 4-wire, and 2-wire BRI loop were developed for each scenario. Costs were also determined for DS-1, DS-3, and Optical cross-connects. Investment values were determined from the material needed for a cross-connect and fed into ACES where monthly recurring costs are derived.

Non-recurring costs for cross-connects are related to the installation and disconnection of a cross-connect. Non-recurring costs for cross-connects refer to the expenses labor efforts required to provide service to a customer. Non-recurring costs do not include costs associated with maintaining or repairing the service.

Identifying non-recurring costs entail identifying workgroups involved in installing and disconnecting cross-connects, identifying job functions required to perform the install/disconnect, identifying labor time, and identifying labor rates. Included in the non-recurring costs for cross-connects are costs associated with the business service center, circuit provisioning center work, procurement, inventory control, central office forces, and special service center work. The business service center conducts negotiations and handles service orders. The circuit provisioning center provides circuit design and identifies necessary transmission equipment required to meet circuit parameters. Procurement handles the logistics of shipping equipment. Inventory control handles the administration and tracking of plug-in circuit equipment. Central office forces handle the installation and disconnection. Special service center costs are associated with I&M installation activity and remote testing.

Investment for cross-connects is not identified through a complicated models like the loop elements, switching, or interoffice transport, but is identified through simple formulas. The formula used depends upon the piece of equipment involved. For 2 wire BRI cross-connect to multiplexer plug, 2 wire analog cross-connect to multiplexer plug, and 4 wire analog cross-connect to multiplexer plug, the following series of formulas were used to identify investment:

Formula 1: Circuit Plug-in

Placement Cost = Material Cost * Sales Tax

Power Cost = (Placement Cost + Material) * Power Factor

Total Investment = Material + Placement Cost + Power Cost

Unit Investment = Total Investment / (Capacity * Utilization),

where utilization is a fill factor and capacity is the physical limit of the equipment.

For 2 wire analog / BRI cross-connects, 4 wire cross-connects with test equipment, and 2 wire analog / BRI cross-connects without test equipment the following series of formulas were used to determine investment:

Formula 2: Hardwired 57c (Central Office Equipment)

Placement Cost = Material Cost * 57c Hardwired In-Place Factor
Power Cost = Placement Cost * Power Factor
Total Investment = Placement Cost + Power Factor
Unit Investment = Total Investment / (Capacity * Utilization).

For the components that make up a DS-1 cross-connect, DSX-1 and DTAU[2]-hardwired, formula series number two is used. For the remaining component, DTAU-plug in, the following series is used:

Formula 3: Common Plug-In

Placement Cost = Material Cost * Plug-In 57c In- Place Factor
Power Cost = Placement Cost * Power Factor
Total Investment = Placement Cost + Power Cost
Unit Investment = Total Investment / (Capacity * Utilization).

Once investment is identified, CAPCOST is used to identify the capital costs associated with the equipment. Unit investment for each piece of equipment is plugged into ACES where annual and monthly costs are identified.

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[2]DTAU - Digital Test Access Unit

SWITCHING COST INFORMATION SYSTEM

This report describes the SCIS Intelligent Network (SCIS/IN) and SCIS Model Office (SCIS/MO) models, and identifies our concerns and recommendations. This report is divided into two sections: SCIS/IN and SCIS/MO. Because SCIS/MO produces outputs which are fed into the SCIS/IN model as well as other cost studies, the majority of this report will focus on the SCIS/MO model. The SCIS/MO report is divided into the following sections: (1) Purpose; (2) Concerns and Recommended Modifications; (3) Summary Recommended Modifications; (4) Description; and (5) Inputs.

SECTION I - SCIS/IN

Purpose

Switching Cost Information System Intelligent Network (SCIS/IN) is a feature costing program that utilizes vendor tables, results of SCIS/MO studies and feature specific inputs and algorithms to calculate investments for various network services. SCIS/IN can be used to determine investment for vertical services and special assemblies (e.g., individual case based services requiring special pricing).

As with SCIS/MO, SWBT runs SCIS/IN in the average mode. SCIS/IN is used in the cost studies to determine investment for DS1 trunk ports, Basic Rate Interface (BRI) and Primary Rate Interface (PRI).

Staff does not propose any modifications be made to the SCIS/IN studies.

SECTION II - SCIS/MO

Purpose

SCIS/MO is an engineering-based economic model, developed by BellCore, that identifies investments for switching services. SCIS/MO produces switching investment which is utilized in numerous SWBT TELRIC studies, such as local switching, tandem switching, etc. SCIS/MO uses a building block approach by dividing a switching system into functional categories, assigning each switch equipment component to one or more categories and developing an investment per unit of use of the function.

Concerns and Recommended Modifications

In July, 1992, Arthur Anderson & Company performed an independent review of the SCIS model as part of an Open Network Architecture tariff proceeding before the FCC. After conducting an extensive review, Arthur Anderson concluded the SCIS model was fundamentally sound and provides reasonable estimates of switching system investment attributable to service and feature usage of the switch. Further, Arthur Anderson determined the costing principles inherent in SCIS/MO are appropriate for estimating long run incremental investments attributable to switching system usage, and the specific methods for implementing these principles are reasonable. In its study, Arthur Anderson identified certain "key levers" which have a substantial impact on the model results. Among those identified were vendor discounts, cost of money and others.

Arthur Anderson's review of the SCIS/MO model reinforced Staff's belief that the SCIS/MO model is essentially a solid model. Therefore, Staff attempted to primarily examine those inputs that had substantial impacts on the investment, and those inputs that appeared unreasonable. The following section identifies our primary areas of concern and/or recommended modifications with SWBT's inputs to the SCIS/MO model and/or related models, which are as follows: (1) vendor discounts; (2) analog switch exclusion; (3) tandem/end office double counting; (4) COM; (5)line count; and (6) SS7.

<u>Vendor Discounts</u>

SWBT, AT&T and MCI negotiate discounts off list prices for material, engineering and installation for switching equipment with various switch vendors. These discounts are considered by these companies and the switch vendors to be confidential. Because these discounts involve information deemed confidential by the vendors that are not a party to this case, the actual amount of the discounts received or proposed by SWBT, AT&T,

MCI were presented in this report. Staff has provided the Commission with a detailed analysis which does contain firm specific discounts information.

Staff reviewed discounts used by SWBT in the SCIS/MO cost studies. Staff believes SWBT is receiving discounts in addition to those used in SWBT's original cost studies. To determine a more complete discount, Staff reviewed vendor contracts, Firm Price Quotes (FPQ) which are prices for a specific job, and purchase orders. Based upon the review of these documents, Staff proposed different discounts for both Nortel and Lucent switches. SWBT also purchases switches for Ericsson but Staff did not propose to modify the Ericsson discounts.

Staff believes SWBT may receive additional discounts on the Ericsson switches. However because of the limited number of Ericsson switches employed in SWBT's network and that Staff believes the additional discounts, if any, are minimal, Staff is not proposing any adjustment.

Staff does propose to modify the discounts for both Lucent and Nortel switches. Staff believes that SWBT receives significant additional discounts for both Lucent and Nortel switches than was originally used in the SCIS/MO model. The modified discounts proposed by Staff are based upon a review of FPQ's for growth jobs. Staff feels these are conservative estimates of the discounts SWBT receives. Historically, it has been widely acknowledged throughout the industry that the discounts for growth jobs are typically less than the discounts for new switches. Recent information indicates that trend may be changing throughout the industry so that new switch purchases and growth jobs receive the same discount. Regardless, Staff is certain the discount on growth jobs is no greater than the discount on new switch purchases and believes these to be conservative estimates.

Finally, the discounts proposed by Staff only apply to materials. Staff's review of contracts and FPQs could not confirm whether or not SWBT receives discounts on engineering and installation. Staff does note that it appears that other firms receive discounts on these items.

During the cost study review, Staff received switch discount information from AT&T for Lucent switches. Because of the possibility that AT&T may receive a higher discount than any other company because of its relationship with Lucent and because of some language contained in AT&T - Lucent contract, Staff does not believe it is appropriate to recommend the use of AT&T's discounts in SWBT's cost models.

In summary, the discounts Staff proposes are reasonable, based on actual purchase orders and FPQs, and considerably more indicative of actual prices paid by SWBT than the existing discount levels in the SCIS/MO studies. Further, Staff believes the recommended discounts are conservative, based on the fact that SWBT's resulting investment per line is still greater than that which Staff believes is standard in the industry, based on the fact that the discounts are extracted from growth jobs. Finally, engineering and installation discounts are not being recommended.

Analog Switch Exclusion

Although SWBT currently has 24 1A ESS analog switches (12 end office and 12 combination tandem/end office) in Missouri, their resulting investment and line counts are excluded from the local switching study. SWBT will eventually replace the 1A ESS switches with DMS-100/200 and 5ESS switches. The 1A ESS switches are primarily located in high density urban areas, thus having a lower investment per line. Our concern in this regard is that excluding the 1A ESS switches from the study will increase the investment per line (most prevalently in the urban zones) by failing to take into account those efficient, high line count switches.

In order to compensate for this, Staff recommends that SWBT perform a forward looking replacement of all 1A ESS switches in the SCIS/MO model with DMS-100 and 5ESS switches. In discussions with SWBT in this regard, a company official created a "replacement list" of 5ESS and DMS-100 offices for the analog offices. Essentially, 24 existing digital offices with similar characteristics will be used in the SCIS/MO studies in place of the excluded analog switches. Staff has reviewed the list and believes the replacement offices are appropriate.

Tandem/End Office Double Counting

Certain switches used by local exchange carriers serve as both tandem and end office switches (Class 4/5 switches). Currently, SWBT has 10 digital and 12 analog Class 4/5 switches in use. The investment for these switches is undisputedly double recovered in the tandem and local switching studies because of the switches dual functionality. For example, processor and SS7 functionality is utilized in local and tandem switching applications. Further, tandem trunk investment is also recovered in both the tandem and local switching studies. In order to compensate for this double recovery, we propose the following solution: (1) for tandem/end office switches, completely remove the tandem trunks from the SCIS/MO model runs which are fed into the local switching study; and (2) for the tandem/end office switches, reduce the getting started investment and SS7 investment by the ratio of local to (tandem + local) minutes of use. Performing this calculation will reduce processor and SS7 investment appropriately by removing the investment associated with tandem use. The aforesaid adjustment should be performed on Class 4/5 offices which are utilized in the local switching study.

Cost of Money

The SCIS/MO model contains a window to input the COM used; SWBT used 10.69%. COM is used to determine present-worth investment when switch additions/modifications are performed at a later date. Consistent with our recommendation with regard to cost of capital, SWBT should utilize a 10.36% COM in the SCIS/MO calculations. As noted previously, the effects of modifying the COM in the SCIS/MO studies are minor.

Line Count

The line and trunk count data utilized in the SCIS/MO studies is not forward looking. In order to maintain consistency with other forward looking assumptions, it Staff's recommendation that line counts be forward looking to account for two years of growth. Actual data used in the SCIS/MO studies is from June, 1996. Therefore two year growth adjustment will estimate line counts as of June, 1998. In some instances this adjustment will reduce per line investment; in other instances an increase in per line investment could be realized when equipment capacity is exceeded and must be increased (for example a Nortel DMS-100 with a growable processor). According to a SWBT official, the recommended line count growth was not substantial enough to have major impacts upon trunk counts. Therefore, trunk counts were not adjusted.

SS7

As discussed above, SWBT uses the link mode in the SCIS/MO studies to determine SS7 investment. For many of the offices in the study, it appears that SS7 utilization is understated (a SWBT official also confirmed this). The utilization which can be adjusted in the model is the utilization of the A link, or the SS7 link connecting the end office to a signal transfer point (STP). It is our recommendation that the utilization on this link be modified to reflect normal growth and to take into account the increased utilization produced through number portability implementation. Specifically, number portability implementation will result in increased utilization of A links, D links (transmission paths connecting regional and local STPs). Therefore, we recommend link utilization in the SCIS/MO model be 0.4613. This utilization assumes a 10% growth on existing utilization per year, plus 2.5 times the resulting growth figure. The 2.5 multiplier is applied to adjust for increased utilization due to number portability. This recommendation is consistent with our link utilization recommendation in the SS7 report, which is fully described in the link utilization section.

Summary of Recommendations

The SCIS/MO model is a complex, proven model with a substantial number of inputs. A thorough investigation into the validity of every input would necessitate additional time. However, Staff believes it has examined the major inputs and recommended modifications where necessary. Specifically, Staff recommends the following modifications be made to the SCIS/MO studies:

Discounts	Modified to reflect discounts contained in FPQ's and Purchase Orders for growth jobs.
Analog Switch	SWBT shall perform a complete 24 office analog switch replacement.
Double Counting	SWBT shall eliminate Class 4/5 double counting through deletion of tandem trunk investment, and reduction of getting started and SS7 investment by the ratio described above.
COM	COM shall be modified to reflect 10.36%.
Line Count	SWBT shall utilize forward looking line counts as described above.
SS7 Links	SWBT shall utilize a forward looking SS7 link utilization as described above.

Description of SCIS/MO Model

If desired, SCIS/MO can be used to produce costs by including annual cost factors, however SWBT uses SCIS/MO to produce investment, then runs the investment through its ACES model to determine costs. SCIS/MO calculates a standard set of investment primitives for each switching center. The calculations may be performed in either marginal or average mode; SWBT uses the average mode. SCIS/MO can also be used to support LEC business decisions, such as in a profitability analysis, contribution analysis and new service analysis. SCIS/MO produces results which are accurate to +/- 2%. SCIS/IN utilizes investment outputs from the SCIS/MO model.

Inputs

SCIS/MO utilizes the most recent equipment investment inputs; this information is not user adjustable and is supplied from vendors to BellCore. Following is a summary of SCIS/MO inputs which are adjustable. System defined inputs are user changeable and include the following categories: (1) Discounts; (2) Marginal Options; (3) SS7 Services;(4) Automatic Message Accounting (AMA) Assumptions; (5) Plain Old Telephone Service (POTS) Assumptions; and (6) Integrated Services Digital Network (ISDN) Assumptions. Cost of Money (COM) can also be adjusted at the system level. The aforesaid input categories apply to all the offices in the study unless office specific input categories are assigned to override. Office specific inputs include the following categories: (1) office input; (2) general; (3) central processor unit (CPU)/getting started investment (GSI); (4) processor utilization factor (PUF); (5) GSI adjustments; (6) switching module processor; (7) lines/trunks; (8) SS7; (9) ISDN; (10) TR303; (11) AMA;

(12) Remotes; and (13) link peripheral processor (LPP). Following is a description of both system defined and office specific inputs.

System Defined Inputs

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LOCAL SWITCHING MOU COST STUDY

This Report describes SWBT's local switching study and identifies Staff's concerns. This report is divided into the following sections: (1) Purpose; (2) Concerns and Recommended Modifications; (3) Summary of Recommended Modifications; and (4) Description of Study.

Purpose

SWBT's local switching cost study identifies the TELRIC costs per minute of use for local switching. SWBT's local switching study uses the following inputs to determine the local switching per minute investment: (1) switching investment calculated by the SCIS/MO model; (2) hardware investment; and (3) minutes of use (MOU). The study then converts investments into costs through utilization of the ACES model. SWBT's local switching study geographically disaggregates costs as follows:

Group 1 - offices in rate groups C and D
Group 2 - offices in rate group B
Group 3 - offices in rate group A

Concerns and Recommended Modifications

The following section identifies our concerns and lists our recommendations for the local switching study. In reviewing SWBT's local switching study, we have identified the following areas of concern: (1) modifications to the SCIS/MO model as discussed in the SCIS report; (2) modification of the hardware factor; (3) forward looking MOU; and (4) geographic deaveraging.

<u>SCIS/MO Inputs</u>

As discussed in the SCIS report section, several modifications are recommended. Because the local switching study uses SCIS/MO investment outputs, the modifications are relevant in this study. Refer to the SCIS report for a detailed description of recommended modifications.

<u>Hardware Factor</u>

The proposed hardware factor is a composite of the 5ESS and DMS-100 switches which results in a factor of **____** . The factor is developed using a ratio of hardware investment for all DMS-100 and 5ESS switches to total investment for DMS-100 and 5ESS switches, respectively. This factor is then applied to all switches used in the local switching study. However, this calculation is erroneous because data was only gathered from DMS-100 and 5ESS switches; DMS-10 and Ericsson AXE-10 switches could conceivably have lower hardware investments. Because SWBT provided no data to support a hardware factor for DMS-10 and Ericsson AXE-10 switches, the cost studies should be modified so that the hardware factor is only applied to the DMS-100 and 5ESS switches.

Further, Staff has a concern over the manner in which the hardware factor, even after modification as recommended above, is applied to switching investment. SWBT's existing methodology is as follows: (1) total Engineering Furnished and Installed (EF&I) switching investment is multiplied by the hardware factor; (2) the line investment is subtracted from this figure to give the total non-line investment. The fact that the hardware factor is applied to the total investment (which includes both non-line and line investment), resulting in a larger number, while the line investment which is subtracted from this is not multiplied by the hardware factor appears suspect (even though the line investment was used to develop the hardware factor). Therefore it is our recommendation that the hardware factor be a switch specific ratio of total hardware investment to total non-line investment. The hardware factor should then be applied to the non-line investment only. The non-line investment is the total EF&I minus the line investment.

As described above, the hardware investment accounts for the following equipment: (1) conference ports; (2) class model resource card for calling name delivery; (3) input/output port for simplified message desk interface; (4) message waiting power supply for lamps; (5) specialized announcements; (6) tone circuits; (7) private network trunking (i.e., tie facilities for Plexar); (8) data sets; and (9) stutter dial tone equipment. Because SWBT has included investment for the functionality provided by the hardware factor equipment in the local switching study, the costs will be recovered in the local switching element. Therefore, SWBT should not be allowed to charge separately for any of the functionality provided by the equipment included in the hardware factor.

Staff has the concern that some components of the hardware investment may be double recovered. Specifically, it is not known exactly what types of ports are included in the input/output port for simplified message desk interface investment total. If maintenance input/output ports are included then this would constitute double recovery since maintenance ports are included in another investment category in the SCIS/MO study. Although it is not known if the input/output port or any other item in the hardware category is double recovering investment, the hardware factor has a substantial effect on local switching costs. In addition, it is not clear at this time if the hardware factor is forward looking; data may have been gathered from old technology. If this is the case and forward looking technology is less expensive, then the hardware factor could be overstated.

Forward Looking MOU

In its TELRIC local switching study, SWBT develops MOU by taking the working lines in each rate group times the average monthly MOU per line, and then annualizes this figure. The working lines used are lines served by digital switches only, consistent with SWBT's exclusion of analog switches from its studies. Because SWBT's existing analog switches generally serve urban areas with high line counts, we are concerned that the MOU data excluding analog offices may not be indicative of actual MOU.

In response to a data request, SWBT provided 1993 through 1996 total intrastate end office (digital and analog) MOU. This data showed annual increases in MOU throughout the four year period. Consistent with our recommendation for modifications to the SCIS/MO model to include digital switch replacements of all existing analog switches (see SCIS report), Staff recommends that total analog plus digital MOU from this data source be used in the local switching study, modified as described below. Because annual MOU trends are demonstrating an increase and other forward looking assumptions are used (such as all digital switch technology, and ISDN provisioned from 5ESS switches only), Staff recommends that SWBT apply a forward looking 10% per year growth factor, for the next 2 years, using the middle of the 2 year growth period in the local switching study.

SWBT also proposed two adjustments to the total MOU count. First, SWBT proposed an adjustment to account for incomplete calls. SWBT would incur costs for these incomplete calls, but CLECs would not be billed for such calls. To calculate this adjustment SWBT provided Staff with an average length of a local call, the average length of a an incomplete call, and the incomplete call ratio. However, there was no data to support these numbers. SWBT officials stated that Internet usage, which would decrease the incomplete call ratio by increasing the denominator (Total MOU), was not taken into consideration in the calculations provided to Staff. Therefore, Staff believes that due to insufficient data, an adjustment for incomplete calls should not be performed.

In addition, SWBT presented Staff with information regarding intraoffice calls. Because intraoffice calls originate and terminate in the same central office, intraoffice MOUs are counted twice. From separations, SWBT determined that **____** of all MOU are intraoffice. In order to compensate for this inequity, SWBT proposed to decrease MOU by **___** (1/2 of the **___** MOU total). Staff agrees with SWBT that this adjustment is legitimate and should be performed.

Geographic Deaveraging

Finally, SWBT has proposed three rate zones in its arbitration cost studies, although SWBT currently utilizes four rate groups in its tariffs. SWBT has included Springfield in the proposed St. Louis and Kansas City zone (rate group 1). The effect of including Springfield in rate group will increase the costs for local switching in that group due to the low density of lines in Springfield and the high density in Kansas City and St. Louis. In order to more accurately reflect costs in the proposed rate groups, Staff recommends deaveraging costs into four rate groups, identical to those represented in SWBT's existing tariffs.

Summary of Recommended Modifications

In summary, Staff recommends the following modifications to SWBT's local switching study:

SCIS/MO	Modifications to the SCIS/MO model should be performed, as discussed in the SCIS report section.
Hardware Factor	The hardware factor should be switch specific and applied to only the DMS-100 and 5ESS switches, and should be a ratio of hardware investment to non-line investment (total EF&I minus line investment). The hardware factor should be applied to non-line investment.
MOU	Total MOU in each zone should be discounted 9% to account for intraoffice calls, and increased 10% to make the MOU count forward looking.
Deaveraging	Investment/MOU should be deaveraged into four geographic zones, consistent with our zone geographic deaveraging recommendations in other studies.

Description of Study

The non-line switching investment is generated by the SCIS/MO model on a wire center basis. This investment includes all costs for end office switching except line and trunk ports. SCIS/MO also calculates the line related investment which is used in this study. Although SWBT currently utilizes 24 Lucent 1AESS analog switches (12 of them have dual functionality, or are considered tandem/end office switches or class 4/5 switches), they are excluded from the study because they do not represent forward looking technology. Therefore, only digital switches are included in the study.

Total feature hardware investment for the DMS-100 and 5ESS switches is calculated. The hardware investment accounts for the following equipment: (1) conference ports; (2) class model resource card for calling name delivery; (3) input/output port for simplified message desk interface; (4) message waiting power supply for lamps; (5) specialized announcements; (6) tone circuits; (7) private network trunking (i.e., tie facilities for Plexar); (8) data sets; and (9) stutter dial tone equipment. A composite feature hardware factor is developed based on the hardware investment to total investment for DMS-100 and 5ESS switches. The feature hardware factor is applied to the total investment for each wire center regardless of switch type, and the line investment is then subtracted out. The resulting number is the total non-line investment for each wire center. Total non-line investment is then summed for each rate group.

MOU are determined by taking the number of working lines per rate group times the average MOU per line. Data used in these calculations excludes MOU associated with the analog offices, which are not used in the study. Therefore, only digital MOU are used. Further, the MOU calculated in this instance is based on existing data and is not forward looking. Total non-line investment per rate group is divided by total annual MOU per rate group to determine investment per MOU in their appropriate rate groups. Finally, the investment per MOU for each rate group is inserted into the ACES model.

SWITCHING PORT STUDIES

This Report describes SWBT's switching port studies and identifies our concerns. This report is divided into the following sections: (1) Purpose; (2) Concerns and Recommended Modifications; and (3) Summary of Concerns and Recommended Modifications; and (4) Description;

Purpose

SWBT's port studies develop recurring and nonrecurring costs for the following types of ports: analog line-side, 2-wire analog trunk (direct inward dial), DS1 trunk, Primary Rate Interface (PRI), and Basic Rate Interface (BRI). The port investments are produced from either the SCIS/MO or SCIS/IN models (for a detailed description of the SCIS model, see the Staff's SCIS report).

Concerns and Recommended Modifications

The following section identifies our concerns with and recommended modifications to SWBT's cost studies for analog line-side, 2-wire analog trunk (direct inward dial), DS1 trunk, Primary Rate Interface (PRI), and Basic Rate Interface (BRI). In reviewing SWBT's port studies, we have identified the following areas of concern: (1) SCIS/MO modifications; (2) weighting; (3) switch types; and (4) geographic deaveraging.

SCIS/MO Modifications

As discussed in the SCIS report section, several modifications are recommended. Because the port studies use SCIS/MO results, and because SCIS/IN uses SCIS/MO results, the modifications are relevant in this study. Refer to the SCIS report for a detailed description of recommended modifications.

Weighting

As discussed above, investment for the analog line-side port is weighted by the frequency of occurrence of each switch type, while investment for the 2-wire analog trunk port and the DS1 trunk port is weighted by lines in service for each of the technologies. Staff believes that weighting is necessary to develop costs, however there should be consistency in the application of weighting among studies. Therefore Staff recommends that for the analog line-side, 2-wire analog trunk and the DS1 trunk ports, weightings should be according to the number of lines in service for each technology. Staff notes that the BRI and PRI studies are not affected, because they only utilize one technology.

Switch Type

As noted above, the DS1 trunk port study uses a weighting of the 5ESS and DMS-100 switch types. SWBT stated that the DMS-10 and AXE-10 switches were excluded from the study because a version of the SCIS/IN model was previously unable to develop DS1 port costs for these switches. However, SWBT has informed Staff that the port costs can currently be developed using all switch types used to provision the service. Therefore, Staff recommends that DMS-10, DMS-100, 5ESS and AXE-10 switches be used in the DS1 port study. The recommendation that all switch types used to provide any port be included in that port cost study shall apply to all port cost studies (except the PRI and BRI), for the reason specified above.

Geographic Deaveraging

SWBT has proposed one cost for ports, regardless of the rate zone within which the C-LEC is purchasing the element. Consistent with its recommendations regarding other cost studies, Staff recommends SWBT geographically deaverage costs into four rate zones which match SWBT's existing four rate groups. Refer to the geographic deaveraging report for a thorough description of this topic.

Summary of Recommendations

In summary, Staff recommends the following modifications to SWBT's analog line-side, 2-wire analog trunk (direct inward dial), DS1 trunk, Primary Rate Interface (PRI), and Basic Rate Interface (BRI) ports:

SCIS/MO	Modifications to the SCIS/MO studies should be performed, as discussed in the SCIS report.
Weighting	SWBT shall weight all switch port costs by the number of lines served by each switch.
Switch Type	In the case any switch type is used to provide a port, that switch type shall be included in the cost study (excluding BRI and PRI studies).
Deaveraging	SWBT shall geographically deaverage all costs into four rate zones.

Description of Study

This study calculates the investment for Analog Line-Side Ports, 2-Wire Analog Trunk Ports, DS1 Trunk Port and ISDN-PRI and ISDN-BRI ports. Each of these is detailed below.

Analog Line-Side Port

The analog line-side port is a line side switch connection. The analog line-side port study develops costs for a switch port for a 2-wire analog line. Total line investment, produced by the SCIS/MO model, was weighted by the frequency of occurrence of the switch type. Nonrecurring costs were developed based on the costs of the labor efforts required to provide service to a customer, including both connection and disconnection.

2-Wire Analog Trunk Port

The 2-wire analog trunk side port (direct inward dial, or DID) is a trunk side switch connection. The 2-wire analog trunk side port (DID) study develops recurring port costs from data produced by the SCIS/IN model. The investment was then weighted by switch type by the lines in service for each switch type. Nonrecurring costs were developed based on the costs of the labor efforts required to provide service to a customer, including both connection and disconnection.

DS1 Trunk

DS1 trunk port is a trunk side switch connection that provides the equivalent of 24 paths, used primarily for voice communications via customer premises equipment. The DS1 trunk port study develops recurring port costs from SCIS/IN model studies. SCIS/IN produces investment for DS1 trunk ports, which are then weighted based on the total lines in service for each of the technologies. Investment used in the DS1 port studies includes only that associated with the DMS-100 and 5ESS switches. Nonrecurring costs are based on the labor hours required to install the DS1 trunk port and perform the required switch translations.

Primary Rate Interface

PRI provides access for circuit switched voice and data communications including interconnect capabilities, where applicable. The capability is provided using Integrated Services Digital Network (ISDN) architecture. PRI typically includes 23 bearer (B) channels and one data (D) channel. The B channels provide voice and data communications, while the D channel provides out-of-band signaling, although a portion of the bandwidth of the D channel can also be used to carry data traffic. The PRI study develops recurring costs from SCIS/IN model studies, which produce investment for PRI. Although SWBT currently provides PRI service via the DMS-100 and 5ESS switches, the PRI investment study only utilizes 5ESS switches. SWBT has excluded the DMS-100 switches from the study, because on a forward looking basis ISDN will be provisioned by the 5ESS switch. SWBT officials stated the reason for this is that the company was able to obtain superior vendor prices from Lucent.

Nonrecurring costs for PRI include labor costs to establish initial and each additional PRI service.

BRI

BRI is an ISDN service which provides 2 B channels, of 64 kbps bandwidth, and a D channel of 16 kbps. The B channels can be configured to carry circuit switched and/or data switched traffic. As with the PRI, the D channel is utilized for out-of-band signaling, but a portion of the available bandwidth may be used for carrying packet switched data traffic. Again, as with the PRI study, the BRI study develops recurring costs from SCIS/IN model studies, which produce investment for BRI. Only the 5ESS switch is used in the SCIS/IN model studies.

Nonrecurring costs for BRI include labor costs to establish initial and each additional BRI service.

SS7 COST STUDIES

This Report describes SWBT's SS7 cost studies and identifies our concerns. This report is divided into the following sections: (1) Purpose; (2) Concerns and Recommended Modifications; (3) Summary of Recommendations; (4) Description of CCSCIS; and (5) Description of Specific Studies.

Purpose

SWBT has submitted TELRIC signaling studies for Line Information Database (LIDB) validation query investment, calling name delivery query investment, toll free calling database query investment, signal transfer point (STP) investment, and SS7 transport investment. Common Channel Switching Cost Information System (CCSCIS), a BellCore model, determines investment for signaling equipment based on numerous adjustable and non-adjustable inputs. Depending on the particular service or signaling equipment, the investment is assigned to either a per query, per octet (eight bit byte), or in the case of STPs, on a monthly per port and nonrecurring per port basis. The investment per unit is then fed into SWBT's ACES model where annual cost factors, operating expenses, a levelized inflation factor, and Commission assessment are applied to determine TELRIC costs.

Concerns and Modifications

The following section identifies our concerns with and recommended modifications to SWBT's SS7 cost studies. In reviewing SWBT's SS7 studies, we have identified the following areas of concern: (1) COM; (2) link utilization; (3) STP ports; (4) 800, LIDB and Calling Name queries; (5) discount levels.

<u>COM</u>

As discussed in the Cost of Capital and Capital Structure for SBC Section, Staff recommends a COM of 10.36%.

Link Utilization

Before describing link utilization, a brief summary of link functionality will be given. A and E links connect SSPs (end office, tandem and end office/tandem switches) to local STPs. D links provide connectivity between local and regional STPs. C links are used to connect mated STP pairs. B links are used to connect STPs to other STPs of the same level (local to local STPs, regional to regional STPs). F links connect SSPs to other SSPs. SCP link connect SCPs to regional STPs. Currently, SWBT inserts the following link utilization into the CCSCIS model (SWBT does not use E links in the SS7 cost studies):

Link	Utilization
A link	**____**
B link	**____**
C link	**____**
D link	**____**
F link	**____**
SCP link	**____**

Because A and D links carry 800, LIDB and Calling Name queries to the SCP, any projected increase traffic on these links should be incorporated into the model. Staff has reviewed data which shows LIDB, 800 and Calling Name queries are increasing, therefore utilization on links carrying that traffic should increase as well. Additionally, the implementation of local number portability will increase traffic on the A and D links.

Discussions with a SWBT subject matter expert produced **___** as an annual approximation of increased utilization due to normal growth. With regard to the effects of local number portability implementation, SWBT's subject matter expert stated that a good estimate of the effects on utilization would be an increase of **_____ ** times. It is undisputed that A and D links will experience increased utilization due to normal growth and local number portability implementation. However, SWBT did not provide any forward looking forecasts of such utilization. Because of the lack of forward looking data, and due to the discussions with SWBT's signaling subject matter expert, Staff recommends 10% per year growth on A and D links, and multiplying the forecasted utilization by 2.5 to account for local number portability. In addition, SCP links will experience increased utilization due to increases in 800, LIDB and Calling Name queries. Staff recommends a 10% per year growth factor on the SCP links for reasons cited above. Staff does not propose any modifications to the C links. C links, which connect mated STP pairs, should not experience an increase in utilization. Therefore, Staff proposes the following link utilization:

Link	Utilization
A link	0.4613
C link	0.129 (no change)
D link	0.4047
SCP link	0.1876

STP Ports

With regard to STP ports, Staff recommends an increase in ports of 10% per year. Port increases are being realized due to normal increases in usage. Further, the onset of number portability should have the effect of increasing ports due to an increased number of queries. SWBT provided Staff with the following historical data which demonstrates increasing trends in Kansas City, St. Louis and Springfield ports:

STP location	Ports 9/94	Ports 9/96	Ports 2/97	%Increase/year
Kansas City	**___**	**___**	**___**	**___**
Springfield	**___**	**___**	**___**	**___**
St. Louis	**___**	**___**	**___**	**___**

As demonstrated by the above figures, a 10% per year port increase is by all means a conservative estimate of forward looking occupancy. The 10% per year is realized in even the lowest growth STP pair, without the effects of local number portability.

800, LIDB and Calling Name Queries

Currently, SWBT uses the following number of busy hour BH queries per second in the CCSCIS model:

	LIDB	800	Calling Name
Queries	**___**	**___**	**___**

Although SWBT could not provide us with forward looking data, SWBT provided historical trends that demonstrated yearly increases for LIDB, 800 and Calling Name queries, respectively. SWBT could not provide forward looking estimates of BH queries/second so Staff was forced to estimate such forward looking trends based on the historical data. Staff proposes a 10% annual increase for all types of queries. Staff believes this to be a very conservative estimate.

Discount Levels

Although Staff is not recommending any modifications with regard to switch discounts for the CCSCIS model, Staff believes that SWBT's reported discount for SCP equipment may be less than the discounts actually received. Based on information discovered while attempting to determine SCIS/MO discounts, Staff has reason to suspect that SWBT may be receiving additional discounts. Staff does not have data to propose an alternative discount.

Summary of Recommended Modifications

SWBT' SS7 studies utilize the CCSCIS models, release 3.9 and 4.2.1. Both models use an immense quantity of inputs. Specifically, Staff notes that discount levels were not verified and could very well be incorrect. Staff recommends that SWBT make the following modifications to its SS7 cost studies:

COM	Consistent with our recommended modifications to other studies, COM shall be 10.36%.
Link utilization	see below
Ports	Ports shall be forward looking for two years using a 10% per year growth factor
BH queries/second	BH queries/second shall be forward looking for two years using a 10% per year growth factor.

Link	Utilization
A link	0.4613
C link	0.129
D link	0.4047
SCP link	0.1876

Description of CCSCIS

SWBT utilizes two versions of the CCSCIS model - release 3.9 and release 4.2.1. SWBT utilizes release 3.9 for the SCP investment only. As with the SCIS/MO studies, SWBT uses the average mode for both releases of the CCSCIS model. The average costs use the same methodology of the SCIS/MO model.

Release 3.9

**

investment and toll free calling database query investment.

For the toll free calling database query investment, an additive investment for a more complex query (such as a query requiring additional time-of-day or day-of-week decisions) covers the additional cost in the SCP. The additive investment for a complex query was determined by subtracting the BH investment per Basic 800 query from the BH investment per Vertical 800 query. BH to business day ratio and equivalent business days per year ratios are applied, producing an investment per query at any time.

SS7 Transport

The SS7 transport study utilizes investment from the CCSCIS study and other related data to determine the incremental cost of the STP and the D links which route traffic from the STP to the next point in the signaling network (the regional STP). See Attachment B for a schematic of the investments being recovered through the SS7 transport cost study. The CCSCIS model produces a busy hour (BH) investment per octet for D link terminations on the local and regional STPs. SWBT then adds a forward looking investment per octet, as described above.

Additionally, investment for the D links connecting the regional STP to the local STP is provided by the CCSCIS model. The investment, which is the cost of the actual transmission facility, is presented on a per octet basis. The sum of the regional and local STP termination investment per octet, the forward looking investment per BH octet, and the D links connecting the regional STP to the local STP per BH octet is the total investment per octet. BH to business day ratio and equivalent business days per year ratios are applied, producing an investment per octet at any time.

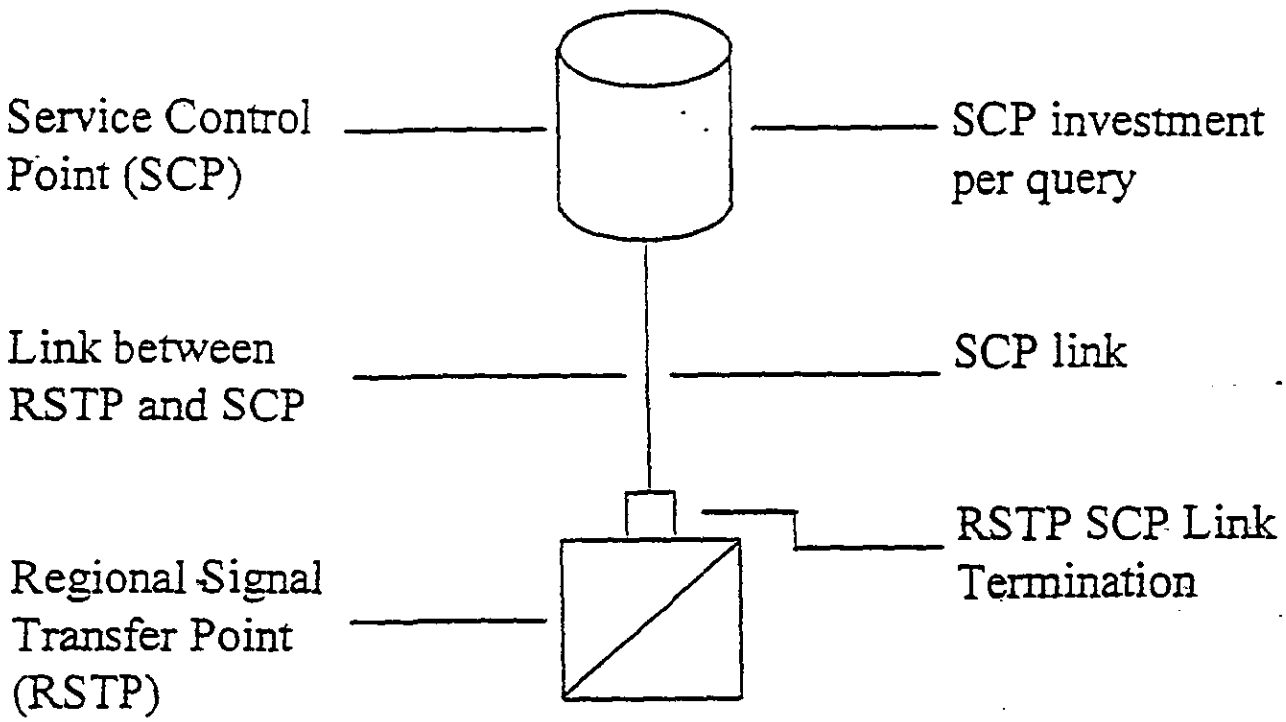
STP Port

The STP port investment study identifies the forward looking cost of one port in an STP. The STP port provides an entry point where a competitive local exchange carrier (C-LEC) would gain access to SWBT's signaling network. Each query entering the STP has a Global Title Type assigned to a field which is used to direct the STP to the correct internal routing table. The table uses other data in the message, such as dialed telephone number or calling card number, to determine the Signal Point Code used for routing. The Global Title Translation is the effort required to establish the tables in one SWBT STP pair. A Signaling Point Code is a nine-digit number that uniquely identifies an individual entry (STP, SCP and SSP). All signaling networks use Signaling Point Codes to perform routing.

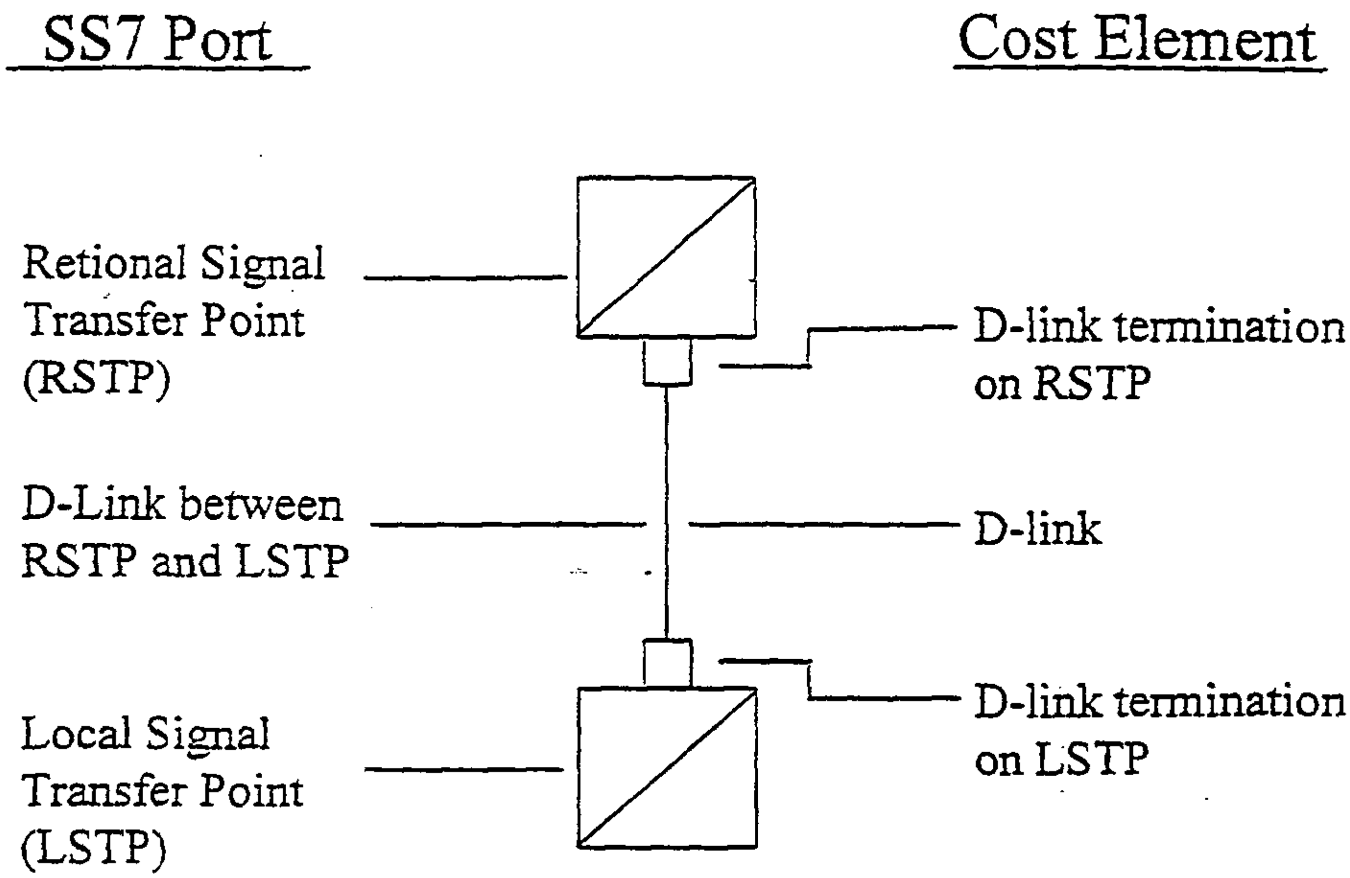
Costs for STP ports are separated into recurring and nonrecurring. The recurring port costs are based on investment per port, which was developed using the CCSCIS model. Nonrecurring costs are based on STP port installation and Global Title Translation per STP pair. The time required to perform the translations and the Exchange Carrier Relations processing was multiplied by the appropriate labor rates and summed. The time required to install the Global Title Translation and perform the Exchange Carrier Relations processing for one STP pair was multiplied by the appropriate labor rates and summed. Finally, the time required to install the Signaling Point Code and perform the Exchange Carrier Relations processing for one Signaling Point Code in an STP pair was multiplied by the appropriate labor rates and summed.

SS7 Parts Included in Query Cost

SS7 Port | Cost Element



SS7 Parts Included in SS7 Transport Cost



Tandem Switching Cost Study

Tandem switches are those switches that connect one trunk group to another trunk group. A tandem switch is an intermediate switch or connection between an originating telephone call location and the final destination of the call. The tandem point passes the call along. The purpose of the tandem switching study is to identify the TELRIC per minute of use costs of tandem switches. The tandem switching cost per minute of use represents the cost of tandem switching equipment required to establish the talking/conversation path, and maintain the path for the duration of a call between central offices.

Purpose

The purpose of the tandem switching total element incremental cost study is to identify the cost per minute of use of tandem switches.

Concerns

The primary model used to determine tandem switching investment is the Network Cost Analysis Tool (NCAT). Like SCIS, NCAT is a Bellcore model. Because NCAT is a Bellcore model and is used by more companies than SWBT and is subject to much scrutiny, no concerns were found specific to the model.

Concerns with the tandem switching cost study are related to SCIS and COSTPROG. Investments in switching and facility by technology per circuit mile are obtained from SCIS. Fixing the problems with SCIS and alleviating the double counting of end-office/tandem switch investment in SCIS will alleviate the concerns with the tandem switching cost study. Termination investment by technology, per circuit is generated by COSTPROG. Alleviating the concerns with COSTPROG regarding fill factors will alleviate any related concerns.

Summary

To complete the tandem switching cost study SCIS, NCAT, and ACES are used. A detailed description of SCIS may be found in the switching cost study section. A description of NCAT may be found below. The investment in tandem switching equipment is obtained from SCIS. This value is plugged into NCAT, which yields tandem switching investment per minute. This value is plugged into ACES. Through ACES, factors related to sales tax, EF&I investment, TELCO labor and engineering, miscellaneous costs, power, buildings, depreciation, cost of money, income tax, equipment expenses, building and grounds maintenance, administrative expenses, ad valorem taxes, and a Commission assessment are applied to determine an annual recurring cost per minute of use.

Summary of the Network Cost Analysis Tool (NCAT)

** The remainder of this page has been deemed Highly Confidential. **

** This page has been deemed Highly Confidential in its entirety[3]. **

[3] ** The associated footnote was deemed Highly Confidential **

** This page has been deemed Highly Confidential in its entirety. **

** <u>This page has been deemed Highly Confidential in its entirety.</u> **

Interoffice Transport Cost Studies

Interoffice transport consists of the facilities that carry calls between central offices. The facilities are either dedicated, meaning they are used solely for transport, or common, meaning they are shared with other purposes, such as distribution or feeder. Interoffice transport facilities consist of entrance facilities, multiplexing facilities, interoffice facilities, and cross-connects. SWBT has separate cost studies for dedicated and common interoffice transport. Concerns for both dedicated and common transport, summaries of the cost studies, and a description of COSTPROG are presented below.

Purpose

The purpose of the unbundled dedicated transport cost study is to calculate the forward looking long run incremental recurring and non-recurring costs for DS-1 and DS-3 unbundled dedicated transport entrance facilities and unbundled dedicated interoffice facilities. The study also includes unbundled costs for cross-connects.

Concerns

After reviewing the interoffice transport cost studies and models used to develop investment and cost, concerns with fill factors and accuracy of the data were identified. Both concerns apply to both dedicated and common transport. By fixing the problem in COSTPROG, the econometric model used to identify interoffice transport investment, the problem will be alleviated in both studies. SWBT uses non-forward looking fill factors for the electronics and fiber facilities in interoffice transport. SWBT utilizes a Busy Hour / Total Day ratio of 10% with little or no evidence to support this assumption. This concern is minimized by the fact the AT&T/MCI use this same value as their input into the Hatfield Model 3.1.

Use of actual fill factors -- SWBT uses actual fill factors for interoffice transport electronic circuits and fiber. Staff believes that forward-looking fill factors are more appropriate.

Synchronous Optical Network (SONET) terminal equipment exists where dedicated transport circuits enter/exit the SONET ring. The equipment converts electrical signals to optical signals and multiplexes the signals to the speed of the SONET ring. SONET terminals, known as Add-Drop Multiplexers (ADM), consist of a high speed side and low speed side. The high speed side connects to the fibers and transmits the signals. The low speed side consists of DS-1 or DS-3 circuit cards which are modular, meaning that as demand for more capacity increases, more circuit cards may be added.

A fill of **___** percent on the fast side electronics is appropriate and forward looking. The value is appropriate because SONET technology is new within the last 15 years and its capabilities are limited by the connecting electronics. Because of the modular nature of the slow side, the fill factor should be 85 percent. The reason for this high fill is because the slow side consists of only a cabinet and line cards -- where each card is modular and operating close to its capacity.

It is not clear what the unused fiber strands will be used for in the interoffice transport cost study and therefore should not be included as a cost for interoffice transport. Instead the investment in unused fiber should be recovered by making the fiber available for competitors to purchase as dark fiber. Therefore, a fill factor of 90 percent is appropriate. A fill factor in this range would allow for the actual use of the fiber, account for dark fiber, and allow for a breakage factor (or fibers that are unusable). The investment in additional fiber can be recovered through dark fiber. (For further information on the fill factor for dark fiber, see the dark fiber section).

Busy Hour / Total Day. SWBT's cost studies use 10% for the Busy Hour/Total Day value. SWBT did not provide a study or data to support that 10 percent of calls occur in an average busy hour on an average busy day. If on average, more calls are placed in that busy hour, the costs will decline, while if less calls are placed, the costs will increase. An empirical study would be useful in determining the accuracy of this value and making the cost study more accurate. If the results of the research suggest a different value, that value should be used.

Staff notes that AT&T/MCI use the same 10% figure in the Hatfield Model 3.1 runs for SWBT. Because both parties use the factor, Staff did not pursue modifications.

Summary of Studies

Dedicated Transport

The purpose of the unbundled dedicated transport cost study is to calculate the forward looking long run incremental recurring and non-recurring costs for DS-1 and DS-3 unbundled dedicated transport entrance facilities and unbundled dedicated interoffice facilities. The study also includes unbundled costs for cross-connects.

An entrance facility is the transmission path between customer premises and the serving central office. DS-1 entrance facilities are equipped to provide 1.544 Mbs capability while DS-3 entrance facilities are equipped to provide 45 Mbs capability. Both facilities are capacity derived and based on an OC3 multiplexing system.

Interoffice facilities consist of an optical transmission path over OC3, OC12, or OC48 Synchronous Optical Networks (SONET). A SONET facility is a family of fiber optic transmission rates created to provide the flexibility needed to transport many digital signals with different capacities and to provide a standard manufacturing design. SONET defines a physical interface, optical line rates known as Optical Carrier (OC) signals, frame format and an Operations, Administration, Maintenance, and Provisioning protocol. The OC signals have their origins in electrical equivalents known as Synchronous Transport Signals (STSs). For SWBT, the costs are based on a weighted average of bi-directional SONET rings and collapsed SONET fiber based chains. Each cost element represents a path between serving central offices or nodes on the ring or chain. When a transmission path is required to include multiple rings or chains, the investments are calculated based on interconnection at a single node.

Recurring costs for each element are based on forward-looking fiber based network. The entrance facilities are based on a sample consisting of all types of loops provided by SWBT. The sample is divided into three groups: Rural, Suburban, Urban. The groups are based on central offices by rate group from the current Local Exchange Tariff. The investments for each element are based on 1996 cable broadgauge costs and multiplexing equipment investments provided by SWBT's procurement department.

The DS-1 and DS-3 cost design characteristics are derived by the circuit process on all OC types of rings and chains. The investments for each element are the results of capacity calculations based on the total capacity of the ring or chain network. The recurring costs are based on A (originating) to Z (terminating) networks from four zones in Missouri. The zones are metro, suburban, rural, and interzone (between zones). The central offices were identified and categorized into their respective zones based on rate group calling areas in the Local Exchange Tariff. Costs for each zone are calculated to represent the first air mile, then each additional air mile. The first mile includes SONET multiplexing equipment and the first air mile investments for the fiber cable. Each additional mile includes only the fiber cable.

Cross-connects consist of the distribution equipment used to terminate and administer communication circuits. In a wire cross-connect, jumper wires or patch cords are used to make circuit connections. In an optical cross connect, fiber patch cords are used. The costs associated with cross-connects are incurred through the facilities to and from interconnector designated equipment. The costs associated with digital cross-connect systems (DCS) are derived from designs associated with a 3/1 system.

Recurring costs for cross-connects represent the cost of equipment required to meet the technical parameters of the cross-connect element. The designs consist of transmission equipment configurations, fiber distribution frames, and optical jumpers for various optical cross-connects. DCS cost include charges for establishment, database modification, arrangement, customer performed reconfiguration, plus DS-1 and DS-3 channel ports.

Non-recurring costs associated with dedicated transport facilities include expensed labor efforts required to provide service to a customer, and includes both installation and disconnection activity. The dedicated transport cost study does not include maintenance costs. A detailed description of non-recurring charges may be found in the Summary of

Non-recurring Charges.

Models Used in the Dedicated Interoffice Transport Cost Study

COSTPROG, LOOPVEST, and ACES are the models used to determine investment and cost for each element related to dedicated transport. COSTPROG is the primary source and is used to determine investment for the electronics and fiber for interoffice transport. COSTPROG basically identifies the routes a call may take to be completed and selects the least cost route. Investment is derived from the number of circuits in a network and the amount of interoffice fiber. Total investment in interoffice fiber is separated into aerial, buried, and underground sections and an investment for each is identified. The investment values for interoffice electronic facilities and interoffice fiber are fed into ACES.

LOOPVEST is used to determine investment and costs related to the entrance facilities. Entrance facilities consist of building cable, poles, aerial cable, DLC equipment, premises equipment, frame equipment, buried fiber and copper cable, copper, conduit, and underground fiber and copper cable. Investment for each element is identified through LOOPVEST. For further information on LOOPVEST, see the section discussing the loop cost studies. The investment values are then plugged into ACES.

Investment for cross-connects are derived from the equipment needed for optical cross-connects and DSX-3 cross-connects (DCS). Investment for optical cross-connects is related to the investment in two optical riser cables, and the investment in DCS is related to investment in two DSX-3s. Investment in DCS is related to DS0, DS-1, and DS-3 ports. These investment values are plugged into ACES.

Through ACES, factors related to power, buildings, depreciation, cost of money, income tax, equipment expenses, building and grounds maintenance, administrative expenses, ad valorem taxes, and a Commission assessment are applied to determine an annual recurring cost. This annual cost is divided by twelve to determine monthly cost associated with dedicated transport.

Common Transport

The unbundled common transport cost study develops a cost per minute, per mile for common interoffice transport facilities. The facility cost per minute, per mile represents the cost of facilities required to establish the talking/conversation path and maintain the path for the duration of a call between different central offices.

To determine costs related to common transport, investment per mile for facility for each of the four zones from COSTPROG was converted to cost through ACES. The annual costs were converted to minutes of use to yield a facility cost per minute, per mile. Included in common transport are the interoffice fiber facilities and the termination equipment. The interoffice fiber is based on a cost per minute, per mile. The termination equipment is based on per minute of use.

Explanation of SWBT's COSTPROG Model

COSTPROG is the model SWBT uses to calculate investment associated with common and dedicated interoffice transport. The model develops interoffice investments on fixed and per mile bases. Fixed investments are related to the electronics within a central office and per mile investments refer to the fiber lines between central offices. The model calculates investment for cross connects with SMAS test equipment, and non-recurring charges associated with 8 db, 5 db, ISDN-BRI, and DS-1 loops. The investment resulting from COSTPROG's calculations is plugged into ACES to generate cost.

COSTPROG calculates investment based on originating and terminating locations of a circuit. To do this, the model generates the route of a call. The route may be a chain of central offices, a ring of central offices, or a combination. A chain is composed of terminal and intermediate add/drop multiplexers. A ring is composed of pass-thrus where the signal enters or exits the network, and nodes where circuits access the interoffice transport.

A different investment is derived for each rate band: urban, suburban, rural, and interzone. For each rate band the COSTPROG process consists of

1) Design inputs
2) Generating Routes
3) Generating Service Files
4) Generating Investment Studies
5) Investment is plugged into ACES.

Design Inputs

Data for COSTPROG are obtained from the Trunks Integrated Records Keeping System (TIRKS) database, broadgauge, and procurement. Assumptions about the data and content of the database are summarized as follows:

- Cost information on equipment is obtained from procurement records. Installation cost data include SWBT engineering and contractor costs.
- The data used was last updated in 1994; SWBT is currently making a new update.
- The network design is obtained from network engineers and is based on facilities currently in place and facilities being placed over the next five years. The network design includes SONET and fiber investment.
- COSTPROG uses the entire data universe (not a sample).
- Data used in COSTPROG consist of originating and terminating locations by

Common language location identification (CLLI) code, total fixed investment in the route, fiber investment, number of circuits, route miles, air miles, route/air ratio, and billing band. Route miles is no longer used and air miles is used in its place for determining rates. Billing band is determined by the route being urban, suburban, rural, or interzone.

- Total fixed investment and fiber investment are derived in COSTPROG.

- Data are generated on how many networks (chain or ring) are crossed to complete a call. Data on the networks are contained in the SONET database. The SONET database contains network ID, LATA, speed (optional carrier 3, 12, or 48), network type (chain, one ring, fiber bidirectional), and number of nodes. For each leg in the network the following are used: originating (A) and terminating locations (Z), cable size, and route length.

Generate Routes

In this step, COSTPROG sorts through all possible routes a call may follow over a network and selects a least cost route. Assumptions about how routes are generated are summarized as follows:

- Investment data on fiber per foot, innerduct per foot, chain and ring in conjunction with network data are used to calculate investments and determine connected networks.

- The data are sorted according to routes a call may take. A least cost path is then determined from all possible routes.

- Data are summarized by number of nodes in the network to find total fiber investment and investment per fiber strand.

- The following calculations are then made for each network:
  1) Investment per Chain = Cost per Node / Capacity of DS-1.
  2) Total Fixed Investment per Network =
  Investment per Chain + Interconnection Investment + Network Access,

  where Interconnection Investment and Network Access are obtained from engineering.
  3) Total Fiber Investment per Pair per Network =
  (Investment per Single Fiber / Capacity of DS-1) * Number of Nodes,

  where, the number of fibers and nodes are obtained from engineering.
  4) Fill factors are applied to the total investment in each network crossed.

Generate Service Files

In this step COSTPROG identifies the total number of circuits within a network and within a rate band. These values are then used to generate the investment studies.

Generate Investment Studies

COSTPROG generates fixed and fiber investment for least cost routes for all originating and terminating locations. Assumptions regarding how investment studies are generated are summarized as follows:

- The values of Total Fixed Investment per Network and Total Fiber Investment per Pair Network are then weighted according to the number of circuits in the network by:

  (Fixed Investment * Number of Circuits) / Total Circuits in Network

  - This is determined for each network for the fixed (electronics) investment. The values for each network are then summed producing Total Raw Fixed Cost, which is plugged into ACES to determine cost related to the electronics in a central office associated with interoffice transport.
    - The result from ACES is annual termination cost.

  - Weighting of circuits for fiber is done as

Fiber Investment / Air Miles * Number of Circuits / Total Circuits in Network

  - This calculation is applied to each network for the fiber investment. The values for each network are then summed producing Raw Fiber Investment, which is plugged into ACES to determine the cost related to the fiber between central offices associated with interoffice transport.
    - The result from ACES is annual facility cost per mile.

Local and IntraLATA Operator Assistance

Purpose of Study

The purpose of this study is to determine the forward-looking TELRIC associated with providing Operator Assistance. The service is currently offered to the Independent Exchange Companies (IEC) and the Competitive Local Exchange Companies (CLEC) in Missouri.

Concerns and Proposed Modifications

Staff has no specific concerns or proposed modifications to this study other than the Proposed Modifications Affecting All Studies (Cost of Money, Depreciation, etc.).

This service is currently offered to other IECs in Missouri and intercompany compensation arrangements are currently in place. Since this is already a market price and these services are not bottleneck or monopoly services, Staff recommends the use of the lowest intercompany compensation arrangement SWBT currently has in place. If SWBT agrees to a lower intercompany compensation arrangement in the future, that rate should be made available to AT&T and MCI.

Directory Assistance

Purpose of Study

The purpose of this study is to determine the forward-looking TELRIC associated with providing Directory Assistance. The service is currently offered to the Independent Exchange Companies (IEC) and the Competitive Local Exchange Companies (CLEC) in Missouri.

Concerns and Proposed Modifications

Staff has no specific concerns or proposed modifications to this study other than the Proposed Modifications Affecting All Studies (Cost of Money, Depreciation, etc.).

This service is currently offered to other IECs in Missouri and intercompany compensation arrangements are currently in place. Since there is already a market price and these services are not bottleneck or monopoly services, Staff recommends the use of the lowest intercompany compensation arrangement SWBT currently has in place. If SWBT agrees to a lower intercompany compensation arrangement in the future, that rate should be made available to AT&T and MCI.

Directory Assistance Call Completion

Purpose of Study

The purpose of this study is to determine the forward-looking TELRIC associated with providing Directory Assistance Call Completion. The service is currently offered to the Independent Exchange Companies (IEC) and the Competitive Local Exchange Companies (CLEC) in Missouri. This service allows the customers of IECs or CLECs who request a number for Directory Assistance with the option of having their call completed by the Directory Assistance operator or audio response system that provides the requested directory number.

Concerns and Proposed Modifications

Staff has no specific concerns or proposed modifications to this study other than the Proposed Modifications Affecting All Studies (Cost of Money, Depreciation, etc.).

This service is currently offered to other IECs in Missouri and intercompany compensation arrangements are currently in place. Since this is already a market price and these services are not bottleneck or monopoly services, Staff recommends the use of the lowest intercompany compensation arrangement SWBT currently has in place. If SWBT agrees to a lower intercompany compensation arrangement in the future, that rate should be made available to AT&T and MCI.

Dark Fiber

Purpose

This study identifies the Forward-Looking TELRIC associated with providing dark fiber as an unbunbled element. Dark Fiber is the unlit or unused fiber strands currently in place throughout the existing network. These fiber strands do not have any electronics attached to them and are not being used to provision services.

Proposed Concerns and Modifications

Fiber Termination - SWBT's proposed charge for dark fiber recovers the investment for fiber termination on distance sensitive or per mile basis. Fiber Termination investment include the costs for fiber distribution frame and the pig tails used to connect equipment to the fiber distribution frame. These costs are not incurred on a distance sensitive basis. They are incurred each time a fiber optic cable terminates to a central office or the customer premises. For this reason, these costs should not be recovered on a distance sensitive basis.

Staff recommends these costs apply per termination on a monthly basis. Recovering the costs in this manner more accurately matches the manner the costs are incurred with the rate structure. This modification should not affect the overall cost of dark fiber.

Fill Factors - Staff disagrees with SWBT's fill factor for dark fiber. SWBT's rational is that it will be unable to either lease or use all of the dark fiber and should recover that investment through the use of the fill factor. The reasons that SWBT will be unable to lease or use fibers are:

- Because of breakage, some of the dark fiber strands or the fibers strands currently in use will not be physically able to be used.
- SWBT will be unable to use or lease all of its dark fiber because of insufficient demand from CLECs or internal uses.
- SWBT needs to reserve fiber for its own future use.

Staff agrees with first reason but disagrees that the use of fill factor is necessary for the other two reasons.

Because of breakage, some of the fiber strands will not be able to be used. In the case of dark fiber, the strands will never be able to have electronics attached to them. In the case of fiber strands currently in use, something may happen to render that fiber useless so SWBT needs to have some fibers in reserve to use in its place. Staff feels that it is appropriate to recover this investment through a fill factor applied to dark fiber.

Using a fill factor for the second reason is inappropriate. If SWBT is allowed to use a low fill factor (low usage percentage), SWBT will be allowed to recover fiber investment without ever making the fiber available or using for its own use. If this occurs, SWBT will have no incentive to lease dark fiber to any other carriers. If SWBT wants to keep dark fiber for its own use, it should recover that investment when the fiber is used. SWBT should not be allowed to require current customers to pay for services for future customers.

Staff also disagrees with the last reason SWBT uses for justifying its fiber fill factor. Fiber reserved for SWBT's future use is recovered in the fill factors used in other rate elements. For example, Interoffice Transport contains a fiber fill factor. The purpose of that fill factor is allow SWBT to recover the investment for fiber that is anticipated to be used in the near future. Under the terms of leasing dark fiber, SWBT has the right to reclaim any fiber leased to another party for its own use if necessary. Since that process may take some time, SWBT should be allowed to retain some fiber for short-term usage. However, that investment is reflected in the fiber fill for other elements and does not also need to be recovered in the dark fiber element.

To allow for breakage, Staff proposes that SWBT use 95% fill factor on dark fiber. This would allow SWBT to retain 5 percent of its fibers for breakage.

Summary of Study

The costs for dark fiber are based upon the current SWBT costs as listed in the 1996 Broadgauge Cost. The per foot fiber costs include underground and buried investments and are weighted based upon the current placement percentages. These investments include placement, conduit, innerduct, and pass-through and end fiber terminations at the serving central offices and the premise terminations. The fiber terminations are converted to a per foot investment based upon the average number of terminations per mile from the DS-1 Interoffice Study. The dark fiber investment contains a **__** fill factor. This means that of the dark fiber strands in the network, **__** will be leased to other CLECs or used by SWBT in the future. The remaining **__** will still be unused and that associated investment needs to be recovered from the dark fiber leased to CLECs or used by SWBT in the future. The rational for the use of a fill factor is discussed in more detail in the Concerns and Proposed Modifications Section. Finally, monthly costs are derived by applying the investments to the ACES model.

Summary of the ACES Cost Model

Purpose

This model applies various capital and cost factors to the incremental investment derived from SWBT's other network investment models. This is necessary to convert the incremental investment into a monthly cost.

Concerns and Proposed Modifications

Building Factor - The numerator in the building factor model begins with the booked investment in network and other buildings and uses the account specific CC/BC (current cost/booked cost) ratio to calculate the replacement cost of the buildings. This assumes that if SWBT were to replace the buildings today, they would build exactly the same number and size of buildings in the same locations. In reality, a truly forward-looking building investment would have to recognize that the increases in digital switch capacity would require fewer wire centers and fewer building to house the wirecenters. In addition, a forward-looking building factor would have to recognize that network building built today would be smaller than existing buildings because switching equipment has physically gotten smaller and the companies have adopted the host/remote technology which reduces space requirements.

The FCC's Interconnection Order (Order) required the use of the existing wire centers which is one thing in the Order that the incumbent LECs tend to agree with. However, the use of the current wire center locations was not intended to be a forward-looking costing standard. ¶ 685 of the Order states that, "the forward-looking pricing methodology for interconnection and unbundled elements should be based upon costs that assume that wire centers will be placed in the incumbent LEC's wire center locations". The Order goes on to say that "this approach encourages facilities-based competition to the extent that new entrants, by designing more efficient network configurations, are able to provide the service at a lower cost than the incumbent LEC." This clearly recognizes that the current wire center locations are not the most efficient but using the current wire center locations would produce economic costs that most closely resemble those the LEC would face. Given that the use of the existing wire centers was not a forward-looking assumption, it seems inappropriate to then inflate the costs of the existing wire center location, namely the building, in an attempt to make this a forward-looking assumption when it was never intended to be forward-looking. If we were to develop a forward-looking building factor, we would also have to consider the fact that fewer wire centers would be built.

Even if the same number of buildings were to be rebuilt, the physical size of most of the equipment housed in the buildings has been reduced dramatically so SWBT would not build the same size of building. For these reasons, this factor, as calculated, overstates the investment in network and other buildings.

An additional consideration is the issue of double recovery of building investment. As calculated by SWBT, this factor would assign all forward-looking building investment to the network elements. SWBT will also recover building investment from collocators through individual case basis (ICB) pricing contracts for leasing central office space. Allowing SWBT to recover building investment from both sources would lead to a double recovery of investment. One option would be to not allow SWBT to include building investment in the ICB pricing calculation. This would drastically reduce the ICB and probably cause collocators to request more space than they actually need resulting in an inefficient use of floor space.

The best approach to allowing SWBT to recover the forward-looking investment in buildings would be to determine the percentage of space available for collocators and remove that investment from the building factor. The remaining space that is used to house network equipment would be recovered by applying the building factor to the network investment. Unfortunately, there is no Missouri specific data on the amount of excess floor space available to collocators so this was not possible.

The most practical approach and the modification proposed by Staff would be to use the historical investments in determining the building factor. This would allow SWBT to recover its investment in buildings but will not build in the costs of replacing the existing buildings. The issue of double recovery would still exist but to a much less extent than if the current investment required to replace the existing buildings were used. In order to be consistent, the building and grounds maintenance factor should be adjusted to reflect the lower historic building investment. This will increase the building and grounds maintenance factor.

Building and Grounds Maintenance

The Building and Grounds Maintenance Factor is calculated by dividing the Building and Grounds Maintenance Expense by the Total Replacement Cost for the Mid-Year Investment in the Buildings and Land Accounts. To be consistent with the recommended changes to the Building Factor, the investment in the maintenance factor should be reduced to the historic investment in building and land. In other words, the building factor and the building maintenance factor should be calculated using comparable investments. As the Maintenance Expense in the numerator remains constant, this adjustment will increase the Building and Grounds factor.

Inflation and Productivity Factors

See Inflation and Productivity Factor Modifications Section.

Summary of ACES Cost Model

The ACES model has three primary costing sections. Each of these categories represents a type of cost applied to the investment. The categories are Equipment Investment, Annual Capital Costs, and Annual Operating Expenses. Each of these is described in greater detail below.

Section 1 - Equipment Investment: The purpose of this section is to identify the additional expenses associated with procuring, installing, housing, and operating the incremental investment input from other SWBT cost models. The inputs for this section are described below.

> **Equipment Investment (EF&I):** This factor is the incremental investment for each network component. This input comes from SWBT's other cost models such as Loopvest and SCIS.
>
> **Ratio of Material to Total EF&I:** This factor is intended to recover the percentage of investment that is actually material. This is the cost of the vendor material excluding vendor design costs to design, engineer and install the investment. The purpose of this input is to determine the percentage of investment that is subject to sales and use taxes.
>
> **Sales Tax:** This factor is intended to recover the statewide average sales tax percentage that SWBT paid in 1995. It is the total sales dollars paid in 1995 divided by the 1995 total purchases subject to sales tax.
>
> **TELCO Engineering:** This factor is intended to recover the labor cost of SWBT engineers to design and engineer the installation and placement of the equipment. It is calculated by dividing the 1993 - 1995 total TELCO Engineering Labor by the Total Vendor Material and Expenses Related to EF&I for 1993 - 1995. Three years of data are used in the calculation to normalize the expenditures.
>
> **TELCO Plant Labor:** This factor is intended to recover the labor cost incurred to actually install the equipment. It is calculated by dividing the Total Plant Labor for 1993 - 1995 by the Total Vendor Material and Expenses Related to EF&I for 1993 - 1995. Again, three years of data are used in the calculation to normalize the expenditures.
>
> **Sundry & Miscellaneous:** This factor is intended to recover the miscellaneous costs associated with purchasing the equipment or investment. This includes the

Interest Paid During Construction, Contracted Labor, and other miscellaneous costs. It is calculated by dividing the Total Sundry and Miscellaneous Expense for 1993 - 1995 by the Total Vendor Material and Expenses Related to EF&I for 1993 - 1995. Again, three years of data are used in the calculation to normalize the expenditures.

Power: This factor is intended to recover the cost of electrical equipment needed to operate telecommunications and computer equipment. This factor does not include the actual power expenses, just the capitalized power equipment. It is calculated by dividing the Cost of Power Equipment Assigned to the Network Components by the Equipment Investment for Network Components. This factor is not account specific. The Cost of Power Equipment Assigned to the Network Components is allocated to different asset categories based upon historical embedded investment in Network Components. Unlike the other cost factors that allocate expenses based upon investment, no adjustment is made to the network investment to make it reflect the replacement cost. This adjustment is not made because this is an investment to investment ratio.

Building: This factor is intended to recover the building investment associated with housing network equipment. It does not include headquarters and administration buildings. This factor is only applied to investments that require buildings. It is calculated by dividing the Building Investment for Network and Other Buildings by the Network Investment for Switching, Operator Systems, and Circuit Equipment. The historical Network Investment for Switching, Operator Systems, and Circuit Equipment is multiplied by an inflation factor to calculate the replacement cost for Network Investment. The inflation factor used in this calculation is called the CC/BC (current cost/booked cost) ratio. This is included in an attempt to make the factor forward-looking.

The use of the CC/BC ratio in the equation results in a cost factor designed to recover the building investment assuming that exactly the same number, size, and location of the buildings would be rebuilt today. In reality, if the network were to be rebuilt it is very doubtful that the same number of wire centers would be necessary. In addition, the actual equipment housed in the buildings has physically gotten smaller so the building space required should also be reduced. Finally, SWBT generates revenue by leasing space for physical collocation so it would not be appropriate to include the entire building investment in the building factor. Considering these facts, the use of the CC/BC ratio will overstate the "true replacement cost" of SWBT's buildings.

Section 2 - Annual Capital Cost: The purpose of this section is to identify the capital costs associated with the total incremental investment identified in the Equipment Investment Section. It is important to note that total incremental investment includes the incremental investment plus the cost of procuring, installing, housing, and operating the incremental investment. The three capital costs contained in this section are the

Depreciation Factor, Cost of Money Factor, and the Income Tax Rate. The source of these inputs is the CAPCOST model. The details of the inputs will be discussed in Summary of the CAPCOST Model. It is important to note that the Annual Capital Cost Factors include the capital costs associated with the particular asset and the capital costs associated the building investment. Only assets that require building investment have capital costs associated with buildings. Each of the Annual Capital Cost Factors is multiplied by the Capital Cost Inflation Factor.

Annual Depreciation Factor: This is the depreciation factor used to calculate the annual depreciation expense. See the Depreciation Section later in this report for a discussion of the actual depreciation factors.

Annual Cost of Money Factor: The purpose of this factor is to identify the annual cost of money for the particular investment. The annual cost of money reflects SWBT's profit from the investment. The Cost of Capital and Capital Structure for SBC Section for a discussion of the actual capital cost inputs.

Income Tax Rate: The purpose of this factor is to identify the income tax expense incurred by using equity financing. This factor is included to ensure that SWBT receives a return sufficient to pay the necessary income tax and still recover its cost of capital. See the Income Tax Section for a discussion of the Income Tax rate.

Section 3 - Annual Expense: The purpose of this section is to identify the annual expenses associated with operating and maintaining the total incremental investment identified in the Equipment Investment Section. It is important to note that total incremental investment includes the incremental investment plus the cost of procuring, installing, housing, and operating the incremental investment.

Equipment Maintenance: This is the recurring expenses (material and labor) associated with ordinary repairs, rearrangements, and changes to plant. This factor is calculated by dividing the Total Maintenance Expense by Account for the latest year by the Replacement Cost of the Mid-Year Investment in a particular Account for the latest year. Once this factor is calculated it is multiplied times the Operating Expense Inflation Factor (OEInf).

The Total Maintenance Expense tends to be asset category specific but not account specific. These recurring expense for each asset type are allocated to individual accounts based upon investment in each account. For example, switch testing expense is recorded as labor specific to switching but not specific to a specific account such as digital or analog switching. Therefore, the total switch testing expense is allocated among the different switching accounts (analog, digital, etc.) based upon the investment in each account. If one type of switching requires a disproportional share of maintenance, this allocation will not reflect it. Since SWBT's TELRIC cost studies only include one type of switching (digital), this allocation could overstate maintenance costs for digital switching. This would occur if analog switching actually incurred more maintenance costs per dollar of investment than digital switching. Of course, if analog switching required less testing per dollar of investment than digital switching required per dollar of investment, this allocation could understate the maintenance cost for digital switching.

The Total Replacement Cost of the Mid-Year Investment of a particular asset account is calculated by multiplying the historical, embedded investment times the CC/BC ratio. This increases the embedded asset investment to reflect the current replacement cost of that particular account. The Mid-Year investment number is subject to the same concerns expressed in the Building Factor.

Once this factor is calculated it is multiplied by the OEInf. This calculation is done to make the maintenance expenses forward-looking. The effect of this is to make the numerator forwarding looking while holding the denominator at the current value.

Building and Grounds Maintenance: This factor is applied to recover the annual expenses associated with ordinary repairs, rearrangements, and changes to land and buildings. This factor is only applied to asset accounts that require the use of a building. It is calculated by dividing the Building and Grounds Maintenance Expense by the Total Replacement Cost for the Mid-Year Investment in the Buildings and Land Accounts. This factor contains all buildings, including administrative and headquarter buildings in both the numerator and the denominator. Once the factor is calculated, it is multiplied by the OEInf. This is done to make the maintenance expenses forward looking.

An additional consideration is the inclusion of administrative and headquarters buildings in calculating this factor. Since the incremental portion of SWBT's TELRIC studies do not include headquarters and administrative buildings, the inclusion of them in the factor needs further investigation. If administrative and headquarters buildings require more maintenance per dollar of investment than other buildings, the portion of building maintenance allocated to the incremental investment may be overstated. Of course the opposite is true if headquarters and administrative buildings require less maintenance per dollar of investment. The real effect of including all buildings in the calculation of this factor is unknown.

Of greater importance, is the need to ensure that all Building and Grounds Maintenance Expenses are not included in the calculation of common costs. The portion of this expense that is applied to total incremental investment needs to be removed from the calculation of common costs.

Support Assets/Administrative Factor: This factor is intended to recover the recurring expenses incurred for support assets that can be allocated to plant specific accounts. These expenses are reported by asset type but not by asset account. The expenses associated with each asset type are allocated to asset accounts through two different methods.

> 1). A portion of the support asset expense is allocated to each account based upon the investment in each account.
>
> 2). The remaining support asset expense is allocated to each account based upon the salaries charged to that particular account.

This is the only factor that uses such an allocation scheme.

Ad Valorem/Miscellaneous Tax: The purpose of this factor is to recover the taxes levied on the asset values of the plant. This includes all property taxes, franchise taxes, and miscellaneous other taxes. It is calculated by dividing the total Ad Valorem and Miscellaneous taxes paid in 1995 by the Total Plant Investment.

Commission Assessment: The purpose of the factor is to recover the cost of the Public Utility Assessment Charge. It is calculated by dividing the 1995 Public Utility Assessment Charge by the Total Intrastate Operating Revenues less Uncollectible Revenues. The Public Utility Assessment charge is based upon revenues not investment. Therefore, it cannot be directly applied to the amount of the investment. In this instance, SWBT defines its revenues as being equal to its capital costs plus its other expenses. Therefore, this factor is applied to the Total Annual Capital Costs and the Annual Operating Expenses.

Inflation Factors

See the Inflation and Productivity Factor Section later in this report.

Explanation of CAPCOST Model

CAPCOST is the model Southwestern Bell Telephone (SWBT) uses to calculate capital costs attributable to specific project investments. The capital costs are depreciation, post tax income (cost of money), and income tax. The model develops these costs recognizing plant survival characteristics, accelerated tax depreciation procedures, planning horizon[4], and investment tax credit. The model produces factors related to these costs that represent the return on investment needed to cover these costs and give a return to investors.

Purpose

CAPCOST calculates the capital cost factors (depreciation, post tax income, and income tax) associated with network investment for various unbundled network elements including loops, cross connects with SMAS test equipment, nonrecurring costs for unbundled loops, local switching, monthly port charges, tandem switching, interoffice transport, and conditioning. The three capital cost factors produced are then used in the ACES model to calculate the annual capital costs.

Concerns

Since CAPCOST results affect all elements, depreciation, income tax, and cost of money modifications are discussed separately. These factors are discussed below only in the way they interact and are treated in the CAPCOST model. Modifications to these factors are presented in the Depreciation, Income Tax, and Cost of Money sections.

Depreciation Factor

Investments with significant original costs and useful, revenue producing lives exceeding one year are capitalized to an asset account. Recovery of these invested amounts is accomplished through depreciation expense built into rates customers pay. The

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SWBT uses a planning period that accounts for each useful year of an asset's life. Using a planning period at least as long as the total estimated life of the asset ensures SWBT will accurately recover the value of the asset, and will accurately determine the cost of the asset. However, if SWBT does not account for the full depreciation of an asset in determining its cost, the true value of the asset will not be recovered, the asset will not be fully depreciated, and the resulting cost will be inaccurate.

accumulation or degree of recovery is maintained by entries to SWBT's depreciation reserve accounts on a monthly basis.

- SWBT defines the depreciation factor to represent the consumed or economic loss of an asset for the period in which costs are being identified through the cost study process.

- Before calculating depreciation, the service life and net salvage of the plant needs to be defined. SWBT establishes a projected life through Gomphertz-Makeham survival analysis to identify how much of the investment will be in service over the useful life. Incremental retirements are then calculated based on the projected useful life.

- The equal life group (ELG) method of depreciation is used to allocate depreciation expense each year. The ELG method assigns higher depreciation rates to investments in earlier years than later years.

- The sum of the fractions of the asset retired each year will equal the average life the asset.

- Depreciation is the procedure used to allocate a portion of the asset investment to each year over the asset's useful life. The depreciation reserve accrues the depreciation expense amounts, and at a given time represents the total of all prior accruals.

- When an asset is retired, both the asset account and the reserve account are reduced by the original investment amount. Gross salvage (if any) is added to and the costs of removal debited from the depreciation reserve.

- The Depreciation Factor is determined from plant retirements, gross salvage value, and cost of removal. The sum of the present values of each year's depreciation expense is compared to the present value of units of the asset in service each year. This ratio represents the amount to be recovered over the life of the asset to cover depreciation expense. This ratio is the factor for depreciation that is fed into ACES.

Post Tax Income (Cost of Money) Factor

CAPCOST utilizes inputs to produce a series of values relating to the capital cost of an investment. An investment is the purchase of an asset usually repaid over several years.

- SWBT defines the Post Tax Income (cost of money) Factor to be the weighted annual cost to the firm of the debt and equity capital invested in the business. It is the amount which must be earned to cover financial commitments to the company's debt holders (interest rate on debt) and to meet the shareholder's expectations (return on shareholder's investment).

- Not all investments are made at the beginning of a year or end of a year. Some are made whenever needed, so a mid-year investment basis is used for calculating the effects of interest and present values.
- For cost determining purposes, SWBT uses a mid year investment timing. The mid-year investment is the average timing of investment that accounts for investments throughout a year.
- The Post Tax Income Factor is calculated from interest and tax payments, book depreciation, net investment, tax depreciation, salvage, book tax depreciation, tax reserves and debt interest. Total post tax income represents the amount to be earned to cover interest expenses over the life of the asset. Its present value is compared to the present value of units of plant in service. This ratio represents the return on the investment needed to cover interest expenses over the life of the asset.

Income Tax Factor

Investment comes from equity and debt. There is an obligation to maximize stockholder equity and to pay interest on debt. In addition, an income tax is levied upon the equity return paid. Thus, not only does the return need to cover the investment and interest, the return required must reflect income tax incurred during the year.

- SWBT defines the Income Tax Factor to be the amount owed to federal and state governments on the return earned on its investments.
- Income tax expense is the product of the composite income tax rate and the taxable income generated by the investment less any tax credits.
- SWBT calculates a statutory composite income tax rate by adding the statutory federal income tax rate to the statutory state income tax rate.
- The Income Tax Factor is determined from effective taxable income and income tax expense. The present value of income tax expense is compared to the present value of units of plant in service. This ratio represents the amount of return on investment needed to cover income tax expense over the life of the asset. This value is plugged into ACES as the income tax factor.

CAPCOST

The model calculates the annual capital costs associated with the investment on a year-by-year basis over the life of the asset. Time value of money is then applied to each years cost and each years units in service. Total capital cost is the sum of book depreciation, post tax income and income tax expense.

Total CAPCOST =
Book depreciation factor + Post tax income factor + Income tax expense factor

- Total CAPCOST represents the amount of return on investment needed to recover all three costs associated with CAPCOST allowing for a return to investors.

Cost of Capital and Capital Structure for SBC

Purpose

This section analyzes the cost of capital and capital structures presented by the parties and contians Staff's proposed cost of capital. This section is organized by issue with each parties position and Staff's critique and proposal. The attached worksheet also summarizes each parties position and contains Staff's analysis.

Cost of Debt

SWBT: SWBT includes a cost of debt of **___** in the CAPCOST model while SWBT's cost of capital witness, William C. Avera recommends an 8% cost of debt in his rebuttal testimony. The 8% recommended is intended to represent the cost of debt if SBC would have to pay if bonds were issued today. Avera bases the 8% cost of debt upon Moody's Credit Perspective report of the average yield on "A" rated long-term bonds plus 16 basis points for flotation costs. Incidentally, SWBT's embedded cost of debt is about 7%.

Analysis: SBC's bonds currently carry a "Aa" rating and have a lower interest rate than the "A" bonds Avera referenced. In addition, the use of the long-term bond rate as a forward-looking cost of debt would assume that SBC would only issue long term bonds. It is likely that if SBC were to issue all bonds today, it would issue some of those bonds with a shorter time to maturity and therefore, have a lower cost of debt. One of Avera's criticisms of AT&T's proposed cost of debt was that it focused on a bond guide that contained many bonds close to maturity and therefore understated the cost of debt. It would also appear that only focusing on long-term bonds would be an equally biased measurement.

AT&T: AT&T's witness Bradford Cornell recommends a cost of debt of 7.5%. This is based upon an average of SBC and SWBT bond yields reported in the August 1996 Standard & Poor's Bond Guide. AT&T's cost of debt estimate does not include any allowance for flotation costs.

Analysis: The S&P Bond Guide is not a complete reflection of SWBT's cost of debt because it only contains a portion of SWBT's and SBC's outstanding debt issues. Cornell's Direct Testimony stated that he planned to update the cost of debt estimate when more complete data became available (Page 9).

In reviewing his Rebuttal Testimony, it is not apparent that this estimate was ever updated.

AT&T's proposed cost of debt does not include any allowance for flotation costs. Since flotation costs are incurred when bonds are issued, it seems reasonable that the issuer should be able to recover those costs.

Proposed: The forward-looking cost of debt for SBC should be 7.6%. This is based upon the February 1997 Moody's Corporate Bond Yield Averages which reports the current bond yield for "Aa" corporate bonds. This measure focuses on long-term bonds which carry a higher interest rate than shorter-term bonds. Since it is likely that SBC would issue bonds of varying maturity, the forward-looking cost of debt would be less than a strictly long-term bond rate. However, the issuer would also incur flotation costs with new issues. The recommend cost of debt of 7.6% does not include an explicit flotation cost but the flotation costs should be offset by the lower debt costs of short-term maturities. Further offsetting the flotation costs is the fact that SBC bonds generally track about 10 basis points lower than other "Aa" utility bonds.

Cost of Equity

SWBT: SWBT uses a cost of equity of **____** in the CAPCOST model. SWBT's cost of capital witness, William C. Avera, uses several different equity measures to arrive at a cost of equity that ranges from a high of 13.35% to a low of 12.54%. Avera uses a combination of the CAPM analysis and a single-stage DCF analysis to arrive at the high number of 13.35%. The low end of the range is calculated by a combination of a CAPM analysis and a two-stage DCF analysis. The two are then averaged to arrive at Avera's recommended cost of capital of 12.95%.

Analysis: Avera's CAPM relied on one Beta value from Value Line as the measure of risk. Value Line makes an adjustment to the traditional calculation of the Beta value to make it closer to one on the belief that, in the long run, all Beta values will approach one. The exact adjustment that Value Line makes is considered proprietary. Focusing only on Value Line's Beta value results in a higher risk premium. It seems more appropriate to consider several Beta values to reduce the risk that one particular value is biased.

Avera's single-stage and two-stage DCF calculations use an expected dividend yield that is the current dividend times the total SBC earnings growth rate. This would assume the growth in dividends is equal to the expected growth in the earnings of the firm. This is not a reasonable assumption. An increase in earnings does not always translate into a growth in dividend. A comparison of SBC's growth in earnings per share

(EPS) to the growth in dividend payments from 1993 to 1996 indicates that EPS has grown an average of 13.5% annually while dividends have increased an average of 4.3% annually. Clearly it is inappropriate to calculate the expected dividend by assuming the current dividend will increase by the expected growth in earnings. Value Line has estimated the expected dividend to be $1.80 while Avera's method estimated it at $1.89.

In addition, Avera uses the SBC stock price from 7/31/96 as the denominator in his DCF analysis. Using the stock price from a single day increases the risk of a biased estimate of equity if that day were an anomaly in the market or in the price of SBC stock. It would be more appropriate to use an average stock price over at least a two week period to reduce any bias caused by a one day blip in the stock market.

AT&T: AT&T's cost of capital witness, Bradford Cornell uses a combination of the CAPM and a three-stage DCF to arrive at AT&T's proposed cost of equity of 11.3%. To reduce estimation errors, Cornell focuses on a sample of 11 local telephone companies, including SBC, to calculate the cost of equity. This is intended to reduce forecasting errors by focusing on several companies and not relying upon a single forecast.

Analysis: The use of a three-stage DCF to measure the cost of equity creates some areas of concern. In theory, the use of a three-stage DCF is appealing. Since the DCF model is based upon the value of future dividends, the use of three growth stages to reflect the future dividend stream would seem to be appropriate. However, accurately reflecting future dividend streams is extremely difficult which is where the use of the three-stage DCF generates concern. Cornell used a widely published five year growth forecast for the first stage. The second stage lasts for 15 years and assumes that the growth rate falls from the higher level of growth achieved in the first five years to the growth rate of the U.S. economy. The third stage begins in the twentieth year and assumes that the firms in the sample will grow at a rate equal to the U.S. economy. There is no empirical evidence to support the growth in the second and third stages in this analysis. Accurately forecasting five years of growth is almost impossible and accurately forecasting twenty years of growth is even more unlikely. Because of the mathematics and averaging involved in a three-stage DCF, the growth in the second and third periods significantly affect the outcome of the analysis. Unfortunately, the growth estimates in the second and third periods are not reliable so the analysis is heavily based upon questionable estimates. Because of this, the use of a three-stage DCF raises accuracy issues and its results should be used with a degree of caution.

Cornell's CAPM analysis also generates some concern. Primarily, the concern centers around his use of the Beta values. Cornell employs an "unleveraging" method for using the Beta value. This method is supposed to account for differences in capital structures for the different firms in the sample. In his direct testimony, Cornell states that the Betas are unleveraged using standard financial economic formulas. In a review of financial literature, we were not able to find any support for this unleveraging procedure. Because its use tends to reduce the Beta value and the resulting equity estimate, its use generates a great deal of concern.

Proposed: Because of concerns with each parties' equity estimates, we recommend of cost of equity of 12.36%. This estimate is based upon a combination of a single-stage DCF and a CAPM analysis for SBC.

To avoid the methodological concerns associated with a three-stage DCF, we used a single-stage DCF to estimate the cost of equity. This analysis used an expected dividend of $1.80 based upon the January 10, 1997 Value Line Projection. Three different growth estimates were used to reduce any possible bias associated with the use of a single growth forecast. The sources for these estimates were Institutional Brokers Estimate System (IBES), Standard & Poor's, and Zacks Earning Estimates. The stock price for SBC used in the calculation was the average closing price for SBC as reported in the Wall Street Journal over the period of March 17 thru March 28. A two-week average was used to reduce any bias that might be reflected in the closing price of a single day. The result of the single-stage DCF was 13.13%

The CAPM analysis focuses on SBC but uses three different sources for the Beta value to reduce any bias that results from the use of a single estimate. The three sources were Standard & Poor's, IBES, and Value Line. Because the analysis focused only upon one firm, the unleveraging procedure employed by AT&T's witness is unnecessary. His goal of not relying upon a single estimate was achieved by using multiple forecasts for a single firm instead of a single source of forecasts for multiple firms.

The risk-free rate used is the 30 day T-bill rate which is a widely accepted proxy for a risk-free rate. Some analysts use a 30 year Treasury Bond rate as a risk-free rate but we rejected its use because a long term rate includes an inflation premium associated with inflationary risk and therefore does reflect a risk-free rate. The inflationary risk is reflected in the risk premium and does not need to be included twice. The risk premium was calculated by subtracting Arithmetic Mean Annual Return for U.S. Treasury Bills from 1926 - 1996 from the Arithmetic Mean Annual Return for Large Company Stocks for the same time period. The result of the CAPM was a cost of equity estimate of 11.59%

To arrive at the proposed cost of equity, the results of the two measures were averaged. In theory, the two methods should have produced almost identical results. In this case, they did not which raises some initial concerns. The two methods estimate the cost of equity from two different approaches. The DCF estimate is based upon future growth while a CAPM analysis is based upon relative risk.

The single-stage DCF relied upon a five year growth forecast as the estimate for long-term growth. SBC's average expected annual growth for the next five years is 9.83%. It is very unlikely that SBC will be able to maintain such a high growth rate indefinitely. At some point SBC's growth will decline. Unfortunately, it is almost impossible to accurately estimate when that growth will diminish. If it were possible to accurately estimate the long-run growth of SBC, a multiple-stage DCF analysis would be preferred. Because of the uncertainties associated with a long-term forecast, a single-stage DCF analysis was used. However, because of the high short run growth expectation, the single-stage DCF is likely to overestimate the true cost of equity. Its results should be used with a note of caution or in combination with another methodology.

The CAPM analysis estimates the cost of equity from risk perspective. It relies upon the historical relationship of SBC stock to the market as a whole to calculate the risk premium. Every stock advertisement points out that past performance does not always reflect future performance. The relationship between SBC's stock and the market as a whole may or may not continue to follow the historical pattern. Some analysts argue that the risk associated with SBC has already increased or will increase because of local competition and that the historical relationship between SBC and the market will change as competition develops. If the riskiness of SBC relative to the riskiness of the market increases, the CAPM will generate a cost of equity estimate that is low. Whether the riskiness of SBC relative to the market will increase is not known so this CAPM analysis does not necessarily produce an estimate that is too low.

An average of the two methodologies provides an estimate for the cost of equity for a company that has historically been low-risk but is expected to achieve high-growth for the next five years.

It is important to remember that this estimate of the cost of equity, as well as AT&T's and SWBT's estimates, are for SBC not SWBT. SBC has investments that are more risky and have more growth potential than SWBT. If competition does increase and is effective, the difference between SWBT and SBC will disappear as the risks and returns of the two entities converge. However, at the present time SWBT is a lower risk entity than SBC. The use of SBC to determine the cost of equity for SWBT will likely produce an estimate that is too high. An adjustment to SBC's cost of equity may be appropriate if the Commission wishes to reflect SWBT's current cost of equity or SWBT's cost of equity in the near future. If the Commission wishes to reflect a likely long-term cost of equity for SWBT, no adjustment is necessary from the 12.36%.

Capital Structure

SWBT: SWBT proposed a debt/equity ratio of 42%/58%. Currently, SWBT's capital structure is **____** debt and **____** equity. SWBT's proposed capital structure reflects two major accounting adjustments that were made to comply with orders from the Financial Accounting Standards Board. These adjustments were recognized by the Commission in SWBT's last rate case proceeding, Case No. TC-93-224 in which the Commission ordered a capital structure of 57.42% equity and 42.58% debt. In addition, Value Line projects a 42%/58% debt to equity ratio for SBC in the future.

AT&T: AT&T also recommends a debt/equity ratio of 42%/58% but arrives at the number by another method. AT&T's proposed capital structure is based upon an average of the capital structure weighted by market value and the capital structure weighted by book value.

Analysis: The capital structure proposed by both SWBT and AT&T are identical and seem to be appropriate.

Cost of Capital Analysis for SBC

Summary of Positions

Cost of Debt	High	Low	Average	Proposed
SWBT Position	8.00%	7.50%	7.75%	7.50%
AT&T Position	-	-	7.50%	7.50%
Recommended Cost of Debt	-	-	7.60%	7.60%

Based upon Moody's 2/97 Long-Term Corporate Bond Yield Averages for Aa Rated Bonds

Cost of Equity	High	Low	Average	Proposed
SWBT Position	13.35%	12.54%	12.95%	13.00%
AT&T Position	11.32%	11.25%	11.29%	11.30%
Recommended Cost of Equity	13.12%	11.59%	12.36%	12.36%

Capital Structure	Debt	Equity
SWBT Position	42%	58%
AT&T Position	42%	58%
Recommended Structure	42%	58%

Weighted Average Cost of Capital	High	Low	Average	Proposed
SWBT Position	11.10%	10.42%	10.76%	10.69%
AT&T Position	9.72%	9.68%	9.70%	9.70%
Recommended WACC	10.80%	9.91%	10.36%	10.36%

Staff Analysis

DCF Analysis

Expected Dividend	$1.80
Growth Estimates	
Moody's	10.03%
S&P's	10.00%
Zacks	9.47%
Average Growth Rate	9.83%
Stock Price	$54.56

Expected Dividend based upon Jan. 10 ,1997 Value Line Projection
Stock Price based upon average SBC stock price 3/17-3/28

Results based upon the average growth rate 13.13%

CAPM Analysis

30 Day T-Bill Rate	5.24%
Beta's	
S&P Beta	0.6
IBES Beta	0.64
Value Line Beta	0.90
Average Beta	0.71
Risk Premium	
Premium over 30 Day T-Bill Rate	8.90%

Results based upon the average Beta 11.59%

30 Day T-bill rate as of 3/26/97
S&P Beta is from S&P Online, 3/14/97
Value Line Beta is from the 1/10/97 SBC Value Line Report
IBES Beta is from 2/20/97 IBES Utility Sector Annual Company Summary Data
Risk Premium based upon Ibbotson Associates Annual Returns for Large Companies

Average Using Both Methods	12.36%
DCF Weighting	50.00%
CAPM Weighting	50.00%

Depreciation

Staff was given the goal of determining reasonable depreciation rates based upon reasonably expected life and salvage inputs for each asset category for SWBT based upon "economic" and "forward-looking" methodologies. The crux of the depreciation dispute by the parties to this case lies in what "economic" and "forward-looking" mean, as there is no clear-cut definition of either.

Depreciation expense represents the annual charge to recover the utility's investment in capital items required to create an integrated telephone network over its life. The driving factor in determining appropriate depreciation expense in this arbitration case is the definition of "life." The general equation used to derive depreciation rates is:

$$Depreciation\ Rate = \frac{1 - Net\ Salvage\ \%}{Average\ Service\ Life} \qquad \text{Equation 1}$$

<u>*Summary of Staff Depreciation Recommendations*</u>

With six modifications to SWBT's proposals, Staff concludes that SWBT's proposed depreciation rates and underlying parameters in this docket are reasonable for the purposes of this arbitration proceeding. These revisions are as listed below:

1. SWBT proposes Equal Life Group (ELG) procedures to calculate depreciation rates. Staff's modification is to eliminate ELG completely and recommends vintage group (VG) methods be applied instead.

2. SWBT proposes a Projection Life (P-life) for the Furniture account of 18.4 years. Staff recommends a P-life of 15.0 years.

3. SWBT proposes a P-life for the Digital Circuit account of 5.8 years. Staff recommends a P-life of 7.0 years.

4. SWBT proposes a P-life for the Underground Cable Exchange Metallic account of 8.3 years. Staff recommends a P-life of 15.0 years.

5. SWBT proposes a P-life for the Underground Cable Toll Metallic account of 6.3 years. Staff recommends a P-life of 15.0 years.

6. SWBT proposes net salvage parameters by account based on averages of year-end 1995 data for its entire 5 state operation. Staff recommends using Missouri-specific data for all accounts and updating that information through year-end 1996

for three accounts: Conduit Systems, Underground Cable Exchange Metallic, and Underground Cable Toll Metallic.

Reasons for these Staff modifications and how the recommendations were arrived at are discussed below.

Schedules DMB-1 and DMB-2 delineate proposed depreciation salvage and life parameters, respectively, from SWBT, AT&T, and Staff for setting depreciation rates in this arbitration case.

Historical Depreciation Methods

NARUC defines depreciation as applied to utility plant as:

> The loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of utility plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand, and requirements of public authorities. (NARUC, "Public Utility Depreciation Practices", August 1996, p. 13).

The FCC's definition is almost identical to NARUC's, except it applies to telephone plant instead of utility plant and it requires that the causes of depreciation "can be forecast with a reasonable approach to accuracy." "Service value" as used above has the special meaning of original cost of plant less net salvage. Depreciation, then, is an allocation of cost, not of valuation.

The traditional rate-of-return depreciation goal has been to recover the original cost of a company's assets, less net salvage, from the consumers over the estimated useful life of the property as determined by Equation 1 above. Physical deterioration was historically the leading cause of plant retirements. The retirement rate method is the chief analytical method to determine the plant life. It entails analysis of mortality data by actuarial methods. It is a statistical method in which the underlying assumption is that if history does tend to repeat itself, the service life of the new unit will be reflected in the history of the retired units. The purpose is to generalize the attrition of dollars or units representing physical property into curves representing expected trends (i.e., Iowa curves or sometimes Gompertz-Makeham curves). The area calculated under the generalized curve is the average service life of the property in question.

While recovery was not guaranteed, the depreciation professional attempted to design depreciation rates to recover all prudent investments. Where, in hindsight, lives for newer assets and technologies were set too long based on knowledge of prior life histories of earlier investments, depreciation expense was increased through various means to make the utility whole, and that higher expense could, and was, usually passed on to consumers through their tariffed rates. Absent a specific reason for not doing so, the utility thereby received full recovery of its investment, albeit sometimes delayed with costs passed on to customers who did not receive a direct benefit from the investment. That was the regulated world.

TELRIC Depreciation

"The depreciation rates used in calculating forward-looking economic costs of elements shall be economic depreciation rates." (Appendix B, FCC Part 51 rules, § 51.505 (b)(3)).

"Depreciation is the method of recognizing as an expense the cost of a capital investment. Properly calculated economic depreciation is a periodic reduction in the book value of an asset that makes the book value equal to its economic or market value." (The Interconnection Order, FCC 96-98/95-185, Released August 8, 1996, Footnote 1711).

The Commission must therefore determine reasonable depreciation rates so that SWBT will recover its TELRIC investment on an economic forward-looking basis. Staff believes this is very similar to the goal under rate-of-return. However, on a go-forward basis, non-regulated companies are not as able to pass service costs from prior investments on to its customers. Doing so would likely increase its customer rates so as to make its services unmarketable in a competitive environment. Or, in the alternative, the company could risk angering its shareholders by providing a lower or no return to them. Also, non-regulated entities are more likely to write off non-performing investments (such as aerial wire, troublesome buried cable, analog switches, and some analog carriers) than keep them in service and on the books as is done under rate-of-return.

Staff's goal is to recommend depreciation rates based on parameters that SWBT is likely to experience for financial purposes so as to fully recover its long run capital costs in a timely fashion and be fair to the customers.

TELRIC Distinctions

As previously stated, the key distinction between setting depreciation rates for TELRIC purposes from depreciation rates for rate making under rate-of-return is in the selection of the life parameter of the depreciation rate equation. Economic obsolescence has overtaken physical deterioration as the primary cause of loss of value and retirements. Small changes to the net salvage parameter have little effect on the depreciation rate as compared to changes in the life parameter. Life selection was therefore Staff's predominant focus. The following example illustrates why lives under each of the above scenarios may be different.

Given that in an exchange a buried copper feeder cable with 1200 pairs runs under Main Street to serve the many customers along Main Street and beyond. The LEC must maintain that cable in service until the last customer served by the cable is moved onto a replacement facility many years ahead. Under rate of return regulation, regardless of the number of customers on the 1200 pair cable, the LEC depreciates the cable investment at the same depreciation rate over its life so that the investment is recovered. Recovery is essentially assured, even if only one customer remains on the cable, because the depreciation expense is built into revenue requirement for the entire customer base, not just rates for those directly using that plant.

In a competitive environment, the utility must also maintain that cable while it provides service. However, it must price its service to the extent possible such that those who receive service pay for the investment required to provide that service. If the cable was expected to remain in service 25 years and only one customer received service over that cable in the last year, that customer can not be expected to be charged for one 25th of the cost of the cable that last year; the company must recover its cost over a shorter period or economic life. The company's depreciation life must be short enough to recover its investment from the pool of customers receiving benefit from that plant, or risk never recovering the investment fully.

A counter position, which Staff does not support, is that it is possible that a plant category, such as buried cable above, will permit increasing cash flows rather than declining cash flows to the utility over time, due to increased use of the network from line growth, second line take, FAX lines, introduction of some cost reducing technology, etc. This suggests that depreciation should be end loaded or depreciation lives lengthened. While network minutes of use have increased over time and certain technologies have been introduced to extend the usefulness of segments of plant, historical plant retirement data does not support the contention that overall economic lives should be longer; indeed, a wealth of available data indicates that lives have become shorter for computers, switching devices of all types, transmission equipment, and all varieties of metallic cable.

Staff Review Methodologies

SWBT provided Staff a list of life and salvage parameters for input into its CAPCOST depreciation model, which calculates levelized depreciation rates the Company believes should be applied to its Missouri operation for TELRIC pricing purposes. Three approaches were used by Staff to test the reasonableness of these depreciation parameters:

1. Comparison by USOA account and company composite to depreciation rates and parameters currently prescribed by the MoPSC and the FCC.

2. Benchmarking against implied depreciation rates calculated via financial information obtained over the Internet and through other sources available to the Commission.

3. Comparison to available information on an individual account basis. This involved both public document searches and HC information obtained as a result of Staff's investigation.

1. MoPSC and FCC Prescribed Parameters and Rates

Schedules DMB-3 and DMB-4 delineate current salvage and life depreciation parameters for AT&T, SWBT Missouri Intrastate (PSC approved) and SWBT Missouri Interstate (FCC approved), and FCC allowed ranges for setting depreciation rates nationally for company accounts which meet specific criteria.

SWBT existing intrastate depreciation rates became effective January 1, 1996 in Telephone Authority Order 997. Following comprehensive depreciation studies by SWBT, Staff, and the FCC Staff and subsequent 3-way meeting discussions in 1995, this Order was drafted to revise rates for 14 of 34 accounts. All three parties desired changes to the remaining 20 accounts, but because no docket was open to allow each party to argue its positions before the Commission and no settlement could be reached on the parameters or rates for those 20 accounts, current rates at that time were continued. Depreciation rates for those 20 accounts were last decided in Case No. TC-93-224, effective January 1, 1994.

In Staff's opinion, prescribed rates provide little value as a comparison for several reasons. As described under the TELRIC Distinctions subsection, a reasonable assumption is that TELRIC telephone plant will probably not be able to be depreciated over as long a life as embedded plant, therefore, embedded depreciation rates are most likely the lowest expected in any comparison.

The FCC opened a docket in 1993 to consider and adopt methods to streamline its interstate depreciation rate setting procedures. The result is a set of minimum and maximum future net salvage and projection life parameters for 30 plant accounts (of approximately 40 commonly used accounts) shown on Schedules DMB-3 and DMB-4. FCC rules allow a degree of flexibility to use those parameters. As long as company data supports both life and salvage parameters within the range for any of the 30 accounts, the company may elect to use any parameter within the ranges. Once an account meets this range criteria, the LEC no longer need submit detailed analytical data, and may merely file with the FCC for revised parameters with little support. This process began in 1994 and is used by SWBT.

Prior to the FCC's decision in Docket 92-296, the MoPSC filed comments with the FCC that it is opposed to the range concept for accounts which constitute more than two percent of the LEC's total investment, that depreciation parameters should be based in regards to the circumstances of individual LECs, and that the magnitude of the difference between upper and lower bounds would permit a LEC to change its depreciation without justification.

Staff desires to caution the Commission from relying heavily, if at all, on the FCC's ranges to reach its decision in these depreciation matters based upon how parameters underlying those ranges were determined. To derive the ranges, the FCC relied upon simple averages of the then approved parameters by all FCC regulated companies. The ranges were calculated by rounding to within one standard deviation plus and minus from the mean. From experience, Staff is aware that not all, and perhaps many, parameters the FCC used in its averages do not represent true plant mortality experience. Rather, those parameters are many times settled upon at triennial depreciation rate review meetings by the FCC

Staff, PUC Staffs, and company representatives for expediency, sometimes involving compromise, in order to reach mutual agreement.

2. Benchmarking

Staff believes that benchmarking SWBT depreciation rates against those booked for financial purposes of likely competitors and other companies using similar technologies is appropriate and is the best method to determine if SWBT parameters pass the muster of reasonableness.

The key source of public financial information relied upon is the Security and Exchange Commission's (SEC's) EDGAR database of form 10-K financial reports filed annually by all publicly traded firms. Staff chose 19 of the largest CAP, CATV, Cellular, IXC, and PCS companies to benchmark against:

AirTouch
AT&T
Brooks Fiber Properties
Cablevision Systems
Comcast
Continental Cablevision
Cox Cable
Jones Intercable
LCI International
McCaw Cellular ('93 data)
MCI
MFS
Nextel
Sprint
Tele-Communications, Inc.
Teleport Communications Group
Time Warner
US Cellular
360º Communications

Other sources of information are available for these and other companies, but because the source data could not be verified, the depreciation rate information was generally deemed not reliable. These sources included:

- Standard & Poors Utilities Rating Service, which publishes financial statistics quarterly
- Value Line, which publishes a wealth of stock information annually
- Arthur Andersen, Net Results 96 Report on the Communications Industry
- Wisconsin PSC Staff performed an analysis in 1993 identical to Staff for over 300 of the Fortune 500 companies, but did not save the 10-K reports.

After the companies were chosen, Staff conducted an EDGAR database query for the years 1996, 1995, and if necessary, 1994 to locate and print the 10-K reports. Then each report was combed to locate the financial entries for annual depreciation accrual from the Cash Flow Statement and year end gross plant investment from the Balance Sheet. If identifiable, land investment was excluded from the plant amount, as it is not depreciable. For companies with unreported amounts of land investment, the resulting implied depreciation rates are understated by an unknown amount, likely only tenths of a percentage. For the end result, an implied depreciation rate is calculated by dividing the annual accrual by the average annual plant balance.

A calculated implied depreciation rate is the best obtainable value for a company composite depreciation rate. Companies are not required to provide, and no company reviewed did provide, a composite or detailed depreciation rates by account; this is closely held information.

SWBT conducted an identical implied depreciation rate calculation for year-end 1995 only, for nearly the same company pool as Staff. Therefore, after verifying the accuracy of about half of the 1995 data from SWBT, Staff used SWBT's supplied information for the remainder of the 19 companies.

At this point, Staff had a table of implied depreciation rates for the 19 companies in the benchmark group for 1995 and for 9 of the 19 companies for 1996. Schedule DMB-5 is a complete summary of the benchmark results.

Next, a composite SWBT rate was developed. Assuming that the telephone network in a TELRIC environment as compared to today would require a similar magnitude of investments in switching, circuit equipment, cable, and other items to function, Staff used SWBT's 1995 year end plant investments from MR6 reports filed with Staff and SWBT's proposed depreciation rates by account to calculate a company composite depreciation rate of 10.6%. This rate is what was compared to the other company benchmarks.

To more accurately reflect reality, the above rate should have been calculated using the 1995 plant *average* balances rather than year-end, however, Staff encountered difficulty obtaining and then using the 1994 report needed to obtain beginning of year 1995 balances. This difference is estimated to make the calculated rate 0.2 to 0.4 % lower than had that data been available.

The Wisconsin PSC Staff calculated an average implied depreciation rate of 8.7% for 367 companies of the Fortune 500 in a similar endeavor based on 1993 financial reports. This was without regard for the type of industry or size of company and represents a simple average.

Few of the 28 implied rates calculated by Staff were lower than SWBT's 10.6%. It is significant to note that with the exception of US Cellular, all IXC and only IXC implied rates were less than SWBT's. If one expects SWBT rates to be in line with IXCs as a group, the observer could make the determination that, yes, SWBT rates are close, but fall on the high end of that group.

Per AT&T, the large change in implied depreciation rates from 1995 to 1996 (10.5 to 7.6%) is distorted by the spinoff in 1996 of Lucent Technologies and NCR from AT&T. AT&T provided data directly to Staff which indicates higher composite depreciation rates for 1996 of 11.0% and for 1995 of 11.3%.

Aside from the few rates lower than SWBT's mentioned above, the remaining results were scattered throughout the teens, with a few higher figures. The 1995 average implied rate is 16.0 % and the median 13.8%. The range of implied rates is puzzling and begs the reviewer to search for an answer. Unfortunately, no actual explanation is available other than to state that for the most part, each company chooses its own depreciation rates for the particular type of assets in the particular market and industry it is in. There is no requirement to report details of how depreciation is calculated. Other than IXCs, no particular type of company had unusually high or low rates compared to the others in the group of 19 companies.

The major drawback to relying on benchmark results is that implied rates are wholly dependent on a particular company's investment in certain assets and those details are not disclosed. That is, a cellular company most likely has the majority of its investment in circuit equipment with relatively short lives and high depreciation rates and little in cable with relatively long lives and low rates, so it is expected that a cellular company will have generally higher depreciation rates than a cable intensive LEC or IXC.

Similar rationale applies to benchmarking IXC and CAP rates to a LEC. For example, Staff does not know the difference in mix of plant investment for these entities, the expected average life of LEC Class 5 switches versus an IXC's Class 4 switches, nor the reasons for or actual rates applied to each asset type.

While the implied rates indicate a large range, SWBT TELRIC depreciation rate parameter proposals put SWBT sixth from the lowest in the pool of 19 benchmarked companies. Staff's modifications reduce SWBT's composite rate even further, into or below those implied rates for the IXC group. This is the most significant contributing factor to Staff's belief that SWBT's proposed depreciation parameters as modified by Staff are reasonable.

3. Comparison to Individual Account Information Available

In this proceeding, depreciation rates should be more closely scrutinized in the areas of switching, transmission, and cable because those are the areas where the vast majority of capital dollars are spent. As stated previously, applied depreciation rates by account is generally closely held company information and not available for comparison purposes. However, some sources for this information remain available.

AT&T provided this data on an HC basis. How AT&T's IXC investments relate specifically to SWBT's LEC investments is only partially understood. While AT&T has stated it sees no reason for a correlation between its life used for fiber and that a LEC will experience, Staff expects similar performance from fiber optic cable. AT&T uses a **__** year life on fiber optic cable. SWBT proposes 13.7 years for aerial, 25.7 years for most underground, and 20.4 years for most direct buried fiber cable.

Knowing that AT&T uses little copper cable and a LEC in the near term will invest heavily in that media, AT&T uses ** _ ** years for its direct buried account. The 10-K reports provided a small amount of additional insight for some companies in the benchmark group in their Notes to Financial Statements section: for cable accounts, Sprint reports a life of 15 to 20 years, Cablevision 10 to 15 years, and Jones 15 years. SWBT proposes 13.7 for aerial, 8.3 years for most underground, and 16.3 years for most buried cable (as SWBT's largest investment category, the buried metallic cable account represents 22% of its depreciable plant investment). **Staff discusses its adjustment for the underground copper account later in this section.**

For digital switching, AT&T uses **___** years. In 10-K Financial Notes Sprint reports a life of 11-12 years and AirTouch 10 years. SWBT proposes 9.4 years (account represents 10% of SWBT's depreciable plant investment). The numbers compare favorably. While the detailed use and type of switching gear of all these companies is unknown, the conclusion can be drawn from the evidence that SWBT's proposals are reasonable, albeit on the low side, in this area.

For digital circuit equipment, AT&T uses **___** years. 10-K Financial Notes indicate Sprint uses 7-11 years, AirTouch 10 years, and Cablevision 6-10 years. SWBT proposes 5.8 years (account represents 14% of SWBT's depreciable plant investment). **Staff discusses its adjustment for the digital circuit account later in this section.**

Does new technology mean lives should be shorter than the replaced technology? Not necessarily. However, one must take the perspective of an investor creating a network from scratch today. Staff does not believe anyone making those substantial investments today would expect to merely sell dial tone and voice services over that network. And Staff does not believe it was the intention of the FCC to have this state's Commission set prices on such a network. Far more, the network we are pricing is quite complex, robust, and flexible, capable of providing not only voice and the many related services, but also transmitting data over copper voice grade DS-0 circuits and at faster DS-1 speed, and over fiber optic facilities at DS-3 and higher bandwidths.

Staff desires to bring to the Commission's attention Order FCC 97-163 released May 8, 1997 regarding implementation of Section 254(k) of the Communications Act of 1934 as Amended which addresses specifically prohibiting telecommunications carriers from subsidizing competitive service with services that are not. AT&T has discussed with Staff that TELRIC rates should not be set to recover any LEC investment for future service offerings, such as CATV or other high bandwidth investments. No attempt has been made to do so by Staff. To the extent any provider's network is built with fiber optic facilities on poles and in underground conduit and manhole systems, extra capacity is most likely available for provision of future services, be they competitive or not. Any entity building a communication network today would be foolish not to build in extra capacity for system growth and flexibility. It would be an impossible task, however, to determine what of SWBT's investment was built for strictly competitive purposes.

<u>AT&T's Depreciation Position</u>

AT&T's salvage and life proposals are as indicated on Schedules DMB-1 and DMB-2. Upon inspection, the Commission will notice these parameters were selected by AT&T as identical to the FCC's currently allowed parameter ranges on Schedules DMB-3 and DMB-4.

AT&T's position is that depreciation inputs to the Hatfield model should be based upon salvage and life values falling within the ranges currently allowed by the FCC. AT&T argues that these ranges are based upon national averages for embedded plant and are therefore representative for TELRIC purposes. To counter SWBT's claims requiring generally shorter lives for TELRIC than those for the embedded network, AT&T visions no replacement technology for the existing digital switch network nor any reason that the existing copper cable based network can not continue to provide service for another 20 to 30 years.

SWBT's Depreciation Position

For cable and other outside plant accounts, SWBT's proposals are based upon its subject matter experts' (SMEs') ability to forecast retirement patterns of its embedded network over time. SMEs make life cycle estimates based upon the usefulness and usability of its plant. Then, based on these economic life cycle estimates, an economic remaining life is calculated.

Using the economic remaining life and known historical mortality patterns from earlier depreciation analyses in a depreciation model known as the generation arrangement, a projection life (P-life) for each account is determined. This is the input to SWBT's CAPCOST model.

SWBT uses very similar methods to derive P-lives for other account types. For circuit accounts, the inputs for remaining life come from the Network Department. And for the digital switch account, SWBT relies upon the FCC's 20 year lifespan method to derive an economic remaining life, but uses the company specific historical interim retirement rate of 3.2% rather than 2% as required by the FCC in prior studies.

Comparison of the parties' positions

AT&T relies wholly upon depreciation parameters set for embedded plant, based upon national averages and whatever nuances are built into how those parameters were originally derived or settled upon.

SWBT goes through a barrage of tedious mathematical calculations using inputs from prior studies and SWBT experts' opinions about the future of Company plant investments to derive its life inputs.

Staff has found certain faults in SWBT's methodologies in the past which remain today. However, in Staff's opinion, those faults are not so serious as to cause Staff to ignore the results. On the contrary, with relatively few exceptions, Staff has accepted SWBT's inputs as reasonable for the purpose of this arbitration. Given the original direction to determine if SWBT's inputs are reasonable, Staff believes after its review of the available information that those inputs are reasonable if modified as recommended.

AT&T has provided Staff several documents with claims to support its depreciation inputs. Staff discussed some documents with AT&T's Mr. Flappan and Mr. Richard Lee of Snavely King Majoros O'Connor & Lee, serving as a consultant to AT&T. Mr. Lee supports the FCC's plant lives because "since its Staff has the responsibility and the opportunity to review periodically the plans of every large telephone company, I consider them to be the most knowledgeable individuals on this subject in the Nation" and "the FCC directed its staff ... to pay closer attention to company plans, technological developments and other future oriented analyses."

Larry Vanston, of Technology Futures, Inc. (TFI) opines that lives of regulated telephone plant are much too long and performs substitution analyses to calculate how short lives of embedded plant should be. SWBT opinions parallel those of TFI, its consultant through a telecommunications group comprised primarily of RBOCs and GTE. Mr. Lee criticizes Mr. Vanston's opinions.

While Staff's view of lives for telephone plant are not as aggressive as TFI's projections, Staff is concerned that AT&T does not consider forces of retirement in a fashion such as SWBT or TFI. For example, as discussed in the TELRIC Distinctions subsection, although there is no technology in immediate sight which will economically replace copper distribution cable, one need not wait for that day to occur to prepare by writing down the investment through depreciation. Similarly, there is no replacement for digital switching technology (Mr. Lee points out that Bell Labs has closed the doors to its photonic switching research area in Mount Laurel, NJ), but if one waits for that day when a replacement is economically efficient, then a situation like that of unrecovered analog switching gear when digital came along will recur.

Mr. Lee has provided Staff testimony wherein he argues that because LECs have many times more switches than AT&T's 150, that the LECs can not replace them as often and therefore LEC switch lives must be longer than AT&Ts. He goes on "... regardless of what you want to change, it's not physically possible to convert everything very quickly in a local network, versus a long distance network. So the lives bear no resemblance whatsoever to each other, as far as what the future will be or what the past has been." These statements may or may not be true. This is an unsubstantiated argument provided without support or consideration of all the variables and pertinent facts.

<u>*Staff's Modifications to SWBT's Proposed Depreciation Parameters*</u>

Modification 1.

SWBT uses Equal Life Group (ELG) procedures to calculate its proposed P-lives. The Staff modification is to reject the use of ELG for TELRIC purposes and use Vintage Group (VG) procedures in its place.

The Commission approved use of ELG in Missouri for telephone companies in Case No. TO-82-3. Only SWBT, GTE, and Sprint use ELG in Missouri.

ELG is an ideally appealing depreciation method because it attempts to depreciate assets over their group expected life. For illustration, use the pole account. Poles will last different numbers of years. Some will live to the age of 60 or more years. Some will be replaced because they are in the way of road construction, regardless of age. Yet others will be struck by lightning or an unfortunate motorist to meet their fate. ELG assumes a particular retirement pattern and calculates a depreciation rate such that the number of poles that live only one year are recovered in that year, those which live two years are recovered in two years, etc. In this ideal situation, as plant ages over time, the depreciation rate should reduce for the longer living survivors because the short lived plant has been recovered and removed from service. Therefore, customers receiving service from older plant should be paying less for service than those who received service from younger aged plant.

In practice, this reduction in depreciation rates being passed on to customers has not been the case. ELG rates are calculated for a plant account at an instant in time. In practice, composite depreciation rates are used, level from one year to the next, until such time that depreciation and customer rates are reevaluated. Customers do not receive the theoretical benefit of ELG's perfect depreciation stream.

A review of SWBT's CAPCOST model indicates the same treatment as above. CAPCOST models depreciation bookings on an ELG basis, decelerating that expense over time. But the model then levelizes that expense at the cost of money discount rate to calculate levelized system costs. ELG is thereby defeated.

Staff therefore modified SWBT's proposal so depreciation rates are calculated using VG methods instead of ELG. While VG is not as ideal a depreciation method as ELG, the calculation of depreciation using VG and in practice is a closer match. This modification reduces the overall depreciation rate by less than 0.2 percent.

Modification 2.

For the Furniture account, SWBT proposes a P-life of 18.4 years. Staff revised that to 15.0 years based on published figures from other companies.

Modification 3.

For the Digital Circuit account, SWBT proposes a P-life of 5.8 years. Staff considers its revision conservative at 7.0 years. 7 is at the low end of the 6 to 11 years for benchmarked companies. AT&T books depreciation for this account using a P-life of 7.2 years for equipment which is most likely similar to SWBT's digital circuit gear. SWBT should have excluded from its calculations most embedded T-carrier equipment (15% of 1994 investment) which it states is obsolete or in the decline phase.

Modifications 4 and 5.

For the Underground Metallic Exchange and Toll accounts, SWBT proposes P-lives of 8.3 and 6.3 respectively. Staff's modification is a revision to 15.0 years, at the low end of comparative companies. Benchmarked companies report a range of 15 to 20 years. SWBT stated to Staff and OPC that proposed lives appear and are probably too short in this area. In Staff's opinion, the 6.3 and 8.3 years proposed are very unreasonable for this critical plant investment.

Modification 6.

SWBT proposed Future Net Salvage values for all accounts based on SWBT company averages for all 5 operating states. Staff's modification is to use Missouri specific salvage parameters. Additionally, for the Underground Metallic Cable accounts and the Conduit account, sufficient data updated through year end 1996 was provided to Staff to warrant updating salvage parameters for those particular accounts.

Proposed Depreciation Parameters
Future Net Salvage (FNS)

ACCOUNT	DESCRIPTION	SWBT	AT&T * Low	AT&T * High	Staff
2112	MOTOR VEHICLES	9	10	20	10
2115	GARAGE WORK EQUIPMENT	-141	0	10	5
2116	OTHER WORK EQUIPMENT	4	0	10	2
2121	BUILDINGS	4	N/A	N/A	4
2122	FURNITURE	5	0	10	7
2123.1	OFFICE SUPPORT	1	0	10	0
2123.2	CO COMMUNICATION EQPT	2	-5	10	5
2124	GENERAL PURPOSE COMPUTERS	5	0	5	5
2212	DIGITAL ESS	4	0	5	4
2220	OPERATOR SYSTEMS	1	0	5	3
2231	DIGITAL RADIO SYSTEMS	1	N/A	N/A	3
2232.11	CIRCUIT-DDS	0	0	5	0
2232.12	CIRCUIT-DIGITAL	0	0	5	0
2232.21/22	CIRCUIT ANALOG	-4	N/A	N/A	-4
2311	STATION APPARATUS	-2	N/A	N/A	-2
2341	LARGE PBX	-2	N/A	N/A	-2
2351	PUBLIC TELEPHONE	2	0	10	3
2362	OTHER TERMINAL EQUIPMENT	-1	N/A	N/A	1
2411	POLES	-134	-75	-50	-120
2421	AERIAL CABLE - METALLIC	-42	-35	-10	-46
2421	AERIAL CABLE - FIBER	-42	-25	-10	-46
2422.11	U/G CABLE EXCH METALLIC	-20	-30	-5	-17
2422.12	U/G CABLE TOLL METALLIC	-12	-30	-5	-17
2422.21	U/G CABLE EXCH FIBER	-6	-20	-5	-5
2422.22	U/G CABLE TOLL FIBER	-7	-20	-5	-8
2423.11	BURIED CABLE EXCH METALLIC	-20	-10	0	-15
2423.12	BURIED CABLE TOLL METALLIC	-2	-10	0	-15
2423.21	BURIED CABLE EXCH FIBER	-5	-10	0	-5
2423.22	BURIED CABLE TOLL FIBER	-5	-10	0	-5
2424	SUBMARINE CABLE - METALLIC	-2	N/A	N/A	-2
2424	SUBMARINE CABLE - FIBER	-2	N/A	N/A	-2
2426	INTRABUILDING CABLE - METALLIC	-17	-30	-5	-17
2426	INTRABUILDING CABLE - FIBER	-17	-15	0	-17
2441	CONDUIT SYSTEMS	-6	-10	0	-25

Note:
AT&T believes the salvage parameter should fall within the FCC's allowed range indicated to calculate its adjusted Projection Life for input into the Hatfield model.

Schedule DMB-1

Proposed Depreciation Parameters
Projection Life (P-life)

ACCOUNT	DESCRIPTION	SWBT	AT&T * Low	AT&T * High	Staff
2112	MOTOR VEHICLES	9.5	7.5	9.5	9.5
2115	GARAGE WORK EQUIPMENT	10.8	12	18	10.8
2116	OTHER WORK EQUIPMENT	15.2	12	18	15.2
2121	BUILDINGS	38.0	N/A	N/A	38.0
2122	FURNITURE	18.4	15	20	15.0
2123.1	OFFICE SUPPORT	11.0	10	15	11.0
2123.2	CO COMMUNICATION EQPT	7.9	7	10	7.9
2124	GENERAL PURPOSE COMPUTERS	6.9	6	8	6.9
2212	DIGITAL ESS	9.4	16	18	9.4
2220	OPERATOR SYSTEMS	13.6	8	12	13.6
2231	DIGITAL RADIO SYSTEMS	12.8	N/A	N/A	12.8
2232.11	CIRCUIT-DDS	9.7	11	13	9.7
2232.12	CIRCUIT-DIGITAL	5.8	11	13	7.0
2232.21/22	CIRCUIT ANALOG	7.0	N/A	N/A	7.0
2311	STATION APPARATUS	7.1	N/A	N/A	7.1
2341	LARGE PBX	8.3	N/A	N/A	8.3
2351	PUBLIC TELEPHONE	7.8	7	10	7.8
2362	OTHER TERMINAL EQUIPMENT	7.2	N/A	N/A	7.2
2411	POLES	18.4	25	35	18.4
2421	AERIAL CABLE - METALLIC	13.7	20	26	13.7
2421	AERIAL CABLE - FIBER	13.7	25	30	13.7
2422.11	U/G CABLE EXCH METALLIC	8.3	25	30	15.0
2422.12	U/G CABLE TOLL METALLIC	6.3	25	30	15.0
2422.21	U/G CABLE EXCH FIBER	25.7	25	30	25.7
2422.22	U/G CABLE TOLL FIBER	20.1	25	30	20.1
2423.11	BURIED CABLE EXCH METALLIC	16.3	20	26	16.3
2423.12	BURIED CABLE TOLL METALLIC	15.1	20	26	15.1
2423.21	BURIED CABLE EXCH FIBER	20.4	25	30	20.4
2423.22	BURIED CABLE TOLL FIBER	19.2	25	30	19.2
2424	SUBMARINE CABLE - METALLIC	24.6	N/A	N/A	24.6
2424	SUBMARINE CABLE - FIBER	24.6	N/A	N/A	24.6
2426	INTRABUILDING CABLE - METALLIC	19.3	20	25	19.3
2426	INTRABUILDING CABLE - FIBER	19.3	25	30	19.3
2441	CONDUIT SYSTEMS	52.0	50	60	52.0

Note:
AT&T believes the life parameter should fall within the FCC's allowed range indicated to calculate its adjusted Projection Life for input into the Hatfield model.

Schedule DMB-2

Current Depreciation Parameters
Future Net Salvage (FNS)

ACCOUNT	DESCRIPTION	Intrastate SWBT	Interstate SWBT	AT&T	FCC Range Low	FCC Range High
2112	MOTOR VEHICLES	10	10	14	10	20
2115	GARAGE WORK EQUIPMENT	5	5	N/A	0	10
2116	OTHER WORK EQUIPMENT	3	3	0	0	10
2121	BUILDINGS	4	4	0	N/A	N/A
2122	FURNITURE	7	7	0	0	10
2123.1	OFFICE SUPPORT	0	0	0	0	10
2123.2	CO COMMUNICATION EQPT	11	11	0	-5	10
2124	GENERAL PURPOSE COMPUTERS	5	5	0	0	5
2212	DIGITAL ESS	10	4	0	0	5
2220	OPERATOR SYSTEMS	3	3	1	0	5
2231	DIGITAL RADIO SYSTEMS	10	-5	-5	N/A	N/A
2232.11	CIRCUIT-DDS	0	0	N/A	0	5
2232.12	CIRCUIT-DIGITAL	1	0	-8	0	5
2232.21/22	CIRCUIT ANALOG	-3	-3	-8	N/A	N/A
2311	STATION APPARATUS	-2	-2	N/A	N/A	N/A
2341	LARGE PBX	6	-2	N/A	N/A	N/A
2351	PUBLIC TELEPHONE	15	15	0	0	10
2362	OTHER TERMINAL EQUIPMENT	1	1	-2	N/A	N/A
2411	POLES	-100	-120	-22	-75	-50
2421	AERIAL CABLE - METALLIC	-29.8	-46	-20	-35	-10
2421	AERIAL CABLE - FIBER	-29.8	-15	0	-25	-10
2422.11	U/G CABLE EXCH METALLIC	-25	-9	N/A	-30	-5
2422.12	U/G CABLE TOLL METALLIC	6	-9	-7	-30	-5
2422.21	U/G CABLE EXCH FIBER	-5	-9	N/A	-20	-5
2422.22	U/G CABLE TOLL FIBER	-8	-9	-4	-20	-5
2423.11	BURIED CABLE EXCH METALLIC	-10	-10	N/A	-10	0
2423.12	BURIED CABLE TOLL METALLIC	-1	-10	-6	-10	0
2423.21	BURIED CABLE EXCH FIBER	-5	-5	N/A	-10	0
2423.22	BURIED CABLE TOLL FIBER	-5	-5	-4	-10	0
2424	SUBMARINE CABLE - METALLIC	1	2	-2	N/A	N/A
2424	SUBMARINE CABLE - FIBER	1	2	-2	N/A	N/A
2426	INTRABUILDING CABLE - METALLIC	-17	-17	N/A	-30	-5
2426	INTRABUILDING CABLE - FIBER	-17	-5	N/A	-15	0
2441	CONDUIT SYSTEMS	-6	-6	-8	-10	0

Schedule DMB-3

Current Depreciation Parameters
Projection Life (P-life)

ACCOUNT	DESCRIPTION	Intrastate SWBT	Interstate SWBT	AT&T	FCC Range Low	FCC Range High
2112	MOTOR VEHICLES	9.3	8.0	6.6	7.5	9.5
2115	GARAGE WORK EQUIPMENT	14.0	12.0	N/A	12	18
2116	OTHER WORK EQUIPMENT	17.0	16.0	8.2	12	18
2121	BUILDINGS	47.0	47.0	40	N/A	N/A
2122	FURNITURE	23.0	18.0	5.6	15	20
2123.1	OFFICE SUPPORT	15.0	11.0	9.3	10	15
2123.2	CO COMMUNICATION EQPT	9.0	9.0	4.7	7	10
2124	GENERAL PURPOSE COMPUTERS	6.8	6.5	5.8	6	8
2212	DIGITAL ESS	17.5	16.0	9.7	16	18
2220	OPERATOR SYSTEMS	15.0	15.0	8.1	8	12
2231	DIGITAL RADIO SYSTEMS	14.5	11.0	9.5	N/A	N/A
2232.11	CIRCUIT-DDS	7.0	7.0	N/A	11	13
2232.12	CIRCUIT-DIGITAL	15.0	11.0	7.2	11	13
2232.21/22	CIRCUIT ANALOG	11.5	11.5	2.5	N/A	N/A
2311	STATION APPARATUS	6.9	6.9	N/A	N/A	N/A
2341	LARGE PBX	9.0	7.0	N/A	N/A	N/A
2351	PUBLIC TELEPHONE	13.0	13.0	7.1	7	10
2362	OTHER TERMINAL EQUIPMENT	7.0	7.0	10.5	N/A	N/A
2411	POLES	36.0	35.0	9.3	25	35
2421	AERIAL CABLE - METALLIC	27.8	25.0	3.4	20	26
2421	AERIAL CABLE - FIBER	27.8	25.0	20	25	30
2422.11	U/G CABLE EXCH METALLIC	30.0	25.0	N/A	25	30
2422.12	U/G CABLE TOLL METALLIC	11.5	25.0	9	25	30
2422.21	U/G CABLE EXCH FIBER	35.0	25.0	N/A	25	30
2422.22	U/G CABLE TOLL FIBER	30.0	25.0	20	25	30
2423.11	BURIED CABLE EXCH METALLIC	28.0	20.0	N/A	20	26
2423.12	BURIED CABLE TOLL METALLIC	12.5	20.0	15	20	26
2423.21	BURIED CABLE EXCH FIBER	30.0	25.0	N/A	25	30
2423.22	BURIED CABLE TOLL FIBER	30.0	25.0	20	25	30
2424	SUBMARINE CABLE - METALLIC	22.0	22.0	24.5	N/A	N/A
2424	SUBMARINE CABLE - FIBER	22.0	22.0	20	N/A	N/A
2426	INTRABUILDING CABLE - METALLIC	30.0	20.0	N/A	20	25
2426	INTRABUILDING CABLE - FIBER	30.0	25.0	N/A	25	30
2441	CONDUIT SYSTEMS	65.0	65.0	54.5	50	60

Schedule DMB-4

Implied Depreciation Rate Calculations
For Arbitration Case Nos. TO-97-40 & TO-96-63

Companies	Predominant Industry Type	31 Dec 96 Investment ($1,000)	31 Dec 95 Investment ($1,000)	31 Dec 94 Investment ($1,000)	Avg. 96 Investment ($1,000)	Avg. 95 Investment ($1,000)	1996 Depr & Amort ($1,000)	1995 Depr & Amort ($1,000)	Implied 1996 Rate	Implied 1995 Rate
Brooks Fiber Properties Inc.	CAP		60,042	20,720	50,042	35,381		4,118		11.6%
MFS Communications Co. Inc.	CAP	1,892,523	1,315,952	787,453	1,604,238	1,051,703	286,131	142,496	17.8%	13.5%
Teleport Communications Group Inc.	CAP		545,653	0	545,653	272,827		37,837		13.9%
Cablevision Systems Corp.	CATV	2,423,539	1,860,752	1,549,302	2,142,146	1,705,027	388,982	319,929	18.2%	18.8%
Comcast	CATV	3,600,100	2,575,633	2,081,256	3,087,867	2,328,445	698,300	689,052	22.6%	29.6%
Continental Cablevision Inc.	CATV		2,107,473	1,353,789	2,107,473	1,730,631		341,171		19.7%
Cox Cable Communications Inc. (Note 2)	CATV	2,316,374	1,213,857	664,265	2,188,401	939,061	264,188	198,768	12.1%	21.2%
Jones Intercable Inc.	CATV	569,148	475,436	333,686	522,292	404,551	131,186	55,805	25.1%	13.8%
Tele-Communications Inc.	CATV	11,619,000	10,974,000	8,851,000	11,296,500	9,912,500	1,616,000	1,372,000	14.3%	13.8%
Time Warner Inc.	CATV		1,988,000	1,410,000	1,988,000	1,699,000		559,000		32.9%
360 Communications	Cellular		1,161,157	836,387	1,151,157	993,772		114,731		11.5%
AirTouch (Note 3)	Cellular	2,321,500	1,320,200	1,560,700	1,820,850	1,440,450	351,300	215,800	19.3%	15.0%
McCaw Cellular ('93 data)	Cellular		1,616,480	1,439,058	1,616,480	1,527,769		226,239		14.7%
U S Cellular	Cellular		674,450	464,132	674,450	569,291		67,302		10.1%
AT&T Corp. (Note 1)	IXC	39,522,000	48,291,000	44,037,000	36,219,500	46,164,000	2,740,000	4,845,000	7.6%	10.5%
LCI International, Inc.	IXC		448,100	373,557	448,100	410,829		43,955		10.7%
MCI Communications	IXC	NA on 10-K	14,243,000	12,218,000	7,121,500	13,230,500	NA on 10-K	1,308,000	NA on 10-K	9.9%
Sprint Corp. (LD only)	IXC	7,390,800	6,773,700	6,056,300	7,082,250	6,415,000	633,300	581,600	8.9%	9.1%
Nextel	PCS		1,192,204	757,855	1,192,204	975,030		236,178		24.2%
								Average	14.6%	16.0%
								Median	17.8%	13.8%

Notes:
General Note: These 10-K provided sufficient data to exclude land from plant: AT&T, Cablevision, Cox, TCI

Shaded entries are SWBT provided data from its 10-K analysis

1. AT&T 1996 10-K restated plant and depreciation due to spinoff of Lucent & NCR. Adjusted data reported in 1996 10-K was used to derive depr rate for 1996.
2. Cox 1996 10-K restated plant and depreciation due to purchase of Times Mirror. Adjusted data reported in 1996 10-K was used to derive depr rate for 1996.
3. Airtouch 10-K plant is not gross, it is net plant, so implied rates are overstated.

Income Tax

Income tax is a variable that impacts all of the unbundled elements of SWBT's telephone network. Income tax is an input into the CAPCOST model, which determines the capital costs associated with unbundled network elements. It is included as a capital cost because SWBT needs to generate enough return on equity to cover income taxes. The issue is whether SWBT should recover the statutory rate or effective income tax rate with or without income tax credit (ITC) amortization. The arbitration staff believe SWBT should use an effective income tax rate without ITC amortization of 38.36 percent.

To account for all income taxes paid, both state (SIT) and federal income tax (FIT) are included in calculating an effective income tax rate. Through deducting FIT for SIT, statutory effective rates may be calculated. ITC amortization may be included in the calculation, however the result is a non-forward looking income tax rate. Since 1991, SWBT has paid the following amounts of income in taxes:

SWBT Income Tax Rates

	1995	1994	1993	1992	1991
FIT Statutory Rate	35.00	35.00	35.00	35.00	35.00
MO Statutory Rate	6.25	6.25	5.00	5.00	6.5
Total Statutory Rate	41.25	41.25	40.00	39.00	40.50
FIT Deductible for SIT	50.00	50.00	100.00	100.00	100.00
FIT Stat. Effective Rate	** **	** **	** **	** **	** **
MO Stat. Effective Rate	** **	** **	** **	** **	** **
Total Stat. Effective Rate	** **	** **	** **	** **	** **
FIT&SIT Effective Rate with ITC Amortization	** **	** **	** **	** **	** **
FIT&SIT Effective Rate without ITC Amortization	** **	** **	** **	** **	** **

Staff believes the most forward looking income tax rate for SWBT is the FIT and SIT Effective rate without ITC amortization. The reasons for this are:

1) ITC amortization is left over from 1987 and is being depleted. On a forward looking basis, ITC will be gone in the near future and SWBT will no longer be subject to it.

2) The Total Stat. Effective rate and FIT & SIT Effective without ITC amortization are converging. The difference between the two rates has decreased from 1.33 percent in 1991 to 0.03 percent in 1995. The difference has an insignificant impact in determining capital costs of unbundled elements.

Therefore, the income tax rate proposed by Staff is the FIT & SIT Effective Rate without ITC amortization of 38.36 percent.

Inflation Factors and Productivity Factors

Inflation Factors

SWBT includes two types of inflation in its cost models; Capital Investment Inflation and Operating Expense Inflation. Both factors are calculated using a levelization technique that uses the present value of future plant additions including inflation divided by the present value of the plant additions without inflation. In other words, the numerator of the equation is the present value of the future (inflated) cost of the plant additions while the denominator for this factor is the present value of future plant additions not including inflation during the contract period. For calculation purposes, the annual additions are always assumed to be one. The cost of money is used as the return for the present value calculations. SWBT uses this method to levelize the inflation factors throughout a contract period. By using a constant level of plant additions, this levelization method assumes the increase in network investment will always remain constant. Therefore, each yearly increase in cost as a result of inflation is weighted equally. In effect, this assumes the network will be fully replicated each year of the contract. In reality, the only part of the network that will realize an increase in costs is the amount replaced through the depreciation of part of the existing network and any new additions that occur through the growth of the network. In order to more accurately reflect the true effects of inflation, this factor should be calculated based upon the percentage of investment that is replaced or added to the network. Since Staff does not recommend the use of inflation in the cost models, the effects of the levelization technique were not explored further.

Capital Investment Inflation Factor (CLIF) - The purpose of this inflation factor is to recognize the increased cost of investment during the contract period. This is a levelized factor based upon the account specific Telephone Plant Index (TPI) forecast.

Operating Expense Inflation (OEInf) Factor - This inflation factor is intended to account for increases in the expense of operating and maintaining plant investment. Much of the increase in the operating cost is due to increases in the labor rate. Therefore, this rate is based upon the CPI - W which is the Consumer Price Index for Wages. Like the CLIF, this factor is also levelized using the cost of money.

Inflation and Productivity Factors

Staff is concerned with the use of inflation without the use of productivity factors. If the cost study is going to incorporate the increased cost of labor and capital, then the study should also incorporate the increased efficiency in employing those inputs.

SWBT included inflation factors in the cost study but did not include any type of productivity factor. Since inflation reflects the changes in material and labor costs over time it seems only reasonable to include a productivity factor which reflects changes in the efficiency of labor and material utilization. A chart of the sum of the TELCO Labor Factor and TELCO Engineering Factor for seven major accounts shows the labor and engineering expenses as a percentage of investment. In calculating these factors, neither the labor expense nor the level of investment is adjusted to remove the annual affects of inflation or productivity increases. If labor inflation were present while the productivity levels remained constant, the factors would appear to be increasing over time since labor expense per unit of investment would be increasing.

Of course the opposite is also true. If productivity increases were present but labor costs were remaining constant, labor expenses per unit of investment would be decreasing since less labor per unit of investment would be necessary. Comparing these seven factors over time shows no discernable trend that would indicate the presence of inflation without productivity improvements or only productivity improvements without inflation. Therefore, Staff believes that it is inappropriate to make an additional adjustment to include a single inflation factor or a single productivity factor without including both factors.

Summary of TELCO Labor and Engineering Factors
From 1991 - 1994

Account Category	1991	1992	1993	1994
2212 Electronic Digital Services	** __ **	** __ **	** __ **	** __ **
2220 Operator Services	** __ **	** __ **	** __ **	** __ **
2232 Circuit	** __ **	** __ **	** __ **	** __ **
2362 Other Terminal Equipment	** __ **	** __ **	** __ **	** __ **
2421.2 Aerial Cable - Metallic	** __ **	** __ **	** __ **	** __ **
2122.1 UG Cable Metallic	** __ **	** __ **	** __ **	** __ **
2422.2 UG Cable - NonMetallic	** __ **	** __ **	** __ **	** __ **

If both an inflation factors and a productivity factor were included in the studies, the net result would almost zero. For example, SWBT was including a 3-year levelized inflation factor of ** _____ ** for operating expenses while the Staff proposed productivity offset levelized over three years was ** _____ **.

The productivity factor originally proposed by Staff was 4.3% per year. This is based upon the price-cap productivity factor that SWBT agreed to on an interstate level. As additional support, data from a United States Telephone Association productivity study reflected a productivity gain of about 4% per year.

Given that the inflation factors and the productivity factors offset each other and the fact that the table fails to show a discernable trend, Staff recommends that neither a productivity offset nor an inflation factor be included.

SWBT argues that it is appropriate to include only an inflation factor in the cost studies. SWBT's reasoning is that by assuming the most efficient forward-looking technology, all productivity gains that a company might achieve have already been included in the cost studies. Staff disagrees with this because the operating and maintenance expenses included in the studies are based upon historic data from the current network and are not technology specific. Most of the operating and maintenance expenses are allocated to the forward-looking technology accounts based upon historic investment and do not reflect the maintenance expenses directly associated with the new technology. Because the factors are not specific to forward-looking technologies, they will not reflect the productivity gains associated with the new forward-looking technology. For this reason, Staff disagrees with SWBT.

Non-Recurring Charges for Unbundled Network Elements

Purpose of Non-Recurring Charges

The non-recurring charges (NRCs) proposed by SWBT are intended to recover the non-recurring or one time labor and expensed material costs associated with provisioning unbundled network elements (UNE).

Summary of Non-Recurring Charge Studies

The NRCs are intended to recover the expensed labor efforts required to provide UNEs to Competitive Local Exchange Companies (CLEC). SWBT proposes a NRC for almost every element available as well as an additional Service Order charge that applies to each element purchased. The NRC for a particular element includes both the installation and disconnection activity. It does not include the labor associated with maintaining or repairing the UNE.

Identifying non-recurring costs consists of:

- Identifying workgroups involved in the installation and disconnection for each element, Identifying the job functions required to perform the installation and disconnection of each work group,
- Identifying labor requirements within each work group, and
- Applying appropriate labor rates.

To identify the workgroups, subject matter experts determined what workgroups were involved in provisioning the service. Five workgroups were identified:

- Circuit Provisioning Center (CPC) -- provides circuit design and identifies necessary transmission equipment required to meet the circuit parameters.
- Procurement -- provides shipping of plug-ins from warehouse to central office and field locations.
- Central Office Forces (COF) -- installs plug-ins, wires and tests circuits through the central office(s).
- Installation and Maintenance (I&M) -- installs and tests services to the customer locations.
- Special Service Center (SSC) -- coordinates central office and I&M installation activity and performs remote testing.

Work functions are then grouped by unbundled element and totaled to arrive at the non-recurring cost per element. NRCs for all elements are calculated in this manner.

Concerns and Modifications for All Non-Recurring Charges

Staff has three major concerns with all remaining Non-Recurring Charges proposed by SWBT. Each of these is outlined below.

Source of Labor Estimates - The estimated labor time is based upon estimates provided by Subject Matter Experts (SMEs). At this time, SWBT has performed no Time and Motion Studies to support these estimates. As these are new functions, there is probably insufficient data to conduct these studies at this time. However, relying upon estimates from SMEs as the sole source of data is disturbing. NRCs involve a significant amount of expense and can be a significant barrier to entry for competitive companies entering the market. As the labor estimate is the primary input into the NRCs, its accuracy is of upmost importance.

Double Recovery of Labor Costs - Further compounding the labor issue is the fact that since this labor is expensed, it is included in the labor factors applied in the ACES model. SWBT defines the TELCO Plant Labor factors as the "labor cost for the telephone company to install the equipment" and the TELCO Engineering factor as the "labor cost for telephone engineers to design and engineer the equipment".[5] As these two factors are based upon the average labor for the three prior years, they include the average labor costs necessary to install and provision equipment for an average workload. However, the entry of CLECs is likely to increase the amount and type of work required by SWBT. Therefore, while a portion of the non-recurring labor costs are reflected in these factors, not all of the labor costs can be expected to be recovered through these factors.

Barrier to Entry & Market Entry Incentives - The final issue for consideration is the incentive created by the presence of large NRCs for UNEs compared to the low NRC associated with a simple CLEC conversion of all elements. The simple CLEC conversion (Simple Conversion) NRC recovers the non-recurring labor cost required when a CLEC purchases and combines all the elements necessary to provide local service. In this case, no TELCO engineering or labor is required. It is simply a computer records change. In this instance, the company would only pay $21.60[6] or no charge[7]. depending upon which charge is adopted by the Commission. If a CLEC were to provide its own switch but purchase an 8db loop and a 2-wire cross-connect from SWBT it would pay minimum non-recurring charges of $124.40 in addition to the collocation charges necessary to house its own equipment. This obviously creates the incentive for CLECs to purchase and combine UNEs from SWBT and not provide their own facilities. This incentive creates a great deal of concern regarding the development of facilities-based competition. Staff is not

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MO Factors Binder, Provided to Staff by Southwestern Bell Telephone Company, 2/12/97, pages 9 - 10.

6 SWBT's Proposed Non-Recurring Charge. The Service Order Charge would also apply.

7 Staff's Proposed Non-Recurring Charge. The Service Order Charge would also apply.

suggesting the cost of NRCs be set solely based upon the incentives they create. Staff does believe that is an important consideration when considering the validity of the information presented by each party and affect these charges will have on the development of competition.

Concerns and Proposed Modifications to Specific NRCs

Service Order Charge - This is a NRC that is applied each time a CLEC orders an UNE. SWBT's proposed charge is $25.80 and assumes all orders are done manually and require approximately **__** minutes of labor to complete the ordering process. Like all NRCs, the required labor is based upon a SME's estimate. SWBT acknowledged that, in the near future, the ordering could take place electronically, but stated that it had no cost information for the electronic ordering of UNEs.

Given that no data about electronic ordering cost is available, Staff recommends that SWBT's current Primary Interexchange Carrier (PIC) charge of $5.00 apply. This is the fee SWBT applies to Interexchange Carriers (IXC) for switching a customer from one carrier to another. The process used to switch customers is electronic and should be similar to the service order process for switching local customers.

Staff recommends that this charge apply to initial service orders for each customer only and should not apply to modifications to existing CLEC customers configuration. Staff believes that the NRCs associated with each element are comprehensive and no additional NRC should be applied for additional functionalities of that element. This rate is likely to be in excess of the cost of electronic ordering and should cover the costs of additional ordering. In addition, SWBT included **________** in Wholesale Marketing and Service Expense in the Common Costs which are applied to all network elements. Staff believes these two revenues sources should allow SWBT to recover the costs associated with additional orders. Staff recommends this be an interim rate that is in effect until SWBT can develop TELRIC studies for the electronic ordering of UNEs. This rate is likely to be in excess of the cost of electronic ordering and should be reviewed in the future.

CLEC Simple Conversion Charge - This charge is intended to recover the non-recurring costs incurred when a CLEC converts a SWBT customer using all network elements required to provision the service. SWBT proposes a non-recurring charge of $21.85. Like SWBT's proposed Service Order Charge, this charge assumes a manual process that requires a SWBT marketing person **__** minutes to complete. The labor requirement is based upon a SMEs estimate. This charge also includes **__** for the data processing associated with the Service Order.

Staff recommends that there be no additional NRC for a CLEC Simple Conversion. The Staff proposed Service Order Charge of $5.00 would still apply. The expense associated with the Marketing Representative's **__** minutes of labor assumes a manual process and does not consider the fact the an electronic ordering system will be available in the near future. Also, many of the activities described in this NRC cost study are the same activities described in the NRC cost study for the Service Order Charge. When the time required for both the Service Order and Simple Conversion are combined, the result is **___** minutes to process the order. Staff does not believe that it is reasonable for a mechanical process to require **___** minutes to simply transfer one customer to another CLEC. Finally, is the issue of the Wholesale Marketing and Services expenses included in the Common Cost Allocator. Including Wholesale Marketing and Services expense in both the Common Cost Allocator and the NRCs will result in a double recovery and should not be allowed.

The issue of which company is responsible for identifying the types of services a customer has and which network elements are required to serve a customer was brought to our attention by SWBT. SWBT proposes that the CLECs ordering the UNEs through a Simple Conversion to be responsible for specifying which services the customer has and the elements that are necessary to serve that customer. SWBT contends that it does not want to be responsible for identifying which elements are required to serve a particular customer. The Commission's Arbitration Order permits "as is" customer changes but does not address the issue of specifying the necessary UNEs. The issue of "as is" customer changes was not an interim decision and was not addressed by Staff in this review. The issue of specifying which UNEs a particular customer requires was not specified in the Arbitration Order requiring the Staff Cost Study Review. However, Staff would like to bring this issue to the Commission's attention. Staff feels it would be appropriate to require the CLEC to specify exactly which elements it wishes to purchase. This would relieve SWBT from the duty and potential liability of making that determination.

Conclusion

Given that SWBT's estimation of these NRCs is based solely upon the opinions of SME's and the fact that at least a portion of these NRCs are recovered through the cost factors applied to the UNEs, Staff cannot recommend that the Commission accept the NRCs proposed by SWBT. Staff also cannot recommend the Commission accept AT&T/MCI's argument that 100 percent of the NRCs are reflected in the monthly UNE rates and there should be no NRCs. To the extent, the competitors create new or additional labor for SWBT, that labor will not be reflected in the historic cost factors. Staff believes there will be some additional NRCs associated with UNEs, but the extent of which is unknown.

Unfortunately, other than the $5.00 Service Order Charge and the CLEC Simple Conversion, Staff has no data to suggest an alternative that is based upon adequate data. Staff believes the issue becomes one of a burden of proof. If the burden of proof is upon SWBT to justify the proposed NRCs, Staff feels SWBT has failed. If the burden of proof is upon the competitor, Staff believes that AT&T and MCI have failed to provide a reasonable alternative.

The alternative that Staff proposes would be for the Commission to set the rates for the

NRCs at one-half of the rates proposed by SWBT. Given that neither party presents a complete and convincing position, Staff believes this is the best solution we can propose.

Common Cost Allocator

Purpose

The common cost allocator is used to assign the wholesale costs that cannot be attributed directly to a network element to the rate elements. These costs are generally considered overhead and administrative costs and include Executive and Planning Costs, General & Administrative Costs, and Wholesale Marketing Expenses. These costs are recovered by applying a percentage "mark-up" to the element costs.

The allocator is calculated by dividing the Forward-Looking Wholesale Common Costs by the Total Element Expenses. The allocator relies on published 1995 ARMIS data to identify the expenditures in the accounts considered to contain common costs. The 1996 ARMIS data was not available to use in this calculation.

Concerns and Proposed Modifications

Staff has no specific concerns or proposed modifications to this study other than Staff's proposed modifications affecting all studies (Cost of Money, Depreciation, etc.).

Summary

The common cost allocator has two primary components. The first component is the forward-looking common costs and the second is the unbundled element costs that are used in the denominator. Each component is described below.

Forward- Looking Common Costs - The common cost allocator uses an avoidable cost procedure similar to the one used in the retail calculation to determine the portion of retail and wholesale Marketing and Service Expenses. SWBT compares the Retail Marketing and Service Expenses to the Total Expense to calculate the Ratio of Retail Expenses to Total Expenses. This ratio is used to determine the amount of Wholesale Executive and Planning and General & Administrative expenses that are considered to be common costs for wholesale operations. Wholesale Marketing and Service Expense and Network Operations - Supervision Expense are added to the Wholesale Executive and Planning and General & Administrative expenses to arrive at the Wholesale Common Costs. Network Operations - Supervision is included because it is 4th level and above and is not included in any of the TELRIC studies. The Commission Assessment and Inflation Factors are added to the Wholesale Common Costs to arrive at the Total Forward-Looking Common Costs

Total Element Expenses - The Total Element Expenses are the expenses directly associated with the provisioning of unbundled elements. They are the Total Expenses minus the Retail and Wholesale Common Costs. Inflation Factors are added to the Total Elements Expenses to make them forward-looking. The same inflation factor is applied to both the numerator and the denominator so there is no net affect. The same would be true if a productivity factor were applied to both the numerator and the denominator.

Geographic Deaveraging

Geographic deaveraging is intended to make the interconnection rates more closely reflect the true economic costs which vary by geographic area. The FCC's Interconnection Order required State's to use a minimum of three geographic rate zones in setting the rates for interconnection. While this section has been stayed, Staff still proposes geographic deaveraging.

Proposed Modification

Staff proposes to deaverage by exchange into four geographic zones for all loop, switch port, and switching minute of use (MOU) and transport elements. The four zones are identical to SWBT's existing tariffed Rate Groups and are summarized in the following table.

Summary of Staff's Proposed Rate Zones

Zone	Rate Group	Description	Loop/Sq. Mile
1	D	Kansas City and St. Louis	**____**
2	C	Springfield	**____**
3	B	Suburban	**____**
4	A	Rural	**____**

Staff analyzed the loops per square mile which is a measurement of loop density and is a major unbundled network element (UNE) cost driver. The analysis indicated that each Rate Group is unique and should not be combined. The other major cost driver for loops is the loop length. SWBT stated that it did not have loop length by exchange or by Rate Group so this could not be reviewed.

SWBT originally proposed to deaverage all loops, MOU, and interoffice transport. Staff's review indicated that switch ports also vary by geographic zone and should also be geographically deaveraged.

SWBT's Position

The three geographic group proposed by SWBT are based upon a combination of the existing tariffed rate groups. The following table summarize those zones.

Summary of SWBT's Proposed Rate Zones

Zone	Rate Group	Description
1	C & D	Springfield, Kansas City, St. Louis
2	B	Suburban
3	A	Rural

SWBT chose three zones to comply with the minimum FCC requirements for geographic zones. The basis for the three zones was to simply combine the existing tariffed Rate Group C and D into one Zone and use the two remaining Rate Groups and Zones. SWBT offered no analysis to support the combination for Rate Group C and Rate Group D.

AT&T's Position

AT&T's Hatfield Model 3.1 proposed to deaverage by wire center based upon loop density zones. In many areas, a wire center is a smaller geographic area than an exchange. The Commission's Arbitration Order ordered interim geographic deaveraging by exchange and rejected the argument to deaverage by wire center. Staff still believes deaveraging by exchange is the best alternative.

The Hatfield Model

The Hatfield Model was initially developed by Hatfield Associates, Inc. of Boulder, Colorado, at the request of AT&T and MCI. Hatfield Model proponents consider the model to be based on Total Element Long Run Incremental Cost (TELRIC) principles. The model considers all costs to be variable and avoidable. In addition, the model attempts to use the most efficient forward-looking technology available. The model does not take into account any embedded investment or existing network considerations with the exception the model takes into account existing wire center locations. The model accommodates the allocation of overhead costs through the application of an overhead factor.

In brief, the Hatfield Model is a desktop computer model that builds a theoretical telecommunications network based on demographic, geographic, and geologic data. Investments to build the theoretical network are derived based on user definable prices for distribution, feeder, switching, and interoffice facilities. Capital costs are then applied to the investment for the components of the network. Costs for various unbundled network elements are then derived based on total or per unit bases.

Costs were developed based on AT&T/MCI inputs, SWBT inputs, and Staff inputs. The results may be found in the attachments at the end of the Hatfield Model summary. As expected, AT&T/MCI inputs yielded the lowest costs, while SWBT's inputs yielded the highest costs. Staff's inputs typically yielded costs somewhere in between.

The Hatfield Model attempts to determine forward looking TELRIC costs for unbundled telephone network elements. The Hatfield Model calculates costs of:

- Network interface device (NID)
- Loop distribution
- Loop concentrator/multiplexer
- Loop feeder
- End office switching
- Tandem Switching
- Common transport
- Dedicated transport
- Direct transport
- Signaling links
- Signal transfer points
- Service control points
- Operator systems

The model constructs an estimate of the pertinent costs based on customer demand, network component prices, operational costs, network operations criteria, and other factors affecting the costs of providing local service. From these data, the model builds an engineering model of a local exchange network with sufficient capacity to meet total demand, and to maintain a level of service. The model's inputs also include the prices of various network components, with their associated installation and placement costs, along with various capital cost parameters.

Based on these inputs the model calculates the required network investments by detailed plant category. It then determines the capital carrying cost of these investments, to which are added operations expenses to compute the total monthly cost of universal service, carrier access and interconnection, and various unbundled network elements, on both total cost and per unit bases.

The Hatfield Model is comprised of a set of data files, a distribution module, a feeder module, a switching and interoffice module, and an expense module. The distribution, feeder and switching/interoffice modules identify investment related to various facilities. The investment values are then plugged into the expense module where total and per unit monthly costs are derived.

Data Files

The Hatfield Model is dependent upon an extensive array of data files. The data is drawn from a variety of sources such as census reports, local telephone company ARMIS reports, Bellcore reports, and marketing surveys. A user has the ability to adjust 660 of these inputs. These input files contain information on demographics, geology, cabling/switching/facility costs, installation costs, wire center locations, subscriber usage, and customer line information. The model uses this information build a theoretical telephone network and based upon this network, the model estimates the investments and costs to provide various unbundled network elements.

A variety of different sources are used to identify different inputs. Hatfield Associates, Inc. has supplied default values based on its collective judgement, as augmented by subject matter experts, for such items as the price of varying cable sizes and labor costs. In many cases, the default values are specific to a company or a state. A Bellcore routing guide database is used to identify the location of existing wire centers, tandems and other switching centers. Company ARMIS reports are used to identify types of lines. Customer line information is based on 1995 census estimates of Census Block Groups (CBGs). The firm of PNR and Associates of Jenkintown, Pennsylvania utilizes census information to develop a database of demographic and geological parameters. PNR coded household street addresses and telephone numbers with latitude/longitude values and their census block codes. PNR estimates of residential lines are derived using 1995 CBG data from Claritas and current Donnelly Marketing household data. The household and census block data were geocoded and matched to corresponding wire centers based on NPA-NXX codes. Business line data were obtained from Standard Industry Codes (SIC) and then used in a business line estimation model to derive number of business lines. The business establishments were also geocoded. In addition to this data, data on unoccupied land in the CBG, bedrock depth, soil data, and water table depth are also recorded by CBG.

Distribution Module

The distribution module pertains to facilities extending from the customer's premise to the feeder cable. This module calculates the length and size of distribution cable (including poles and trenching), splices, drops and NIDs required to serve the specified number of customers in each CBG. The module accomplishes this task by drawing data from the data input files. The module then calculates the necessary investment for these elements.

The model determines the lengths and sizes of distribution cable, associated structures, terminals, splices, drops, and NIDs required to provide service to the number and type of consumers in each CBG, and the number and type of serving area interface and digital line carrier terminals required. The Hatfield Model chooses to serve a CBG using feeder facilities made of copper wires or digital line carrier over fiber beyond a user definable threshold to the CBG. Investment is calculated based on these characteristics and expense data. Additional considerations and assumptions are as follows:

- CGBs are square, divided into four quadrants, and each CBG is served by one wire center.
- If more than 50 percent of the CBG is empty, consumers occupy only two diagonally opposed quadrants of a CBG. Otherwise, consumers occupy all four quadrants. Each quadrant's occupied area is reduced uniformly, so that each quadrant is identical. The Hatfield Model accounts for high rises by the line density in the CBG and total area of the CBG.
- The Hatfield Model assumes a grid topology for distribution. The backbone distribution cables begin at a serving area interface and branch to within one lot depth of the CBG boundary.
- If the longest distribution cable is greater than a user defined distance (18kft is the default value, while SWBT uses 15 kft for its Hatfield runs), the model assumes a fiber connecting cable and extends it to a digital line carrier remote terminal and serving area interface located at the center of each occupied area. As lengths of distribution increase, load coils are added, larger cable is used, and digital line carrier powering is increased. If the longest distribution cable is less than the threshold, copper cable is assumed.
- The Hatfield Model uses CBG data to determine the total distribution distances involved. It estimates the investment in distribution cable, supporting structures, terminals, splices, drops, NIDs, and serving area interfaces. User defined values to customize the network include cable fill factors; sharing of structure with other utilities; distribution of aerial, underground, and buried cable; material and installation costs; and demographic factors. The Hatfield Model selects the minimum cable size based on known available cable sizes, fill, and demographics.
- Serving area interface investment is calculated based on the number of distribution

lines required and the urban/non-urban characteristics of the CBG.

- Digital Loop Carrier investment is calculated based on the length of and type of feeder.
- Feeder runs greater than 9 kft (user definable), fiber is assumed. For these types of runs one of two types of digital line carrier is used: TR-303 digital line carrier or Low Density digital line carrier. If the number of lines is below a user defined threshold value, low density digital line carrier is used.
- Feeder distance calculations are done in the distribution module because the distribution module needs to know the total route length from the wire center to the serving area interface to determine whether total copper loop lengths will exceed the cooper/fiber cross-over length (18 kft).
- Feeder routes branch off from the wire center in four directions, with sub-feeder facilities branching off at right angles from the feeder. V and H coordinates are then used to determine CBG distance from the wire center, along with feeder and sub-feeder distances. If main feeder intersects a CBG, no sub-feeder is assumed.
- The total feeder plus sub-feeder distance for a CBG determines whether the CBG is served by fiber or copper. CBGs closer to the wire center require more capacity than further CBGs. The Hatfield Model accounts for this by tapering the feeder facilities as the distance to CBGs increases.

For both the distribution and feeder modules line density is an important input and structural sharing is a key assumption. Line density refers to the total number of subscriber access lines per square mile. Line density is a key input because it determines several other parameters such as fill factors and the mixture of underground, buried and aerial plant, drop distance, pole spacing, and so on. The structural sharing assumption suggests the telephone company will share some of its facilities such as poles and trenches with other utilities. For instance the same pole or trench might be used by another utility; therefore the model reduces certain investment amounts in order to account for this structural sharing.

Feeder Module

The feeder module analyzes the portion of the network that extends from the wire center to the serving area interface. Based on data plugged from the distribution module, the Hatfield Model determines the size and type of cables required to reach the serving area interfaces in each CBG and supporting structures. The Hatfield Model also determines characteristics of the digital line carrier equipment needed to serve the CBGs that cannot be served by copper feeder. Investment is then calculated based on these characteristics and expense data. Additional considerations are described below:

- The feeder module uses data on main feeder and sub-feeder from the distribution module to calculate investment in feeder plants. Main feeder cable sizes are a function of number of lines served in each CBG and the feeder fill factor for the CBGs.
- Sizing of copper sub-feeder cable for individual CBGs is a function of lines in the

CBG and the copper feeder fill factor. The model selects the smallest size of cable that meets the quotient of dividing the number of lines needed in the CBG by the fill factor. The number of optical fibers needed to serve a CBG is calculated as the number of digital line carrier remote terminals in the CBG times the number of strands per remote terminal (user definable). The Hatfield Model selects the minimum sized optical fiber cable size that meets or exceeds the required number of strands.

- Each segment in the main feeder is sized to serve all the CBGs located past the segment, accounting for tapering of the feeder to the farthest located CBGs.
- The fraction of aerial, buried, and underground plant may be set separately for all density ranges and for each cable type, copper or fiber. Based on these fractions, the distances, and the cost of structure, the feeder module calculates the investment in feeder structure.

Switching and Interoffice Module

The switching and interoffice module calculates end office switching, tandem switching, signaling and interoffice investment. Switch capacity is determined by the number of lines in the CBG served by the wire center along with a user- adjustable fill factor. A switching cost curve is applied to determine the required switching investment per line. The curve is primarily based on typical per-line prices paid by Bell Operating Companies, GTE and other independents as reported in the Northern Business Information publication "U.S., Central Office Equipment Market: 1995 Database." The curve is represented on the y axis by investment per line while the x axis identifies lines served by switch. In general, the smaller the switch the higher investment per line. Listed below are some details to the calculations made in this module:

- Inputs to this module include total line counts for each wire center, distances between switches, traffic assumptions, and distribution of total traffic among local intraoffice, local interoffice traffic, intraLATA traffic, interexchange access, and operator services. Many of these values are user definable. From PNR, line counts for the CBGs and interoffice distances are obtained.
- The Hatfield Model places at least one end office switch in each wire center. The model sizes the switch by adding up all the switched lines in the CBGs served by the wire center, applying a user-definable fill factor. The Hatfield Model checks the capacity based on busy hour call attempts by the mix of lines served by each switch to determine if the switch is line limited or processor time limited, and compares offered traffic with a user defined traffic capacity limit. If the capacity of the selected switch is exceeded, the model calculates investment for an additional switch. Once switch size is determined, the model calculates required investment per line accounting for economies of scale. Investment per line is calculated based on typical per line prices paid by Bell Operating Companies and GTE as reported in the Northern Business Information publication "U.S. Central Office Equipment Market: 1995 Database." A switching investment curve is then developed from these data. Investment ranges from $173 per line for less than 2,000 lines to about

$80 per line for 80,000 lines. A different set of costs are used for small companies. Wire center investments required to support end office and tandem switches are based on assumptions regarding the room size required to house a switch, construction costs, lot sizes, land acquisition costs and investment in power systems and distributing frames.

- Transport calculations are based on traffic and routing assumptions and total mix of access lines served by each switch. The Hatfield Model assumes that all interoffice facilities are a series of interconnected OC48 SONET fiber rings. The model provisions enough of these rings to support all interoffice circuit requirements. Offices that serve less than 5,000 lines are assumed to need lower capacity, less expensive technology. Once the amount of fiber cable is determined, the model determines the costs of installed cable and structure based on user definable inputs for cable costs, structure cost and configuration, mix of structure type, and sharing between feeder and interoffice facilities.
- Tandem and operator tandem switching investments are computed according to assumptions contained in an AT&T Capacity Cost Study. The investment calculation assigns a price for switch "common equipment," switching matrix and control structure, and adds to these amounts the investments in trunk interfaces. The Hatfield Model scales the investment in tandem switch common equipment according to the total number of tandem trunks computed for the study area.
- The Hatfield Model computes signaling link investment for Signal Transfer Point (STP) to end office and tandem "A links," "C links," between STPs in a mated pair, and D link segments assumed to be connecting the STPs of different carrier's networks. All links are assumed to be carried on the interoffice rings. The Hatfield Model always equips at least two signaling links per switch. Required SS7 message traffic is computed according to the call type and traffic assumptions of the CBG. Other data define the number and length of Transaction Capabilities Application Part (TCAP) messages required for database lookups, along with the percentage of calls requiring TCAP message generation. STP capacity is expressed as the total number of signaling links each STP mated pair can terminate. STP investment is expressed in terms of dollars of investment per transaction per second derived from calls requiring TCAP message generation, and the TCAP message rate in each LATA.
- Operator tandem and trunk requirements are based on a user defined operator traffic amount and on the overall trunk capacity. Operator positions are assumed to be based on current workstation technology.

Expense Module

The expense module calculates annual and monthly costs for unbundled network elements. The expense module takes investments determined by the distribution, feeder, and switching and interoffice modules. The module estimates the capital carrying costs associated with the investments. The capital carrying costs include such costs as depreciation, rate of return, taxes, and maintenance. Non-network related operating expenses are also determined such as customer operations expenses, general support expenses, uncollectibles and variable overhead expenses. The expense module then displays the investments and associated expenses for each unbundled network element for each wire center or CBG.

Data for the expense module are obtained from the distribution, feeder, and switching and interoffice modules, as well ARMIS. Results may be displayed by density zone, by individual wire center, or by CBG. Listed below are additional details describing the calculations and assumptions used in this module:

- While certain costs are closely linked to the number of lines provided by the incumbent local exchange company, other categories of operating expenses are related more closely to the levels of their related investments. The expense module develops factors for numerous expense categories and applies these factors both against investment levels and demand quantities generated by previous modules.
- Capital carrying costs are estimated using standard financial techniques. A weighted average cost of capital is derived from a debt/equity ratio, cost of debt, and cost of equity. Equity is subject to federal, state, and local income tax, which necessitates an increase in pre-tax return dollars, so after tax return is equal to the assumed cost of capital. All rates are user definable.
- The Hatfield Model assumes straight-line depreciation and calculates return on investment, tax gross-up and depreciation expenses annually on the mid-year value of the investment. Return is earned only on net capital, but because depreciation results in a declining value of plant in each year, the return amount declines over the service life of the plant. To ensure that a meaningful long run capital carrying cost is calculated, the return amount is levelized over the assumed life of the investment using net present value factors.
- Operating expenses are comprised of network related and non-network related. Network related expenses include the cost of operating and maintaining the network, while non-network expenses include customer operations and variable overhead. Expense categories in USOA are Plant Specific Operations Expense, Plant Non-Specific Operations Expense, Customer Operations Expense, and Corporate Operations Expense. Local telephone companies report historical expense information for each of these major categories through the FCC's ARMIS program. These data are then used to estimate forward looking expenses.
- Plant specific operations and non-plant specific operations are the two major network categories under which expenses are reported. Expense ratios are calculated based on capital investments. These ratios are applied to the investments developed from the distribution, feeder, and switching and interoffice modules to derive associated operating expense amounts. Other expenses vary more directly with the number of lines rather than capital investment. Expenses for these elements are calculated in proportion to the number of access lines supported.
- The expense module estimates direct network-related expenses for all of the unbundled network elements. Operating expenses are added to the annual capital carrying cost to determine the total expenses associated with each unbundled network element. The network related expenses include network support, central

office switching, central office transmission, cable and wire, and network operations.

- Total network operations expense is strongly line-dependent. The Hatfield Model computes the expense as a per-line additive value based on the reported total network operations expense divided by the number of access lines and deducting 50 percent of the result to produce a forward looking estimate.

- Non-network related expenses are assigned to each line density range, CBG, or wire center based on the proportion of direct expenses for that unit of analysis to total expenses in each category. Non-network related expenses include variable support, which varies by size of firm and are not pure overhead; general support equipment, which calculates investment for furniture, office equipment, general purpose computers, buildings, motor vehicles, garage work equipment, and other work equipment. Ratios of investments in the preceding categories to total investment are multiplied by the estimated network investment obtained from the model to produce the investment in general support equipment. The recurring costs of these items are then calculated from the investments in the same fashion as the recurring costs for other network components. A portion of general support costs is assigned to customer operations and corporate operations according to the proportion of operating expenses in these categories to total operating expense reported in the ARMIS data. The remainder of the costs is then assigned directly to unbundled network elements.
- Revenues are used to calculate the uncollectibles factor. The factor is a ratio of uncollectibles expense to adjusted net revenue. This module computes both retail and wholesale uncollectibles factors, with the retail factor applied to basic local telephone service monthly costs and the wholesale factor used in the calculation of unbundled network element costs.

Criticisms of the Hatfield Model

The Hatfield Model is a good attempt at modeling the TELRIC costs of forward looking telephone network. However, after reviewing the model, inputs, and methodology Staff found several concerns that suggest the Hatfield Model is not yet ready to develop permanent prices for unbundled telephone network elements in Missouri. These concerns are based on the Hatfield Model being a work in progress, weaknesses in the data, assumptions about Census Block Groups, how the network is built, assumptions about switching and wire centers, certain area specific variables cannot be geographically deaveraged, and that the model does not account for growth. Many of these concerns can be fixed through geocoding individual households and businesses. These concerns are discussed below:

The Hatfield Model is a work in progress:

- Several revisions have taken place for the Hatfield Model since 1996. Many of these changes were to make the model more efficient and user friendly. However the model is still being improved and needs more improvement. As with all computer programs there are bugs to be fixed. Many of the recent changes were made to fix bugs in the programming. In fact, Staff received updates on May 16, 1997 that fixed several bugs. The following modifications were recently made to The Hatfield Model:

- Modifications were made to the distribution and expense modules and to the data.
- The modifications to the distribution module includes correction of calculations for ratios, investment in cable and structure, low density DLCs, and backbone distribution tapering.
- Modifications to the expense module includes correction of the assignment of expenses to network support and investment and expenses for general support.
- Modifications to the data include increasing the accuracy of the data in general, correcting household and business data, and geocoding CBGs to 97.2 percent of wire centers.

Data criticisms:

- Even though the population data are publicly available, it is based on 1990 Census data. The CBGs were created from this data in 1995. Since seven years have passed since the last Census, the accuracy of the data may have diminished.
- The data were obtained from several sources: Census, Dun and Bradstreet, Donnelly Marketing, Claritas, and Bellcore. The data were then merged together to create the database. Many of the variables are based on national averages and knowledge of the Hatfield Model designers. Therefore, the data may not be appropriate for determining the cost of unbundled network elements in Missouri.
- CBGs are based on population size only and do not include the area covered by the CBG.
- The Hatfield Model assumes an entire CBG is served by one wire center. If more than one wire center serves a CBG, the wire center serving the majority of customers in the CBG is the one selected for calculations. In reality, several wire centers may serve a CBG.
- If company specific data were used, residences and businesses were geocoded into the database, and state specific prices, were used for network components, the Hatfield Model would be a more viable model.

Assumptions about Census Block Groups:

- The Hatfield Model bases all network designs on square CBGs. In reality, networks are not all square.
- The Hatfield Model divides CBGs into four quadrants and assumes that the population is evenly distributed in the CBG. If more than 50 percent of the CBG is empty, consumers occupy only two diagonally opposed quadrants of a CBG. Otherwise, consumers occupy all four quadrants. In reality, consumers are scattered sometimes evenly, sometimes unevenly throughout an area.

- Creates a theoretical network based on CBGs. The CBGs are geocoded into the Hatfield Model database based on latitude and longitude. From these data, The Hatfield Model creates a theoretical network based on assumptions concerning the size and shapes of the CBGs. This network may not match what has been built in reality. The model will place switches and cable based on the CBGs, not based on where consumers actually reside. Therefore, the network the Hatfield Model creates is not an accurate representation of reality. If residence and business locations were geocoded into the Hatfield Model database, the network that is created would be more realistic. Geocoding individual dwellings and business would also alleviate concerns related to population distribution and eliminate the need to rely on CBG data.

Deaveraging:

- The Hatfield Model is limited in the number of density zones for which rates are determined. HM allows 9 zones only, which cannot be varied to match incumbent LEC's rate zones.
- The Hatfield Model does not geographically deaverage terrain, rock depth, soil hardness, town, or lot size. The fact that these values are not deaveraged, leads to the idea that the output is limited to company-wide averages.

Switching and Transport:

- The switching investment curve is much lower compared to SWBT. The Hatfield Model assumes that investment per line, depending upon number of lines, that the investment is between $173/line for less than 2,000 lines and $80/line for 80,000 lines or greater. SWBT contends that switching investment per line is between $150 and $250 per line. Modifying the switch investment curve requires significant programming changes and even renaming the model.
- HM assumes all SONET rings are OC48. SONET rings can also be OC3 , OC12 and OC192 (being developed).
- The model assumes 100 percent integrated DLC. This assumption is not realistic with collocation.

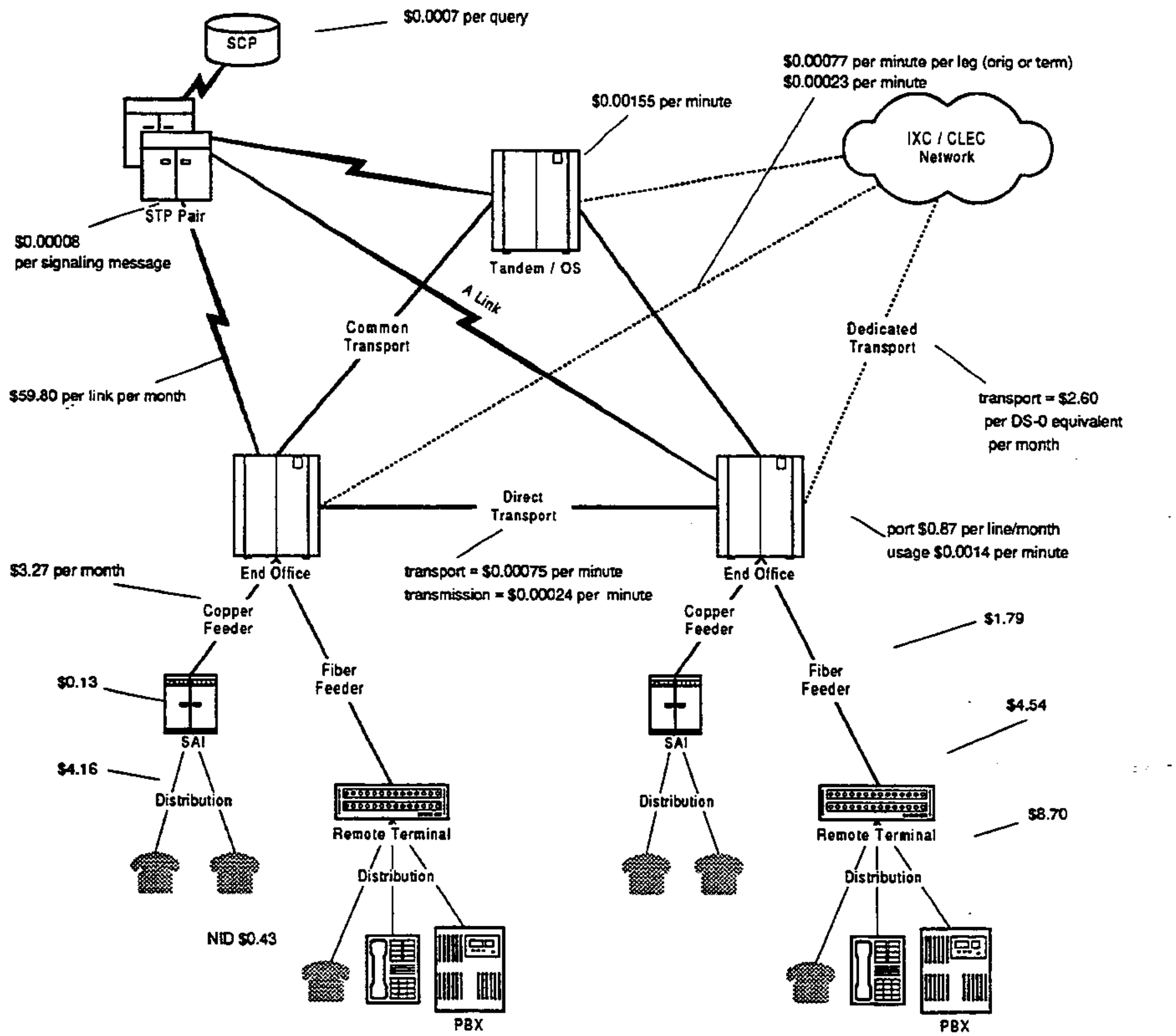
- The network the Hatfield Model constructs is assumed to be built all at once. This is not reasonable because telephone companies construct networks pieces at a time. Even on a long run basis, where an entire new network can be built, the new network will not be built all a once. Furthermore, the Hatfield Model does not provide costs for all elements needed in a network. For example, costs for trunks and ISDN services are not determined.

- Even though the Hatfield Model is forward looking, it does not account for growth. HM assumes the minimum facilities to meet current demand will be built. This assumption has the advantage of placing lower cost facilities, but does not account for future demand.

Conclusion

In summary, the Hatfield is a personal computer based program that develops a local exchange telephone network based on user inputs, demographic, and geographic data. The Hatfield Model builds a network based on current demand and determines costs associated with several unbundled network elements. Although the Hatfield Model attempts to make comprehensive estimates of the costs associated with a network, Staff has several concerns that suggest the Hatfield is not the correct cost-determining model for Missouri. These concerns are based on the Hatfield Model being a work in progress, weaknesses in the data, assumptions about Census Block Groups, how the network is built, assumptions about switching and wire centers, certain area specific variables cannot be geographically deaveraged, and that the model does not account for growth. When these problems are corrected, the Hatfield Model may become a stronger model for estimating TELRIC and providing permanent prices in Missouri.

Missouri / Southwestern Bell



COST OF NETWORK ELEMENTS - AT&T/MCI Inputs

Missouri
Southwestern Bell

Loop elements	0-5 lines/sq mi	5-100 lines/sq mi	100-200 lines/sq mi	200-650 lines/sq mi	650-850 lines/sq mi	850-2550 lines/sq mi	2550-5000 lines/sq mi	5000-10000 lines/sq mi	>10000 lines/sq mi	Totals
NID										
Annual Cost	$ 114,913	$ 1,152,219	$ 507,743	$ 1,609,174	$ 422,679	$ 4,290,863	$ 3,803,166	$ 1,670,379	$ 1,146,504	$ 14,617,660
Unit Cost/month	0.52	0.48	0.43	0.44	0.44	0.45	0.45	0.42	0.33	$ 0.43
Loop Distribution (DLC)										
Annual Cost	$ 9,458,974	$ 56,365,454	$ 15,356,461	$ 29,776,662	$ 5,780,118	$ 39,335,808	$ 19,996,279	$ 6,654,892	$ 4,024,228	$ 186,748,876
Unit Cost/month	43.10	24.36	14.31	9.83	7.41	5.63	4.38	3.90	3.40	$ 8.70
Loop Distribution (non-DLC)										
Annual Cost	$ -	$ 45,319	$ 1,142,613	$ 3,007,795	$ 1,142,076	$ 13,831,425	$ 15,958,419	$ 8,208,457	$ 6,716,449	$ 50,052,554
Unit Cost/month	-	14.03	12.01	7.79	6.11	4.84	4.01	3.67	2.95	$ 4.16
Loop Distribution (all)										
Annual Cost	$ 9,458,974	$ 58,410,773	$ 16,499,073	$ 32,784,458	$ 6,922,194	$ 53,167,234	$ 35,954,698	$ 14,863,349	$ 10,740,677	$ 236,801,430
Unit Cost/month	43.10	24.34	14.13	9.60	7.15	5.53	4.21	3.77	3.10	$ 7.08
Loop Concentration (DLC)										
Annual Cost	$ 1,664,828	$ 12,219,031	$ 4,743,639	$ 13,402,664	$ 3,412,091	$ 29,437,046	$ 21,109,380	$ 7,843,062	$ 4,756,691	$ 98,588,432
Unit Cost/month	7.59	5.10	4.42	4.43	4.37	4.36	4.63	4.69	4.02	$ 4.54
Loop Concentration (non-DLC)										
Annual Cost	$ -	$ 784	$ 15,642	$ 57,985	$ 26,232	$ 408,791	$ 575,292	$ 291,674	$ 165,184	$ 1,541,583
Unit Cost/month	-	0.24	0.16	0.15	0.14	0.14	0.14	0.13	0.07	$ 0.13
Loop Concentration (all)										
Annual Cost	$ 1,664,828	$ 12,219,815	$ 4,759,281	$ 13,460,649	$ 3,438,324	$ 29,845,837	$ 21,684,672	$ 8,134,736	$ 4,921,874	$ 100,130,016
Unit Cost/month	7.59	5.09	4.07	3.94	3.55	3.11	2.64	2.06	1.42	$ 2.97
Loop Feeder (DLC)										
Annual Cost	$ 3,902,768	$ 10,423,107	$ 1,862,525	$ 3,442,524	$ 955,007	$ 8,027,215	$ 6,028,724	$ 2,736,099	$ 1,458,886	$ 38,836,854
Unit Cost/month	17.78	4.35	1.74	1.14	1.22	1.19	1.32	1.60	1.23	$ 1.79
Loop Feeder (non-DLC)										
Annual Cost	$ -	$ 5,262	$ 233,285	$ 1,418,262	$ 733,380	$ 9,632,671	$ 14,260,810	$ 7,563,320	$ 5,426,071	$ 39,273,061
Unit Cost/month	-	1.63	2.45	3.67	3.92	3.37	3.59	3.39	2.38	$ 3.27
Loop Feeder (all)										
Annual Cost	$ 3,902,768	$ 10,428,369	$ 2,095,809	$ 4,860,786	$ 1,688,387	$ 17,659,886	$ 20,289,534	$ 10,299,420	$ 6,884,957	$ 78,109,916
Unit Cost/month	$ 17.78	$ 4.35	$ 1.79	$ 1.42	$ 1.76	$ 1.84	$ 2.38	$ 2.61	$ 1.99	$ 2.32
Total Loop (DLC)										
Annual Cost	$ 15,141,483	$ 82,158,260	$ 22,429,013	$ 47,960,287	$ 10,486,117	$ 79,813,505	$ 49,167,203	$ 17,957,964	$ 10,631,939	$ 335,747,770
Unit Cost/month	69.00	34.29	20.91	15.84	13.44	11.83	10.77	10.51	8.98	$ 15.47
Total Loop (non-DLC)										
Annual Cost	$ -	$ 52,917	$ 1,432,893	$ 4,654,778	$ 1,983,367	$ 25,150,316	$ 32,564,886	$ 17,009,920	$ 13,062,074	$ 95,911,150
Unit Cost/month	-	16.39	15.06	12.05	10.61	8.79	8.19	7.62	5.74	$ 7.98
Total Loop (all)										
Annual Cost	$ 15,141,483	$ 82,211,177	$ 23,861,906	$ 52,615,066	$ 12,471,483	$ 104,963,820	$ 81,732,089	$ 34,967,884	$ 23,694,013	$ 431,658,920
Unit Cost/month	$ 69.00	34.28	20.43	15.41	12.89	10.92	9.57	8.87	6.85	$ 12.80

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Total lines	18,288	199,949	97,330	284,676	80,627	800,683	711,592	328,501	288,361	2,809,897
Total lines served by DLC	18,288	199,680	89,403	252,381	65,043	562,312	380,344	142,366	98,627	1,808,444

	Annual Cost	Units		Unit Cost	
End office switching	$ 78,356,131				
Port	23,506,839	2,280,164	switched lines	$ 0.87	per line/month
Usage	54,849,291	39,498,909,412	minutes	$ 0.00139	per minute
Signaling network elements	$ 5,156,492				
Links	497,657	694	links	$ 59.80	per link per month
STP	3,186,795	39,015,006,141	TCAP+ISUP msgs	$ 0.00008	per signaling message
SCP	1,472,039	2,095,579,400	TCAP queries	$ 0.00070	per query
Transport network elements					
Dedicated					
Sw+Sp Transport	$ 19,418,347	621,424	trunks	$ 2.60	per DS-0 equivalent per month
Switched	2,240,211	71,691	trunks	$ 0.00026	per minute
Special	17,178,136	549,733	trunks		
Transmission Terminal	23,620,458	621,424	trunks	$ 3.17	per DS-0 equivalent per month
				$ 0.00032	per minute
				$ 0.00057	total per minute
Common					
Transport	$ 1,906,647	2,510,257,358	minutes	$ 0.00077	per minute per leg (orig or term)
Transmission Terminal	568,957	2,510,257,358	minutes	$ 0.00023	per minute
				$ 0.00100	total per minute
Direct					
Transport	$ 7,786,651	10,396,784,915	minutes	$ 0.00075	per minute
Transmission Terminal	2,508,590	10,396,784,915	minutes	$ 0.00024	per minute
				$ 0.00099	total per minute
Tandem switch	$ 3,296,528	2,133,655,892	minutes	$ 0.00155	per minute
Operator systems	$ 11,580,759				
Public Telephones	$ 11,513,651				
Total (w/ Public)	$ 597,372,130				
Total cost of switched network elements (w/o Public)	$ 17.08 per line/month				

	Interconnected at end office	tandem	wtd average
Local Interconnection			
EO switching	$ 0.00139	$ 0.00139	
ISUP	$ 0.00008	$ 0.00008	
Common Transport	$ -	$ 0.00100	
Tandem Switching	$ -	$ 0.00155	
TOTAL	$ 0.00147	$ 0.00402	n/a
IXC switched access			
EO switching	$ 0.00139	$ 0.00139	
ISUP	$ 0.00008	$ 0.00008	
Dedicated Transport	$ 0.00057	$ 0.00057	
Common Transport	$ -	$ 0.00100	
Tandem Switching	$ -	$ 0.00155	
TOTAL	$ 0.00205	$ 0.00459	$ 0.00256
Signaling detail			
cost per 800 call attempt (TCAP)	$ 0.0016		
ISUP cost/transaction	$ 0.00057		
ISUP cost/completion	0.0008		
IXC switched access MOU/comp	9.70		
ISUP cost/min	$ 0.000084		
D link per month	$ 84.47		
Dedicated Transport Costs Per Trunk			
DS-0 per month			
Transport per month	$ 2.60		
Terminal per month *	$ 39.28		
TOTAL	$ 41.88		
DS-1 per month			
Transport per month	$ 62.50		
Terminal per month	$ 76.02		
TOTAL	$ 138.52		
DS-3 per month			
Transport per month	$ 1,749.90		
Terminal per month	$ 215.01		
TOTAL	$ 1,964.90		
Trunk Port Costs			
per trunk port (DS-0 equivalent)	$ 2.81		
per trunk port minute	$ 0.000001		
total EO usage per minute	$ 0.001389		
trk port/min	$ 0.000001		
other	$ 0.001388		

	0-5 lines/sq mi	5-100 lines/sq mi	100-200 lines/sq mi	200-650 lines/sq mi	650-850 lines/sq mi	850-2550 lines/sq mi	2550-5000 lines/sq mi	5000-10000 lines/sq mi	>10000 lines/sq mi	weighted average
calculated copper feeder fill (non-DLC)	0.0%	67.3%	65.5%	64.5%	67.6%	69.5%	72.2%	74.5%	76.6%	72.5%
calculated distribution fill (DLC)	34.6%	39.3%	39.7%	43.0%	46.9%	50.7%	53.7%	54.4%	57.8%	48.8%
calculated distribution fill (non-DLC)	0.0%	44.8%	37.6%	44.6%	48.7%	49.9%	54.0%	54.3%	55.4%	52.8%
										50.2%
calculated "mainframe fill" (non-DLC)	0.0%	67.3%	54.4%	45.1%	27.1%	20.2%	12.7%	14.0%	18.4%	17.4%

Hatfield Model Release 3.1
ATT/MCI Inputs

Distribution Input	Current Scenario Value	Default Scenario Value	Feeder Input	Current Scenario Value	Default Scenario Value
Distribution Cable Fill - 0	0.50	0.50	Copper Feeder Fill - 0	0.65	0.65
Distribution Cable Fill - 5	0.55	0.55	Copper Feeder Fill - 5	0.75	0.75
Distribution Cable Fill - 100	0.55	0.55	Copper Feeder Fill - 100	0.80	0.80
Distribution Cable Fill - 200	0.60	0.60	Copper Feeder Fill - 200	0.80	0.80
Distribution Cable Fill - 650	0.65	0.65	Copper Feeder Fill - 650	0.80	0.80
Distribution Cable Fill - 850	0.70	0.70	Copper Feeder Fill - 850	0.80	0.80
Distribution Cable Fill - 2550	0.75	0.75	Copper Feeder Fill - 2550	0.80	0.80
Distribution Cable Fill - 5000	0.75	0.75	Copper Feeder Fill - 5000	0.80	0.80
Distribution Cable Fill - 10000	0.75	0.75	Copper Feeder Fill - 10000	0.80	0.80
Buried Fraction - 0	0.75	0.75	Fiber Feeder Strand Fill - 0	1.00	1.00
Buried Fraction - 5	0.75	0.75	Fiber Feeder Strand Fill - 5	1.00	1.00
Buried Fraction - 100	0.75	0.75	Fiber Feeder Strand Fill - 100	1.00	1.00
Buried Fraction - 200	0.70	0.70	Fiber Feeder Strand Fill - 200	1.00	1.00
Buried Fraction - 650	0.70	0.70	Fiber Feeder Strand Fill - 650	1.00	1.00
Buried Fraction - 850	0.70	0.70	Fiber Feeder Strand Fill - 850	1.00	1.00
Buried Fraction - 2550	0.65	0.65	Fiber Feeder Strand Fill - 2550	1.00	1.00
Buried Fraction - 5000	0.35	0.35	Fiber Feeder Strand Fill - 5000	1.00	1.00
Buried Fraction - 10000	0.05	0.05	Fiber Feeder Strand Fill - 10000	1.00	1.00
Aerial Cable Fraction - 0	0.25	0.25	Copper Aerial Fraction - 0	0.50	0.50
Aerial Cable Fraction - 5	0.25	0.25	Copper Aerial Fraction - 5	0.50	0.50
Aerial Cable Fraction - 100	0.25	0.25	Copper Aerial Fraction - 100	0.50	0.50
Aerial Cable Fraction - 200	0.30	0.30	Copper Aerial Fraction - 200	0.40	0.40
Aerial Cable Fraction - 650	0.30	0.30	Copper Aerial Fraction - 650	0.30	0.30
Aerial Cable Fraction - 850	0.30	0.30	Copper Aerial Fraction - 850	0.20	0.20
Aerial Cable Fraction - 2550	0.30	0.30	Copper Aerial Fraction - 2550	0.15	0.15
Aerial Cable Fraction - 5000	0.60	0.60	Copper Aerial Fraction - 5000	0.10	0.10
Aerial Cable Fraction - 10000	0.85	0.85	Copper Aerial Fraction - 10000	0.05	0.05
Conduit Placement per foot - 0	10.29	10.29	Copper Buried Fraction - 0	0.45	0.45
Conduit Placement per foot - 5	10.29	10.29	Copper Buried Fraction - 5	0.45	0.45
Conduit Placement per foot - 100	10.29	10.29	Copper Buried Fraction - 100	0.45	0.45
Conduit Placement per foot - 200	11.35	11.35	Copper Buried Fraction - 200	0.40	0.40
Conduit Placement per foot - 650	11.88	11.88	Copper Buried Fraction - 650	0.30	0.30
Conduit Placement per foot - 850	16.40	16.40	Copper Buried Fraction - 850	0.20	0.20
Conduit Placement per foot - 2550	21.60	21.60	Copper Buried Fraction - 2550	0.10	0.10
Conduit Placement per foot - 5000	50.10	50.10	Copper Buried Fraction - 5000	0.05	0.05
Conduit Placement per foot - 10000	75.00	75.00	Copper Buried Fraction - 10000	0.05	0.05
Buried Placement per foot - 0	1.77	1.77	Copper Manhole Spacing, feet - 0	800	800
Buried Placement per foot - 5	1.77	1.77	Copper Manhole Spacing, feet - 5	800	800
Buried Placement per foot - 100	1.77	1.77	Copper Manhole Spacing, feet - 100	800	800
Buried Placement per foot - 200	1.93	1.93	Copper Manhole Spacing, feet - 200	800	800
Buried Placement per foot - 650	2.17	2.17	Copper Manhole Spacing, feet - 650	600	600
Buried Placement per foot - 850	3.54	3.54	Copper Manhole Spacing, feet - 850	600	600
Buried Placement per foot - 2550	4.27	4.27	Copper Manhole Spacing, feet - 2550	600	600
Buried Placement per foot - 5000	13.00	13.00	Copper Manhole Spacing, feet - 5000	400	400
Buried Placement per foot - 10000	45.00	45.00	Copper Manhole Spacing, feet - 10000	400	400
Pole Spacing, feet - 0	250	250	Copper Buried Installation per foot - 0	1.77	1.77
Pole Spacing, feet - 5	250	250	Copper Buried Installation per foot - 5	1.77	1.77
Pole Spacing, feet - 100	200	200	Copper Buried Installation per foot - 100	1.77	1.77
Pole Spacing, feet - 200	200	200	Copper Buried Installation per foot - 200	1.93	1.93
Pole Spacing, feet - 650	175	175	Copper Buried Installation per foot - 650	2.17	2.17
Pole Spacing, feet - 850	175	175	Copper Buried Installation per foot - 850	3.54	3.54
Pole Spacing, feet - 2550	150	150	Copper Buried Installation per foot - 2550	4.27	4.27

Distribution Input	Current Scenario Value	Default Scenario Value
Pole Spacing, feet - 5000	150	150
Pole Spacing, feet - 10000	150	150
Drop Distance, feet - 0	150	150
Drop Distance, feet - 5	150	150
Drop Distance, feet - 100	100	100
Drop Distance, feet - 200	100	100
Drop Distance, feet - 650	50	50
Drop Distance, feet - 850	50	50
Drop Distance, feet - 2550	50	50
Drop Distance, feet - 5000	50	50
Drop Distance, feet - 10000	50	50
Aerial Drop Placement (total) - 0	58.33	58.33
Aerial Drop Placement (total) - 5	58.33	58.33
Aerial Drop Placement (total) - 100	46.67	46.67
Aerial Drop Placement (total) - 200	35.00	35.00
Aerial Drop Placement (total) - 650	23.33	23.33
Aerial Drop Placement (total) - 850	11.67	11.67
Aerial Drop Placement (total) - 2550	11.67	11.67
Aerial Drop Placement (total) - 5000	11.67	11.67
Aerial Drop Placement (total) - 10000	11.67	11.67
Buried Drop Placement (total) - 0	0.75	0.75
Buried Drop Placement (total) - 5	0.75	0.75
Buried Drop Placement (total) - 100	0.75	0.75
Buried Drop Placement (total) - 200	0.75	0.75
Buried Drop Placement (total) - 650	0.75	0.75
Buried Drop Placement (total) - 850	0.75	0.75
Buried Drop Placement (total) - 2550	1.13	1.13
Buried Drop Placement (total) - 5000	1.50	1.50
Buried Drop Placement (total) - 10000	5.00	5.00
Buried Drop Placement Fraction - 0	1.00	1.00
Buried Drop Placement Fraction - 5	1.00	1.00
Buried Drop Placement Fraction - 100	1.00	1.00
Buried Drop Placement Fraction - 200	1.00	1.00
Buried Drop Placement Fraction - 650	1.00	1.00
Buried Drop Placement Fraction - 850	1.00	1.00
Buried Drop Placement Fraction - 2550	1.00	1.00
Buried Drop Placement Fraction - 5000	1.00	1.00
Buried Drop Placement Fraction - 10000	1.00	1.00
Buried Drop Fraction - 0	0.75	0.75
Buried Drop Fraction - 5	0.75	0.75
Buried Drop Fraction - 100	0.75	0.75
Buried Drop Fraction - 200	0.70	0.70
Buried Drop Fraction - 650	0.70	0.70
Buried Drop Fraction - 850	0.70	0.70
Buried Drop Fraction - 2550	0.70	0.70
Buried Drop Fraction - 5000	0.40	0.40
Buried Drop Fraction - 10000	0.15	0.15
Pole Investment	201.00	201.00
Pole Labor	216.00	216.00
Buried Cable Jacketing Multiplier	1.04	1.04
Conduit Investment per foot	0.60	0.60
Spare Tubes per route	1.00	1.00

Feeder Input	Current Scenario Value	Default Scenario Value
Copper Buried Installation per foot - 5000	13.00	13.00
Copper Buried Installation per foot - 10000	45.00	45.00
Copper Conduit Installation per foot - 0	10.29	10.29
Copper Conduit Installation per foot - 5	10.29	10.29
Copper Conduit Installation per foot - 100	10.29	10.29
Copper Conduit Installation per foot - 200	11.35	11.35
Copper Conduit Installation per foot - 650	11.38	11.38
Copper Conduit Installation per foot - 850	16.40	16.40
Copper Conduit Installation per foot - 2550	21.60	21.60
Copper Conduit Installation per foot - 5000	50.10	50.10
Copper Conduit Installation per foot - 10000	75.00	75.00
Fiber Aerial Fraction - 0	0.35	0.35
Fiber Aerial Fraction - 5	0.35	0.35
Fiber Aerial Fraction - 100	0.35	0.35
Fiber Aerial Fraction - 200	0.30	0.30
Fiber Aerial Fraction - 650	0.30	0.30
Fiber Aerial Fraction - 850	0.20	0.20
Fiber Aerial Fraction - 2550	0.15	0.15
Fiber Aerial Fraction - 5000	0.10	0.10
Fiber Aerial Fraction - 10000	0.05	0.05
Fiber Buried Fraction - 0	0.60	0.60
Fiber Buried Fraction - 5	0.60	0.60
Fiber Buried Fraction - 100	0.60	0.60
Fiber Buried Fraction - 200	0.60	0.60
Fiber Buried Fraction - 650	0.30	0.30
Fiber Buried Fraction - 850	0.20	0.20
Fiber Buried Fraction - 2550	0.10	0.10
Fiber Buried Fraction - 5000	0.05	0.05
Fiber Buried Fraction - 10000	0.05	0.05
Fiber Manhole Spacing, feet - 0	2,000	2,000
Fiber Manhole Spacing, feet - 5	2,000	2,000
Fiber Manhole Spacing, feet - 100	2,000	2,000
Fiber Manhole Spacing, feet - 200	2,000	2,000
Fiber Manhole Spacing, feet - 650	2,000	2,000
Fiber Manhole Spacing, feet - 850	2,000	2,000
Fiber Manhole Spacing, feet - 2550	2,000	2,000
Fiber Manhole Spacing, feet - 5000	2,000	2,000
Fiber Manhole Spacing, feet - 10000	2,000	2,000
Fiber Buried Installation per foot - 0	1.77	1.77
Fiber Buried Installation per foot - 5	1.77	1.77
Fiber Buried Installation per foot - 100	1.77	1.77
Fiber Buried Installation per foot - 200	1.93	1.93
Fiber Buried Installation per foot - 650	2.17	2.17
Fiber Buried Installation per foot - 850	3.54	3.54
Fiber Buried Installation per foot - 2550	4.27	4.27
Fiber Buried Installation per foot - 5000	13.00	13.00
Fiber Buried Installation per foot - 10000	45.00	45.00
Fiber Conduit Installation per foot - 0	10.29	10.29
Fiber Conduit Installation per foot - 5	10.29	10.29
Fiber Conduit Installation per foot - 100	10.29	10.29
Fiber Conduit Installation per foot - 200	11.35	11.35
Fiber Conduit Installation per foot - 650	11.38	11.38

Distribution Input	Current Scenario Value	Default Scenario Value
Regional Labor Adjustment Factor	1.00	1.00
Residential NID case, no protector	10.00	10.00
Residential NID basic labor	15.00	15.00
Maximum lines per NID	6.00	6.00
Residential Protection Block, per pair	4.00	4.00
Business NID case, no protector	25.00	25.00
Business NID basic labor	15.00	15.00
Business Protection Block, per pair	4.00	4.00
Average Lines per business location	4.00	4.00
Terminal and Splice per line, buried	42.50	42.50
Terminal and Splice per line, aerial	32.00	32.00
Drop cable investment per foot buried	0.14	0.14
Drop cable buried pairs	3.00	3.00
Drop cable investment per foot aerial	0.10	0.10
Drop cable aerial pairs	2.00	2.00
TR-303 DLC Site and Power	3,000.00	3,000.00
TR-303 DLC Maximum Lines/Increment	672	672
TR-303 DLC RT Fill Factor	0.90	0.90
TR-303 DLC Basic Common Eqpt Invest + Initial lines	66,000.00	66,000.00
TR-303 DLC POTS Channel Unit Investment	310.00	310.00
TR-303 DLC POTS Lines per CU	4.00	4.00
TR-303 DLC Coin Channel Unit Investment	250.00	250.00
TR-303 DLC Coin Lines per CU	2.00	2.00
TR-303 DLC 303/LD crossover, lines	384.00	384.00
TR-303 DLC Fibers per RT	4.00	4.00
TR-303 DLC Optical Patch Panel	1,000.00	1,000.00
TR-303 DLC Copper Feeder Max Distance, ft	9,000.00	9,000.00
TR-303 DLC Common Eqpt Invest per additional 672 lines	18,500.00	18,500.00
TR-303 DLC Maximum Number of additional line modules/RT	2.00	2.00
Low Density DLC Site and Power	2,500.00	2,500.00
Low Density DLC Maximum Lines/Increment	96.00	96.00
Low Density DLC RT Fill Factor	0.90	0.90
Low Density DLC Basic Common Eqpt Invest + Initial lines	13,000.00	13,000.00
Low Density DLC POTS Channel Unit Investment	310.00	310.00
Low Density DLC POTS Lines per CU	4.00	4.00
Low Density DLC Coin Channel Unit Investment	250.00	250.00
Low Density DLC Coin Lines per CU	2.00	2.00
Low Density DLC Fibers per RT	4.00	4.00
Low Density DLC Optical Patch Panel	1,000.00	1,000.00
Low Density DLC Common Eqpt Invest per additional 96 lines	11,000.00	11,000.00
Low Density DLC Maximum Number of additional line modules/R	1.00	1.00
Long Loop Loading Adjustment per line 1	-	-
Long Loop Loading Adjustment per line 2	20.00	20.00
Long Loop Loading Adjustment per line 3	40.00	40.00
Long Loop Loading Adjustment per line 4	75.00	75.00
Long Loop Loading Adjustment per line 5	110.00	110.00
Long Loop Loading Adjustment per line 6	175.00	175.00
Long Loop Cable Investment Adjustment 1	1.00	1.00
Long Loop Cable Investment Adjustment 2	1.36	1.36
Long Loop Cable Investment Adjustment 3	2.55	2.55
Long Loop Cable Investment Adjustment 4	2.55	2.55
Long Loop Cable Investment Adjustment 5	13.07	13.07

Feeder Input	Current Scenario Value	Default Scenario Value
Fiber Conduit Installation per foot - 850	16.40	16.40
Fiber Conduit Installation per foot - 2550	21.60	21.60
Fiber Conduit Installation per foot - 5000	50.10	50.10
Fiber Conduit Installation per foot - 10000	75.00	75.00
Fiber Feeder Investment per foot - 216	13.10	13.10
Fiber Feeder Investment per foot - 144	9.50	9.50
Fiber Feeder Investment per foot - 96	7.10	7.10
Fiber Feeder Investment per foot - 72	5.90	5.90
Fiber Feeder Investment per foot - 60	5.30	5.30
Fiber Feeder Investment per foot - 48	4.70	4.70
Fiber Feeder Investment per foot - 36	4.10	4.10
Fiber Feeder Investment per foot - 24	3.50	3.50
Fiber Feeder Investment per foot - 18	3.20	3.20
Fiber Feeder Investment per foot - 12	2.90	2.90
Copper Feeder Investment per foot - 4200	74.25	74.25
Copper Feeder Investment per foot - 3600	63.75	63.75
Copper Feeder Investment per foot - 3000	53.25	53.25
Copper Feeder Investment per foot - 2400	42.75	42.75
Copper Feeder Investment per foot - 1800	32.25	32.25
Copper Feeder Investment per foot - 1200	21.75	21.75
Copper Feeder Investment per foot - 900	16.50	16.50
Copper Feeder Investment per foot - 600	11.25	11.25
Copper Feeder Investment per foot - 400	7.75	7.75
Copper Feeder Investment per foot - 200	4.25	4.25
Copper Feeder Investment per foot - 100	2.50	2.50
Buried Copper Cable Sheath Multiplier	1.04	1.04
Buried Fiber Sheath Addition per foot	0.20	0.20
Pole Materials	201.00	201.00
Pole Labor	216.00	216.00
Conduit Material Investment per foot	0.60	0.60
Inner Duct Investment per foot	0.30	0.30
Spare Tubes per section	1.00	1.00
Regional Labor Multiplier	1.00	1.00
Pole Spacing, feet - 0	250	250
Pole Spacing, feet - 5	250	250
Pole Spacing, feet - 100	200	200
Pole Spacing, feet - 200	200	200
Pole Spacing, feet - 650	175	175
Pole Spacing, feet - 850	175	175
Pole Spacing, feet - 2550	150	150
Pole Spacing, feet - 5000	150	150
Pole Spacing, feet - 10000	150	150
Copper Manhole Materials - 0	1,865.00	1,865.00
Copper Manhole Materials - 5	1,865.00	1,865.00
Copper Manhole Materials - 100	1,865.00	1,865.00
Copper Manhole Materials - 200	1,865.00	1,865.00
Copper Manhole Materials - 650	1,865.00	1,865.00
Copper Manhole Materials - 850	1,865.00	1,865.00
Copper Manhole Materials - 2550	1,865.00	1,865.00
Copper Manhole Materials - 5000	1,865.00	1,865.00
Copper Manhole Materials - 10000	1,865.00	1,865.00
Copper Manhole Frame and Cover - 0	350.00	350.00

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Distribution Input	Current Scenario Value	Default Scenario Value
Long Loop Cable Investment Adjustment 6	13.07	13.07
Long Loop DLC CU Adjustment 1	1.00	1.00
Long Loop DLC CU Adjustment 2	1.00	1.00
Long Loop DLC CU Adjustment 3	1.00	1.00
Long Loop DLC CU Adjustment 4	1.25	1.25
Long Loop DLC CU Adjustment 5	1.00	1.00
Long Loop DLC CU Adjustment 6	1.25	1.25
Distribution Cable Size 1	2,400	2,400
Distribution Cable Size 2	1,800	1,800
Distribution Cable Size 3	1,200	1,200
Distribution Cable Size 4	900	900
Distribution Cable Size 5	600	600
Distribution Cable Size 6	400	400
Distribution Cable Size 7	200	200
Distribution Cable Size 8	100	100
Distribution Cable Size 9	50	50
Distribution Cable Size 10	25	25
Distribution Cable Size 11	12	12
Distribution Cable Size 12	6	6
Distribution Cable Investment per foot 1	42.75	42.75
Distribution Cable Investment per foot 2	32.25	32.25
Distribution Cable Investment per foot 3	21.75	21.75
Distribution Cable Investment per foot 4	16.50	16.50
Distribution Cable Investment per foot 5	11.25	11.25
Distribution Cable Investment per foot 6	7.75	7.75
Distribution Cable Investment per foot 7	4.25	4.25
Distribution Cable Investment per foot 8	2.50	2.50
Distribution Cable Investment per foot 9	1.63	1.63
Distribution Cable Investment per foot 10	1.19	1.19
Distribution Cable Investment per foot 11	0.76	0.76
Distribution Cable Investment per foot 12	0.63	0.63
Distribution Riser Cable Size 1	2,400	2,400
Distribution Riser Cable Size 2	1,800	1,800
Distribution Riser Cable Size 3	1,200	1,200
Distribution Riser Cable Size 4	900	900
Distribution Riser Cable Size 5	600	600
Distribution Riser Cable Size 6	400	400
Distribution Riser Cable Size 7	200	200
Distribution Riser Cable Size 8	100	100
Distribution Riser Cable Size 9	50	50
Distribution Riser Cable Size 10	25	25
Distribution Riser Cable Size 11	12	12
Distribution Riser Cable Size 12	6	6
Distribution Riser Cable Investment per foot 1	42.75	42.75
Distribution Riser Cable Investment per foot 2	32.25	32.25
Distribution Riser Cable Investment per foot 3	21.75	21.75
Distribution Riser Cable Investment per foot 4	16.50	16.50
Distribution Riser Cable Investment per foot 5	11.25	11.25
Distribution Riser Cable Investment per foot 6	7.75	7.75
Distribution Riser Cable Investment per foot 7	4.25	4.25
Distribution Riser Cable Investment per foot 8	2.50	2.50
Distribution Riser Cable Investment per foot 9	1.63	1.63

Feeder Input	Current Scenario Value	Default Scenario Value
Copper Manhole Frame and Cover - 5	350.00	350.00
Copper Manhole Frame and Cover - 100	350.00	350.00
Copper Manhole Frame and Cover - 200	350.00	350.00
Copper Manhole Frame and Cover - 650	350.00	350.00
Copper Manhole Frame and Cover - 850	350.00	350.00
Copper Manhole Frame and Cover - 2550	350.00	350.00
Copper Manhole Frame and Cover - 5000	350.00	350.00
Copper Manhole Frame and Cover - 10000	350.00	350.00
Copper Manhole Site Delivery - 0	125.00	125.00
Copper Manhole Site Delivery - 5	125.00	125.00
Copper Manhole Site Delivery - 100	125.00	125.00
Copper Manhole Site Delivery - 200	125.00	125.00
Copper Manhole Site Delivery - 650	125.00	125.00
Copper Manhole Site Delivery - 850	125.00	125.00
Copper Manhole Site Delivery - 2550	125.00	125.00
Copper Manhole Site Delivery - 5000	125.00	125.00
Copper Manhole Site Delivery - 10000	125.00	125.00
Copper Manhole Excavate and Backfill - 0	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 5	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 100	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 200	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 650	3,200.00	3,200.00
Copper Manhole Excavate and Backfill - 850	3,500.00	3,500.00
Copper Manhole Excavate and Backfill - 255(	3,500.00	3,500.00
Copper Manhole Excavate and Backfill - 500(	5,000.00	5,000.00
Copper Manhole Excavate and Backfill - 100(	5,000.00	5,000.00
Fiber Pullbox Materials - 0	280.00	280.00
Fiber Pullbox Materials - 5	280.00	280.00
Fiber Pullbox Materials - 100	280.00	280.00
Fiber Pullbox Materials - 200	280.00	280.00
Fiber Pullbox Materials - 650	280.00	280.00
Fiber Pullbox Materials - 850	280.00	280.00
Fiber Pullbox Materials - 2550	280.00	280.00
Fiber Pullbox Materials - 5000	280.00	280.00
Fiber Pullbox Materials - 10000	280.00	280.00
Fiber Pullbox Installation - 0	220.00	220.00
Fiber Pullbox Installation - 5	220.00	220.00
Fiber Pullbox Installation - 100	220.00	220.00
Fiber Pullbox Installation - 200	220.00	220.00
Fiber Pullbox Installation - 650	220.00	220.00
Fiber Pullbox Installation - 850	220.00	220.00
Fiber Pullbox Installation - 2550	220.00	220.00
Fiber Pullbox Installation - 5000	220.00	220.00
Fiber Pullbox Installation - 10000	220.00	220.00

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Distribution Input	Current Scenario Value	Default Scenario Value	Feeder Input	Current Scenario Value	Default Scenario Value
Distribution Riser Cable Investment per foot 10	1.19	1.19			
Distribution Riser Cable Investment per foot 11	0.76	0.76			
Distribution Riser Cable Investment per foot 12	0.63	0.63			
Distance Multiplier for difficult terrain	1.20	1.20			
Rock Depth Threshold, inches	24.00	24.00			
Hard Rock Placement Multiplier	3.50	3.50			
Soft Rock Placement Multiplier	2.00	2.00			
Difficult Surface Multiplier	1.00	1.00			
Sidewalk/Street Fraction	0.20	0.20			
Local RT - Maximum Total Distance	18,000	18,000			
Town Factor	0.85	0.85			
Maximum Lot Size, acres	3.00	3.00			
Town Lot Size, acres	3.00	3.00			
SAI Cable Size 1	2,400	2,400			
SAI Cable Size 2	1,800	1,800			
SAI Cable Size 3	1,200	1,200			
SAI Cable Size 4	900	900			
SAI Cable Size 5	600	600			
SAI Cable Size 6	400	400			
SAI Cable Size 7	200	200			
SAI Cable Size 8	100	100			
SAI Cable Size 9	50	50			
SAI Cable Size 10	25	25			
SAI Cable Size 11	12	12			
SAI Cable Size 12	6	6			
SAI Indoor Investment 1	1,052.00	1,052.00			
SAI Indoor Investment 2	864.00	864.00			
SAI Indoor Investment 3	576.00	576.00			
SAI Indoor Investment 4	432.00	432.00			
SAI Indoor Investment 5	288.00	288.00			
SAI Indoor Investment 6	192.00	192.00			
SAI Indoor Investment 7	96.00	96.00			
SAI Indoor Investment 8	48.00	48.00			
SAI Indoor Investment 9	48.00	48.00			
SAI Indoor Investment 10	48.00	48.00			
SAI Indoor Investment 11	48.00	48.00			
SAI Indoor Investment 12	48.00	48.00			
SAI Outdoor Investment 1	4,469.00	4,469.00			
SAI Outdoor Investment 2	3,569.00	3,569.00			
SAI Outdoor Investment 3	2,610.00	2,610.00			
SAI Outdoor Investment 4	2,028.00	2,028.00			
SAI Outdoor Investment 5	1,500.00	1,500.00			
SAI Outdoor Investment 6	1,071.00	1,071.00			
SAI Outdoor Investment 7	902.00	902.00			
SAI Outdoor Investment 8	642.00	642.00			
SAI Outdoor Investment 9	300.00	300.00			
SAI Outdoor Investment 10	250.00	250.00			
SAI Outdoor Investment 11	250.00	250.00			
SAI Outdoor Investment 12	250.00	250.00			

Switching Input	Current Scenario Value	Default Scenario Value
Constant EO Switching Investment Term, small ICO	416.11	416.11
Constant EO Switching Investment Term, BOC and large ICO	242.73	242.73
Switch Capacity Real-Time (BHCA) - 1	10,000	10,000
Switch Capacity Real-Time (BHCA) - 2	50,000	50,000
Switch Capacity Real-Time (BHCA) - 3	200,000	200,000
Switch Capacity Real-Time (BHCA) - 4	600,000	600,000
Switch Capacity Traffic (BHCCS) - 1	30,000	30,000
Switch Capacity Traffic (BHCCS) - 2	150,000	150,000
Switch Capacity Traffic (BHCCS) - 3	600,000	600,000
Switch Capacity Traffic (BHCCS) - 4	1,800,000	1,800,000
Initial Switch Maximum Equipped Line Size	80,000	80,000
Switch Port Administrative Fill	0.98	0.98
Switch Maximim Processor Occupancy	0.90	0.90
Processor Feature Loading Multiplier - normal	1.20	1.20
Processor Feature Loading Multiplier - heavy business	2.00	2.00
Processor Feature Loading Multiplier - business penetration threshold	0.30	0.30
MDF/Protector Investment per line	17.50	17.50
Analog Line Circuit Offset for DLC lines, per line	5.00	5.00
Switch Installation Multiplier	1.10	1.10
Operator Traffic Fraction	0.02	0.02
Total Interoffice Traffic Fraction	0.65	0.65
Maximum Trunk Occupancy, CCS	27.50	27.50
Trunk Port, per end	100.00	100.00
Entrance Facility Distance, miles	0.50	0.50
Direct-routed Fraction of Local Interoffice	0.98	0.98
POPs per Tandem Location	5.00	5.00
Tandem-routed Fraction of Total IntraLATA Traffic	0.20	0.20
Tandem-routed Fraction of Total InterLATA Traffic	0.20	0.20
Local Call Attempts	9,394,922	9,394,922
Call Completion Factor	0.70	0.70
IntraLATA Calls Completed	177,143	177,143
InterLATA Intrastate Calls Completed	166,009	166,009
InterLATA Interstate Calls Completed	739,823	739,823
Local DEMs, thousands	37,570,456	37,570,456
Intrastate DEMs, thousands	3,468,219	3,468,219
Interstate DEMs, thousands	7,107,428	7,107,428
Local Business/Residence DEMs	1.10	1.10
Intrastate Business/Residence DEMs	2.00	2.00
Interstate Business/Residence DEMs	3.00	3.00
BH Fraction of Daily Usage	0.10	0.10
Annual to Daily Usage Reduction Factor	270.00	270.00
Residential Holding Time Multiplier	1.00	1.00
Business Holding Time Multiplier	1.00	1.00
Residential Call Attempts per BH	1.30	1.30
Business Call Attempts per BH	3.50	3.50
ICO STP Investment, per line (equipment)	5.50	5.50
ICO Local Tandem Investment, per line	1.90	1.90
ICO OS Tandem Investment, per line	0.80	0.80
ICO SCP Investment per line (equipment)	2.50	2.50
ICO SCP - STP per line (wirecenter)	0.40	0.40
ICO Local Tandem Investment, per line (wirecenter)	2.50	2.50
ICO OS Tandem Investment, per line (wirecenter)	1.00	1.00

Expense Input	Current Scenario Value	Default Scenario Value
Cost of Debt	0.077	0.077
Debt Fraction	0.450	0.450
Cost of Equity	0.119	0.119
Average Trunk Utilization	0.300	0.300
Tax Rate	0.393	0.393
Corporate Overhead Factor	0.104	0.104
Other Taxes Factor	0.050	0.050
Billing/Bill Inquiry per line per month	1.220	1.220
Directory Listing per line per month	0.150	0.150
Forward-looking Network Operations Factor	0.500	0.500
Alternative CO Switching Factor	0.027	0.027
Alternative Circuit Equipment Factor	0.015	0.015
EO Traffic Sensitive Fraction	0.700	0.700
Monthly LNP cost, per line	0.250	0.250
Carrier to Carrier Customer Service, per line per ye	1.69	1.69
NID Expense per line per year	1.00	1.00
DS-0/DS-1 Terminal Factor	12.4	12.4
DS-1/DS-3 Terminal Factor	9.9	9.9
Average Lines per Business Location	4	4
Distribution Aerial Fraction - 0	0.50	0.50
Distribution Aerial Fraction - 5	0.33	0.33
Distribution Aerial Fraction - 100	0.25	0.25
Distribution Aerial Fraction - 200	0.25	0.25
Distribution Aerial Fraction - 650	0.25	0.25
Distribution Aerial Fraction - 850	0.25	0.25
Distribution Aerial Fraction - 2550	0.25	0.25
Distribution Aerial Fraction - 5000	0.25	0.25
Distribution Aerial Fraction - 10000	0.25	0.25
Distribution Buried Fraction - 0	0.33	0.33
Distribution Buried Fraction - 5	0.33	0.33
Distribution Buried Fraction - 100	0.33	0.33
Distribution Buried Fraction - 200	0.33	0.33
Distribution Buried Fraction - 650	0.33	0.33
Distribution Buried Fraction - 850	0.33	0.33
Distribution Buried Fraction - 2550	0.33	0.33
Distribution Buried Fraction - 5000	0.33	0.33
Distribution Buried Fraction - 10000	0.33	0.33
Distribution Underground Fraction - 0	1.00	1.00
Distribution Underground Fraction - 5	0.50	0.50
Distribution Underground Fraction - 100	0.50	0.50
Distribution Underground Fraction - 200	0.50	0.50
Distribution Underground Fraction - 650	0.40	0.40
Distribution Underground Fraction - 850	0.33	0.33
Distribution Underground Fraction - 2550	0.33	0.33
Distribution Underground Fraction - 5000	0.33	0.33
Distribution Underground Fraction - 10000	0.33	0.33
Feeder Aerial Fraction - 0	0.50	0.50
Feeder Aerial Fraction - 5	0.33	0.33
Feeder Aerial Fraction - 100	0.25	0.25
Feeder Aerial Fraction - 200	0.25	0.25
Feeder Aerial Fraction - 650	0.25	0.25
Feeder Aerial Fraction - 850	0.25	0.25

Switching Input	Current Scenario Value	Default Scenario Value
ICO Tandem A Links and C Links per line (wirecenter)	0.30	0.30
Real-time Limit, BHCA	750,000	750,000
Port Limit, trunks	100,000	100,000
Common Equipment Investment	1,000,000	1,000,000
Maximum Port Fill	0.90	0.90
Maximum Real-time Occupancy	0.90	0.90
Common Equipment Intercept Factor	0.50	0.50
STP Link Capacity	720	720
STP Maximum Link Fill	0.80	0.80
Maximum STP Investment, per pair	5,000,000	5,000,000
Minimum STP Investment, per pair	1,000,000	1,000,000
Link Termination, both ends	900	900
Signaling Link Bit Rate	56,000	56,000
Link Occupancy	0.40	0.40
C Link Cross Section	24.00	24.00
ISUP Messages per Interoffice BHCA	6.00	6.00
ISUP Message Length, bytes	25.00	25.00
TCAP Messages per transaction	2.00	2.00
TCAP Message length, bytes	100.00	100.00
Fraction of BHCA requiring TCAP	0.10	0.10
SCP Investment/Transaction/Second	20,000	20,000
Operator investment per position	6,400	6,400
Operator Maximum Utilization, per position, CCS	32	32
Operator Intervention Factor	10	10
Public Telephone Investment, per station	760	760
Lot Size, Multiplier of Switch Room Size	2	2
Tandem/EO Wire Center Common Factor	0.40	0.40
Power 1	5,000	5,000
Power 2	10,000	10,000
Power 3	20,000	20,000
Power 4	50,000	50,000
Power 5	250,000	250,000
Switch Room Size, sq ft 1	500	500
Switch Room Size, sq ft 2	1,000	1,000
Switch Room Size, sq ft 3	2,000	2,000
Switch Room Size, sq ft 4	5,000	5,000
Switch Room Size, sq ft 5	10,000	10,000
Construction, sq ft 1	75.00	75.00
Construction, sq ft 2	85.00	85.00
Construction, sq ft 3	100.00	100.00
Construction, sq ft 4	125.00	125.00
Construction, sq ft 5	150.00	150.00
Land, sq ft 1	5	5
Land, sq ft 2	8	8
Land, sq ft 3	10	10
Land, sq ft 4	15	15
Land, sq ft 5	20	20
OC-48 ADM, installed, 48 DS-3s	50,000	50,000
OC-48 ADM, installed, 12 DS-3s	40,000	40,000
OC-3/DS-1 Terminal Multiplexer, installed, 84 DS-1s	26,000	26,000
Investment per 7 DS-1s	500	500
Number of Fibers	24	24

Expense Input	Current Scenario Value	Default Scenario Value
Feeder Aerial Fraction - 2550	0.25	0.25
Feeder Aerial Fraction - 5000	0.25	0.25
Feeder Aerial Fraction - 10000	0.25	0.25
Feeder Underground Fraction - 0	0.50	0.50
Feeder Underground Fraction - 5	0.50	0.50
Feeder Underground Fraction - 100	0.40	0.40
Feeder Underground Fraction - 200	0.33	0.33
Feeder Underground Fraction - 650	0.33	0.33
Feeder Underground Fraction - 850	0.33	0.33
Feeder Underground Fraction - 2550	0.33	0.33
Feeder Underground Fraction - 5000	0.33	0.33
Feeder Underground Fraction - 10000	0.33	0.33
Feeder Buried Fraction - 0	0.40	0.40
Feeder Buried Fraction - 5	0.40	0.40
Feeder Buried Fraction - 100	0.40	0.40
Feeder Buried Fraction - 200	0.40	0.40
Feeder Buried Fraction - 650	0.40	0.40
Feeder Buried Fraction - 850	0.40	0.40
Feeder Buried Fraction - 2550	0.40	0.40
Feeder Buried Fraction - 5000	0.40	0.40
Feeder Buried Fraction - 10000	0.40	0.40
Motor Vehicles	9.16	9.16
Garage Work Equipment	11.47	11.47
Other Work Equipment	13.22	13.22
Buildings	48.99	48.99
Furniture	16.56	16.56
Office Support Equipment	11.25	11.25
Company Comm. Equipment	7.59	7.59
General Purpose Computer	6.24	6.24
Digital Electronic Switching	16.54	16.54
Operator Systems	9.94	9.94
Digital Circuit Equipment	10.09	10.09
Public Telephone Terminal Equipment	8.01	8.01
Poles	16.13	16.13
Aerial Cable - metallic	16.80	16.80
Aerial Cable - non metallic	22.11	22.11
Underground Cable - metallic	21.17	21.17
Underground Cable - non metallic	22.87	22.87
Buried - metallic	19.86	19.86
Buried - non metallic	24.13	24.13
Intrabuilding Cable - metallic	15.64	15.64
Intrabuilding Cable - non metallic	23.65	23.65
Conduit Systems	51.35	51.35

Switching Input	Current Scenario Value	Default Scenario Value	Expense Input	Current Scenario Value	Default Scenario Value
Pigtralls, per strand	60	60			
Optical Distribution Panel	1,000	1,000			
EF&I, per hour	55	55			
EF&I hours	32	32			
Regional Labor Factor	1	1			
Channel Bank Investment, per 24 lines	5,000	5,000			
Fraction of SA Lines Requiring Multiplexing	0.50	0.50			
Regenerator, installed	15,000	15,000			
Regenerator spacing, miles	40	40			
DCS installed, per DS-3	30,000	30,000			
Transmission Terminal Fill (DS-0 level)	0.90	0.90			
Fiber Investment, fiber cable	3.50	3.50			
Fiber Investment, number of strands per ADM	4.00	4.00			
Fiber Investment, buried fraction	0.60	0.60			
Fiber Investment, buried placement	1.77	1.77			
Fiber Investment, buried sheath addition	0.20	0.20			
Fiber Investment, conduit	0.60	0.60			
Fiber Investment, spare tubes per route	1.00	1.00			
Fiber Investment, conduit placement	16.40	16.40			
Fiber Investment, pullbox spacing	2,000.00	2,000.00			
Fiber Investment, pullbox investsment	500.00	500.00			
Fiber Investment, aerial fraction	0.20	0.20			
Fiber Investment, pole spacing, feet	150.00	150.00			
Fiber Investment, pole material	201.00	201.00			
Fiber Investment, pole labor (basic)	216.00	216.00			
Fraction Poles and Buried/Underground Placement Common with Fee	0.75	0.75			
Fraction of Aerial Structure Assigned to Telephone	0.33	0.33			
Fraction of Buried Structure Assigned to Telephone	0.33	0.33			
Fraction of Underground Structure Assigned to Telephone	0.33	0.33			

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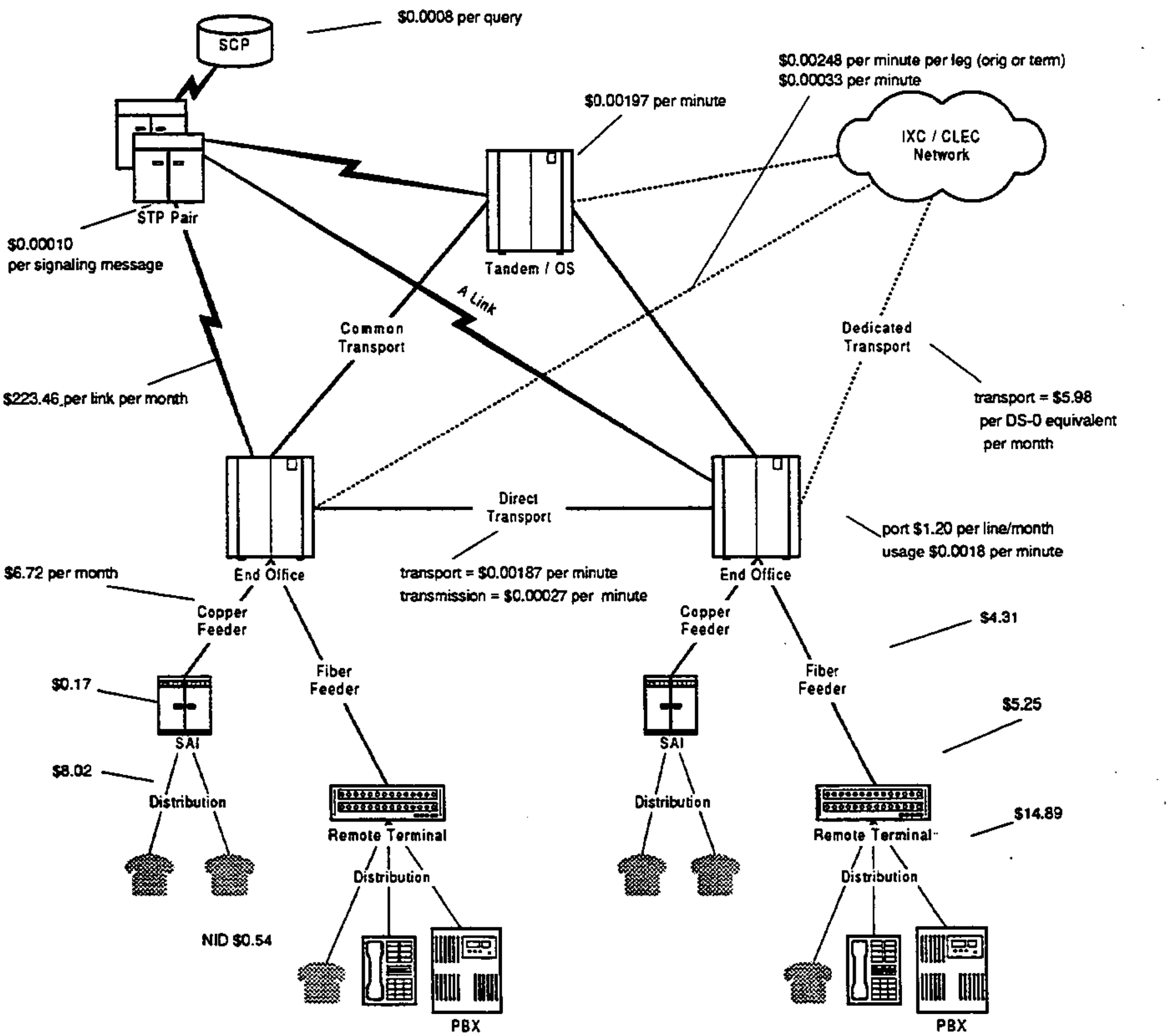

Staff's Modifications
to Hatfield Model 3.1 Inputs

In evaluating the Hatfield Model, Staff modified many of the adjustable inputs to reflect the modifications Staff proposed for SWBT. Staff also adjusted several input values to more closely reflect the characteristics of SWBT. Each of the modifications is summarized below.

Distribution Module

Fill Factors - Modified to reflect the fill factors Staff proposed for use SWBT's Cost Studies.

Distribution to Code -Modified to reflect the fill factors Staff proposed for use SWBT's Cost Studies.

Pole Investment - Modified to reflect the costs reported in SWBT's 1996 Broadgauge Report.

Pole Labor - Modified to reflect the costs reported in SWBT's 1996 Broadgauge Report.

Feeder Module

Fill Factors - Modified to reflect the fill factors Staff proposed for use SWBT's Cost Studies.

Distribution to Code -Modified to reflect the fill factors Staff proposed for use SWBT's Cost Studies.

Pole Investment - Modified to reflect the costs reported in SWBT's 1996 Broadgauge Report.

Pole Labor - Modified to reflect the costs reported in SWBT's 1996 Broadgauge Report.

Switching Module

Switch Cost per Port - HM does not have an easily adjustable modification for this input. Staff wanted to make this adjustment but it would have required a structural modification to the model.

Traffic Parameters - Modified to reflect Staff's proposed forward-looking usage adjustments. This included adjustment to Local Call Attempts, IntraLATA Calls Completed InterLATA intrastate Calls Completed, InterLATA interstate Call Completed, Local DEMs, Intrastate DEMs, and Interstate DEMs.

Maximum Real-time Occupancy - Modified to reflect SWBT's stated maximum capacity.

Fraction of Aerial Structure Assigned to Telephone - Modified to reflect Staff's proposed forward-looking pole sharing.

Fraction of Buried Structure Assigned to Telephone - Modified to reflect Staff's proposed buried structure sharing.

Fraction of Underground Structure Assigned to Telephone - Modified to reflect Staff's proposed forward-looking conduit sharing.

Expense Module

Cost of Debt - Modified to reflect Staff's proposed cost of debt.

Debt Fraction - Modified to reflect Staff's proposed capital structure.

Cost of Equity - Modified to reflect Staff's proposed cost of equity.

Tax Rate - Modified to Staff's proposed income tax rate.

Corporate Overhead Factor - Modified to reflect Staff's Proposed Common Cost Allocator.

Other Taxes Factor - Modified to reflect the Ad Valorem/Miscellaneous Tax factor contained in SWBT's ACES Model. This factor is based upon the taxes actually paid by SWBT.

Structure Fraction Assigned to Telephone - Modified to reflect the Staff's forward-looking sharing percentages. This included modifications to the Distribution Buried Fraction, Distribution Aerial Fraction, Distribution Underground Fraction, Feeder Buried Fraction, Feeder Aerial Fraction, Feeder Underground Fraction.

Depreciation Rates - Modified to reflect Staff's proposed economic depreciation rates and net salvage lives.

COST OF NETWORK ELEMENTS - Staff's Inputs

Missouri
Southwestern Bell

Loop elements	0-5 lines/sq mi	5-100 lines/sq mi	100-200 lines/sq mi	200-650 lines/sq mi	650-850 lines/sq mi	850-2550 lines/sq mi	2550-5000 lines/sq mi	5000-10000 lines/sq mi	>10000 lines/sq mi	Totals
NID										
Annual Cost	$ 152,817	$ 1,428,810	$ 634,318	$ 1,855,193	$ 538,529	$ 5,567,009	$ 4,475,677	$ 2,279,965	$ 1,390,242	$ 18,320,361
Unit Cost/month	0.61	0.59	0.64	0.66	0.57	0.58	0.57	0.50	0.41	$ 0.54
Loop Distribution (DLC)										
Annual Cost	$ 15,230,932	$ 65,700,037	$ 15,598,832	$ 26,589,482	$ 4,148,260	$ 31,807,992	$ 9,185,541	$ 8,293,159	$ 4,094,841	$ 180,647,076
Unit Cost/month	61.20	29.69	20.57	14.29	10.31	9.31	7.11	6.67	5.90	$ 14.89
Loop Distribution (non-DLC)										
Annual Cost	$ -	$ 4,229,594	$ 7,386,199	$ 18,552,542	$ 5,689,953	$ 53,154,325	$ 45,123,003	$ 23,592,239	$ 14,513,189	$ 172,241,045
Unit Cost/month	-	20.18	17.84	12.76	10.33	8.56	6.81	7.11	5.36	$ 8.02
Loop Distribution (all)										
Annual Cost	$ 15,230,932	$ 69,929,631	$ 22,985,032	$ 45,142,024	$ 9,838,213	$ 84,962,317	$ 54,308,545	$ 31,885,397	$ 18,608,030	$ 352,888,121
Unit Cost/month	61.20	28.87	19.61	13.61	10.32	8.82	6.86	6.99	5.47	$ 10.50
Loop Concentration (DLC)										
Annual Cost	$ 1,993,029	$ 12,675,206	$ 3,775,183	$ 9,834,475	$ 2,079,484	$ 17,243,029	$ 6,804,667	$ 5,912,308	$ 3,367,465	$ 63,684,845
Unit Cost/month	8.01	5.73	4.98	5.28	5.17	5.05	5.27	4.75	4.85	$ 5.25
Loop Concentration (non-DLC)										
Annual Cost	$ -	$ 46,471	$ 79,258	$ 266,856	$ 99,450	$ 1,144,378	$ 1,235,375	$ 572,624	$ 265,162	$ 3,709,573
Unit Cost/month	-	0.22	0.19	0.18	0.18	0.18	0.19	0.17	0.10	$ 0.17
Loop Concentration (all)										
Annual Cost	$ 1,993,029	$ 12,721,677	$ 3,854,441	$ 10,101,331	$ 2,178,933	$ 18,387,407	$ 8,040,041	$ 6,484,932	$ 3,632,627	$ 67,394,418
Unit Cost/month	8.01	5.25	3.29	3.05	2.29	1.91	1.02	1.42	1.07	$ 2.00
Loop Feeder (DLC)										
Annual Cost	$ 4,811,981	$ 15,517,421	$ 2,607,824	$ 5,402,190	$ 1,421,137	$ 10,830,436	$ 5,266,773	$ 4,394,429	$ 2,008,782	$ 52,260,953
Unit Cost/month	19.34	7.01	3.44	2.90	3.53	3.17	4.08	3.53	2.89	$ 4.31
Loop Feeder (non-DLC)										
Annual Cost	$ -	$ 1,062,147	$ 2,296,165	$ 8,819,812	$ 3,573,370	$ 41,605,002	$ 47,700,194	$ 24,659,205	$ 14,680,576	$ 144,396,470
Unit Cost/month	-	5.07	5.55	6.06	6.49	6.70	7.20	7.43	5.42	$ 6.72
Loop Feeder (all)										
Annual Cost	$ 4,811,981	$ 16,579,568	$ 4,903,989	$ 14,222,002	$ 4,994,507	$ 52,435,438	$ 52,966,967	$ 29,053,635	$ 16,689,358	$ 196,657,423
Unit Cost/month	$ 19.34	$ 6.84	$ 4.18	$ 4.29	$ 5.24	$ 5.45	$ 6.69	$ 6.37	$ 4.91	$ 5.85
Total Loop (DLC)										
Annual Cost	$ 22,188,539	$ 95,195,987	$ 22,392,177	$ 42,867,162	$ 7,874,153	$ 61,857,278	$ 21,987,523	$ 19,221,483	$ 9,764,913	$ 303,339,215
Unit Cost/month	89.16	43.02	29.53	23.03	19.58	18.10	17.02	15.46	14.05	$ 25.01
Total Loop (non-DLC)										
Annual Cost	$ -	$ 5,461,699	$ 9,985,602	$ 28,453,387	$ 9,674,030	$ 99,494,893	$ 97,803,707	$ 50,482,446	$ 30,565,344	$ 331,921,108
Unit Cost/month	-	26.05	24.12	19.55	17.57	16.02	14.77	15.22	11.29	$ 15.45
Total Loop (all)										
Annual Cost	$ 22,188,539	$ 100,657,887	$ 32,377,780	$ 71,320,550	$ 17,548,183	$ 161,352,170	$ 119,791,230	$ 69,703,929	$ 40,320,257	$ 635,260,323
Unit Cost/month	$ 89.16	41.55	27.82	21.50	18.42	16.76	16.13	15.28	11.85	$ 18.90

Total lines	20,739	201,857	97,695	276,396	79,391	802,395	659,591	380,122	283,450	2,801,835
Total lines served by DLC	20,739	184,387	63,199	155,095	33,505	284,783	107,662	103,633	57,868	1,010,869

		Annual Cost	Units			Unit Cost	
End office switching	$	108,069,583					
Port		32,420,875	2,252,650	switched lines	$	1.20	per line/month
Usage		75,648,708	42,962,410,264	minutes	$	0.00176	per minute
Signaling network elements	$	8,021,335					
Links		1,891,318	705	links	$	223.46	per link per month
STP		4,202,578	43,580,269,228	TCAP+ISUP msgs	$	0.00010	per signaling message
SCP		1,927,440	2,284,409,000	TCAP queries	$	0.00084	per query
Transport network elements							
Dedicated							
Sw+Sp Transport	$	44,295,478	616,948	trunks	$	5.98	per DS-0 equivalent per month
Switched		4,872,350	67,862	trunks	$	0.00071	per minute
Special		39,423,128	549,086	trunks			
Transmission Terminal		33,451,369	616,948	trunks	$	4.52	per DS-0 equivalent per month
					$	0.00054	per minute
					$	0.00125	total per minute
Common							
Transport	$	4,967,312	2,529,083,731	minutes	$	0.00248	per minute per leg (orig or term)
Transmission Terminal		652,903	2,529,083,731	minutes	$	0.00033	per minute
					$	0.00280	total per minute
Direct							
Transport	$	21,906,249	11,744,862,919	minutes	$	0.00187	per minute
Transmission Terminal		3,208,104	11,744,862,919	minutes	$	0.00027	per minute
					$	0.00214	total per minute
Tandem switch	$	4,201,491	2,135,527,361	minutes	$	0.00197	per minute
Operator systems	$	13,816,896					
Public Telephones	$	12,688,031					
Total (w/ Public)	$	890,539,073					
Total cost of switched network elements (w/o Public)	$	25.31	per line/month				

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	Interconnected at end office		Interconnected at tandem		wtd average
Local interconnection					
EO switching	$	0.00176	$	0.00176	
ISUP	$	0.00015	$	0.00015	
Common Transport	$	-	$	0.00280	
Tandem Switching	$	-	$	0.00197	
TOTAL	$	0.00191	$	0.00668	n/a
IXC switched access					
EO switching	$	0.00176	$	0.00176	
ISUP	$	0.00015	$	0.00015	
Dedicated Transport	$	0.00125	$	0.00125	
Common Transport	$	-	$	0.00280	
Tandem Switching	$	-	$	0.00197	
TOTAL	$	0.00316	$	0.00793	$ 0.00411

Signaling detail		
cost per 800 call attempt (TCAP)	$	0.0019
ISUP cost/transaction	$	0.00085
ISUP cost/completion		0.0012
IXC switched access MOU/comp		8.11
ISUP cost/min	$	0.000150
D link per month	$	306.39
Dedicated Transport Costs Per Trunk		
DS-0 per month		
Transport per month	$	5.98
Terminal per month *	$	56.03
TOTAL	$	62.01
DS-1 per month		
Transport per month	$	143.60
Terminal per month	$	108.44
TOTAL	$	252.04
DS-3 per month		
Transport per month	$	4,020.67
Terminal per month	$	306.70
TOTAL	$	4,327.38
Trunk Port Costs		
per trunk port (DS-0 equivalent)	$	3.85
per trunk port minute	$	0.000001
total EO usage per minute	$	0.001761
trk port/min	$	0.000001
other	$	0.001760

	0-5 lines/sq mi	5-100 lines/sq mi	100-200 lines/sq mi	200-650 lines/sq mi	650-850 lines/sq mi	850-2550 lines/sq mi	2550-5000 lines/sq mi	5000-10000 lines/sq mi	>10000 lines/sq mi	weighted average
calculated copper feeder fill (non-DLC)	0.0%	69.3%	73.3%	74.9%	71.3%	74.0%	75.6%	77.2%	78.9%	75.5%
calculated distribution fill (DLC)	43.1%	40.2%	42.9%	40.5%	40.3%	40.5%	40.5%	40.9%	39.2%	40.6%
calculated distribution fill (non-DLC)	0.0%	39.0%	41.2%	40.7%	41.0%	40.3%	41.0%	40.8%	41.1%	40.8%
										40.7%
calculated "mainframe fill" (non-DLC)	0.0%	55.1%	46.5%	32.4%	19.8%	13.5%	8.7%	9.0%	13.1%	13.8%

Distribution Input	Current Scenario Value	Default Scenario Value	Feeder Input	Current Scenario Value	Default Scenario Value
Distribution Cable Fill - 0	0.57	0.50	Copper Feeder Fill - 0	0.90	0.65
Distribution Cable Fill - 5	0.57	0.55	Copper Feeder Fill - 5	0.80	0.75
Distribution Cable Fill - 100	0.57	0.55	Copper Feeder Fill - 100	0.91	0.80
Distribution Cable Fill - 200	0.57	0.60	Copper Feeder Fill - 200	0.91	0.80
Distribution Cable Fill - 650	0.56	0.65	Copper Feeder Fill - 650	0.81	0.80
Distribution Cable Fill - 850	0.57	0.70	Copper Feeder Fill - 850	0.81	0.80
Distribution Cable Fill - 2550	0.57	0.75	Copper Feeder Fill - 2550	0.81	0.80
Distribution Cable Fill - 5000	0.57	0.75	Copper Feeder Fill - 5000	0.81	0.80
Distribution Cable Fill - 10000	0.54	0.75	Copper Feeder Fill - 10000	0.81	0.80
Buried Fraction - 0	0.85	0.75	Fiber Feeder Strand Fill - 0	1.00	1.00
Buried Fraction - 5	0.85	0.75	Fiber Feeder Strand Fill - 5	1.00	1.00
Buried Fraction - 100	0.72	0.75	Fiber Feeder Strand Fill - 100	1.00	1.00
Buried Fraction - 200	0.78	0.70	Fiber Feeder Strand Fill - 200	1.00	1.00
Buried Fraction - 650	0.78	0.70	Fiber Feeder Strand Fill - 650	1.00	1.00
Buried Fraction - 850	0.78	0.70	Fiber Feeder Strand Fill - 850	1.00	1.00
Buried Fraction - 2550	0.78	0.65	Fiber Feeder Strand Fill - 2550	1.00	1.00
Buried Fraction - 5000	0.78	0.35	Fiber Feeder Strand Fill - 5000	1.00	1.00
Buried Fraction - 10000	0.78	0.05	Fiber Feeder Strand Fill - 10000	1.00	1.00
Aerial Cable Fraction - 0	0.15	0.25	Copper Aerial Fraction - 0	0.02	0.50
Aerial Cable Fraction - 5	0.15	0.25	Copper Aerial Fraction - 5	0.02	0.50
Aerial Cable Fraction - 100	0.20	0.25	Copper Aerial Fraction - 100	0.02	0.50
Aerial Cable Fraction - 200	0.05	0.30	Copper Aerial Fraction - 200	0.02	0.40
Aerial Cable Fraction - 650	0.05	0.30	Copper Aerial Fraction - 650	0.02	0.30
Aerial Cable Fraction - 850	0.05	0.30	Copper Aerial Fraction - 850	0.02	0.20
Aerial Cable Fraction - 2550	0.05	0.30	Copper Aerial Fraction - 2550	0.02	0.15
Aerial Cable Fraction - 5000	0.05	0.60	Copper Aerial Fraction - 5000	0.02	0.10
Aerial Cable Fraction - 10000	0.05	0.85	Copper Aerial Fraction - 10000	0.02	0.05
Conduit Placement per foot - 0	10.29	10.29	Copper Buried Fraction - 0	0.81	0.45
Conduit Placement per foot - 5	10.29	10.29	Copper Buried Fraction - 5	0.81	0.45
Conduit Placement per foot - 100	10.29	10.29	Copper Buried Fraction - 100	0.55	0.45
Conduit Placement per foot - 200	11.35	11.35	Copper Buried Fraction - 200	0.14	0.40
Conduit Placement per foot - 650	11.88	11.88	Copper Buried Fraction - 650	0.14	0.30
Conduit Placement per foot - 850	16.40	16.40	Copper Buried Fraction - 850	0.14	0.20
Conduit Placement per foot - 2550	21.60	21.60	Copper Buried Fraction - 2550	0.14	0.10
Conduit Placement per foot - 5000	50.10	50.10	Copper Buried Fraction - 5000	0.14	0.05
Conduit Placement per foot - 10000	75.00	75.00	Copper Buried Fraction - 10000	0.14	0.05
Buried Placement per foot - 0	1.77	1.77	Copper Manhole Spacing, feet - 0	800	800
Buried Placement per foot - 5	1.77	1.77	Copper Manhole Spacing, feet - 5	800	800
Buried Placement per foot - 100	1.77	1.77	Copper Manhole Spacing, feet - 100	800	800
Buried Placement per foot - 200	1.93	1.93	Copper Manhole Spacing, feet - 200	800	800
Buried Placement per foot - 650	2.17	2.17	Copper Manhole Spacing, feet - 650	600	600
Buried Placement per foot - 850	3.54	3.54	Copper Manhole Spacing, feet - 850	600	600
Buried Placement per foot - 2550	4.27	4.27	Copper Manhole Spacing, feet - 2550	600	600
Buried Placement per foot - 5000	13.00	13.00	Copper Manhole Spacing, feet - 5000	400	400
Buried Placement per foot - 10000	45.00	45.00	Copper Manhole Spacing, feet - 10000	400	400
Pole Spacing, feet - 0	250	250	Copper Buried Installation per foot - 0	1.77	1.77
Pole Spacing, feet - 5	250	250	Copper Buried Installation per foot - 5	1.77	1.77
Pole Spacing, feet - 100	200	200	Copper Buried Installation per foot - 100	1.77	1.77
Pole Spacing, feet - 200	200	200	Copper Buried Installation per foot - 200	1.93	1.93
Pole Spacing, feet - 650	175	175	Copper Buried Installation per foot - 650	2.17	2.17
Pole Spacing, feet - 850	175	175	Copper Buried Installation per foot - 850	3.54	3.54

Distribution Input	Current Scenario Value	Default Scenario Value
Pole Spacing, feet - 2550	150	150
Pole Spacing, feet - 5000	150	150
Pole Spacing, feet - 10000	150	150
Drop Distance, feet - 0	150	150
Drop Distance, feet - 5	150	150
Drop Distance, feet - 100	100	100
Drop Distance, feet - 200	100	100
Drop Distance, feet - 650	50	50
Drop Distance, feet - 850	50	50
Drop Distance, feet - 2550	50	50
Drop Distance, feet - 5000	50	50
Drop Distance, feet - 10000	50	50
Aerial Drop Placement (total) - 0	58.33	58.33
Aerial Drop Placement (total) - 5	58.33	58.33
Aerial Drop Placement (total) - 100	46.67	46.67
Aerial Drop Placement (total) - 200	35.00	35.00
Aerial Drop Placement (total) - 650	23.33	23.33
Aerial Drop Placement (total) - 850	11.67	11.67
Aerial Drop Placement (total) - 2550	11.67	11.67
Aerial Drop Placement (total) - 5000	11.67	11.67
Aerial Drop Placement (total) - 10000	11.67	11.67
Buried Drop Placement (total) - 0	0.75	0.75
Buried Drop Placement (total) - 5	0.75	0.75
Buried Drop Placement (total) - 100	0.75	0.75
Buried Drop Placement (total) - 200	0.75	0.75
Buried Drop Placement (total) - 650	0.75	0.75
Buried Drop Placement (total) - 850	0.75	0.75
Buried Drop Placement (total) - 2550	1.13	1.13
Buried Drop Placement (total) - 5000	1.50	1.50
Buried Drop Placement (total) - 10000	5.00	5.00
Buried Drop Placement Fraction - 0	1.00	1.00
Buried Drop Placement Fraction - 5	1.00	1.00
Buried Drop Placement Fraction - 100	1.00	1.00
Buried Drop Placement Fraction - 200	1.00	1.00
Buried Drop Placement Fraction - 650	1.00	1.00
Buried Drop Placement Fraction - 850	1.00	1.00
Buried Drop Placement Fraction - 2550	1.00	1.00
Buried Drop Placement Fraction - 5000	1.00	1.00
Buried Drop Placement Fraction - 10000	1.00	1.00
Buried Drop Fraction - 0	0.75	0.75
Buried Drop Fraction - 5	0.75	0.75
Buried Drop Fraction - 100	0.75	0.75
Buried Drop Fraction - 200	0.70	0.70
Buried Drop Fraction - 650	0.70	0.70
Buried Drop Fraction - 850	0.70	0.70
Buried Drop Fraction - 2550	0.70	0.70
Buried Drop Fraction - 5000	0.40	0.40
Buried Drop Fraction - 10000	0.15	0.15
Pole Investment	" "	201.00
Pole Labor	" "	216.00
Buried Cable Jacketing Multiplier	1.04	1.04
Conduit Investment per foot	0.60	0.60

Feeder Input	Current Scenario Value	Default Scenario Value
Copper Buried Installation per foot - 2550	4.27	4.27
Copper Buried Installation per foot - 5000	13.00	13.00
Copper Buried Installation per foot - 10000	45.00	45.00
Copper Conduit Installation per foot - 0	10.29	10.29
Copper Conduit Installation per foot - 5	10.29	10.29
Copper Conduit Installation per foot - 100	10.29	10.29
Copper Conduit Installation per foot - 200	11.35	11.35
Copper Conduit Installation per foot - 650	11.38	11.38
Copper Conduit Installation per foot - 850	16.40	16.40
Copper Conduit Installation per foot - 2550	21.60	21.60
Copper Conduit Installation per foot - 5000	50.10	50.10
Copper Conduit Installation per foot - 10000	75.00	75.00
Fiber Aerial Fraction - 0	-	0.35
Fiber Aerial Fraction - 5	-	0.35
Fiber Aerial Fraction - 100	-	0.35
Fiber Aerial Fraction - 200	-	0.30
Fiber Aerial Fraction - 650	-	0.30
Fiber Aerial Fraction - 850	-	0.20
Fiber Aerial Fraction - 2550	-	0.15
Fiber Aerial Fraction - 5000	-	0.10
Fiber Aerial Fraction - 10000	-	0.05
Fiber Buried Fraction - 0	0.80	0.60
Fiber Buried Fraction - 5	0.80	0.60
Fiber Buried Fraction - 100	0.55	0.60
Fiber Buried Fraction - 200	0.14	0.60
Fiber Buried Fraction - 650	0.14	0.30
Fiber Buried Fraction - 850	0.14	0.20
Fiber Buried Fraction - 2550	0.14	0.10
Fiber Buried Fraction - 5000	0.14	0.05
Fiber Buried Fraction - 10000	0.14	0.05
Fiber Manhole Spacing, feet - 0	2,000	2,000
Fiber Manhole Spacing, feet - 5	2,000	2,000
Fiber Manhole Spacing, feet - 100	2,000	2,000
Fiber Manhole Spacing, feet - 200	2,000	2,000
Fiber Manhole Spacing, feet - 650	2,000	2,000
Fiber Manhole Spacing, feet - 850	2,000	2,000
Fiber Manhole Spacing, feet - 2550	2,000	2,000
Fiber Manhole Spacing, feet - 5000	2,000	2,000
Fiber Manhole Spacing, feet - 10000	2,000	2,000
Fiber Buried Installation per foot - 0	1.77	1.77
Fiber Buried Installation per foot - 5	1.77	1.77
Fiber Buried Installation per foot - 100	1.77	1.77
Fiber Buried Installation per foot - 200	1.93	1.93
Fiber Buried Installation per foot - 650	2.17	2.17
Fiber Buried Installation per foot - 850	3.54	3.54
Fiber Buried Installation per foot - 2550	4.27	4.27
Fiber Buried Installation per foot - 5000	13.00	13.00
Fiber Buried Installation per foot - 10000	45.00	45.00
Fiber Conduit Installation per foot - 0	10.29	10.29
Fiber Conduit Installation per foot - 5	10.29	10.29
Fiber Conduit Installation per foot - 100	10.29	10.29
Fiber Conduit Installation per foot - 200	11.35	11.35

Hatfield Model Release 3.1
Staff Proposed Inputs

Distribution Input	Current Scenario Value	Default Scenario Value
Spare Tubes per route	1.00	1.00
Regional Labor Adjustment Factor	1.00	1.00
Residential NID case, no protector	10.00	10.00
Residential NID basic labor	15.00	15.00
Maximum lines per NID	6.00	6.00
Residential Protection Block, per pair	4.00	4.00
Business NID case, no protector	25.00	25.00
Business NID basic labor	15.00	15.00
Business Protection Block, per pair	4.00	4.00
Average Lines per business location	4.00	4.00
Terminal and Splice per line, buried	42.50	42.50
Terminal and Splice per line, aerial	32.00	32.00
Drop cable investment per foot buried	0.14	0.14
Drop cable buried pairs	3.00	3.00
Drop cable investment per foot aerial	0.10	0.10
Drop cable aerial pairs	2.00	2.00
TR-303 DLC Site and Power	3,000.00	3,000.00
TR-303 DLC Maximum Lines/Increment	672	672
TR-303 DLC RT Fill Factor	0.85	0.90
TR-303 DLC Basic Common Eqpt Invest + initial lines	66,000.00	66,000.00
TR-303 DLC POTS Channel Unit Investment	310.00	310.00
TR-303 DLC POTS Lines per CU	4.00	4.00
TR-303 DLC Coin Channel Unit Investment	250.00	250.00
TR-303 DLC Coin Lines per CU	2.00	2.00
TR-303 DLC 303/LD crossover, lines	384.00	384.00
TR-303 DLC Fibers per RT	4.00	4.00
TR-303 DLC Optical Patch Panel	1,000.00	1,000.00
TR-303 DLC Copper Feeder Max Distance, ft	15,000.00	9,000.00
TR-303 DLC Common Eqpt Invest per additional 672 lines	18,500.00	18,500.00
TR-303 DLC Maximum Number of additional line modules/RT	2.00	2.00
Low Density DLC Site and Power	2,500.00	2,500.00
Low Density DLC Maximum Lines/Increment	96.00	96.00
Low Density DLC RT Fill Factor	0.85	0.90
Low Density DLC Basic Common Eqpt Invest + initial lines	13,000.00	13,000.00
Low Density DLC POTS Channel Unit Investment	310.00	310.00
Low Density DLC POTS Lines per CU	4.00	4.00
Low Density DLC Coin Channel Unit Investment	250.00	250.00
Low Density DLC Coin Lines per CU	2.00	2.00
Low Density DLC Fibers per RT	4.00	4.00
Low Density DLC Optical Patch Panel	1,000.00	1,000.00
Low Density DLC Common Eqpt Invest per additional 96 lines	11,000.00	11,000.00
Low Density DLC Maximum Number of additional line modules/R	1.00	1.00
Long Loop Loading Adjustment per line 1	-	-
Long Loop Loading Adjustment per line 2	20.00	20.00
Long Loop Loading Adjustment per line 3	40.00	40.00
Long Loop Loading Adjustment per line 4	75.00	75.00
Long Loop Loading Adjustment per line 5	110.00	110.00
Long Loop Loading Adjustment per line 6	175.00	175.00
Long Loop Cable Investment Adjustment 1	1.00	1.00
Long Loop Cable Investment Adjustment 2	1.36	1.36
Long Loop Cable Investment Adjustment 3	2.55	2.55
Long Loop Cable Investment Adjustment 4	2.55	2.55

Feeder Input	Current Scenario Value	Default Scenario Value
Fiber Conduit Installation per foot - 650	11.38	11.38
Fiber Conduit Installation per foot - 850	16.40	16.40
Fiber Conduit Installation per foot - 2550	21.60	21.60
Fiber Conduit Installation per foot - 5000	50.10	50.10
Fiber Conduit Installation per foot - 10000	75.00	75.00
Fiber Feeder Investment per foot - 216	13.10	13.10
Fiber Feeder Investment per foot - 144	9.50	9.50
Fiber Feeder Investment per foot - 96	7.10	7.10
Fiber Feeder Investment per foot - 72	5.90	5.90
Fiber Feeder Investment per foot - 60	5.30	5.30
Fiber Feeder Investment per foot - 48	4.70	4.70
Fiber Feeder Investment per foot - 36	4.10	4.10
Fiber Feeder Investment per foot - 24	3.50	3.50
Fiber Feeder Investment per foot - 18	3.20	3.20
Fiber Feeder Investment per foot - 12	2.90	2.90
Copper Feeder Investment per foot - 4200	74.25	74.25
Copper Feeder Investment per foot - 3600	63.75	63.75
Copper Feeder Investment per foot - 3000	53.25	53.25
Copper Feeder Investment per foot - 2400	42.75	42.75
Copper Feeder Investment per foot - 1800	32.25	32.25
Copper Feeder Investment per foot - 1200	21.75	21.75
Copper Feeder Investment per foot - 900	16.50	16.50
Copper Feeder Investment per foot - 600	11.25	11.25
Copper Feeder Investment per foot - 400	7.75	7.75
Copper Feeder Investment per foot - 200	4.25	4.25
Copper Feeder Investment per foot - 100	2.50	2.50
Buried Copper Cable Sheath Multiplier	1.04	1.04
Buried Fiber Sheath Addition per foot	0.20	0.20
Pole Materials	** **	201.00
Pole Labor	** **	216.00
Conduit Material Investment per foot	0.60	0.60
Inner Duct Investment per foot	0.30	0.30
Spare Tubes per section	1.00	1.00
Regional Labor Multiplier	1.00	1.00
Pole Spacing, feet - 0	250	250
Pole Spacing, feet - 5	250	250
Pole Spacing, feet - 100	200	200
Pole Spacing, feet - 200	200	200
Pole Spacing, feet - 650	175	175
Pole Spacing, feet - 850	175	175
Pole Spacing, feet - 2550	150	150
Pole Spacing, feet - 5000	150	150
Pole Spacing, feet - 10000	150	150
Copper Manhole Materials - 0	1,865.00	1,865.00
Copper Manhole Materials - 5	1,865.00	1,865.00
Copper Manhole Materials - 100	1,865.00	1,865.00
Copper Manhole Materials - 200	1,865.00	1,865.00
Copper Manhole Materials - 650	1,865.00	1,865.00
Copper Manhole Materials - 850	1,865.00	1,865.00
Copper Manhole Materials - 2550	1,865.00	1,865.00
Copper Manhole Materials - 5000	1,865.00	1,865.00
Copper Manhole Materials - 10000	1,865.00	1,865.00

Hatfield Model Release 3.1
Staff Proposed Inputs

Distribution Input	Current Scenario Value	Default Scenario Value
Long Loop Cable Investment Adjustment 5	13.07	13.07
Long Loop Cable Investment Adjustment 6	13.07	13.07
Long Loop DLC CU Adjustment 1	1.00	1.00
Long Loop DLC CU Adjustment 2	1.00	1.00
Long Loop DLC CU Adjustment 3	1.00	1.00
Long Loop DLC CU Adjustment 4	1.25	1.25
Long Loop DLC CU Adjustment 5	1.00	1.00
Long Loop DLC CU Adjustment 6	1.25	1.25
Distribution Cable Size 1	2,400	2,400
Distribution Cable Size 2	1,800	1,800
Distribution Cable Size 3	1,200	1,200
Distribution Cable Size 4	900	900
Distribution Cable Size 5	600	600
Distribution Cable Size 6	400	400
Distribution Cable Size 7	200	200
Distribution Cable Size 8	100	100
Distribution Cable Size 9	50	50
Distribution Cable Size 10	25	25
Distribution Cable Size 11	12	12
Distribution Cable Size 12	6	6
Distribution Cable Investment per foot 1	42.75	42.75
Distribution Cable Investment per foot 2	32.25	32.25
Distribution Cable Investment per foot 3	21.75	21.75
Distribution Cable Investment per foot 4	16.50	16.50
Distribution Cable Investment per foot 5	11.25	11.25
Distribution Cable Investment per foot 6	7.75	7.75
Distribution Cable Investment per foot 7	4.25	4.25
Distribution Cable Investment per foot 8	2.50	2.50
Distribution Cable Investment per foot 9	1.63	1.63
Distribution Cable Investment per foot 10	1.19	1.19
Distribution Cable Investment per foot 11	0.76	0.76
Distribution Cable Investment per foot 12	0.63	0.63
Distribution Riser Cable Size 1	2,400	2,400
Distribution Riser Cable Size 2	1,800	1,800
Distribution Riser Cable Size 3	1,200	1,200
Distribution Riser Cable Size 4	900	900
Distribution Riser Cable Size 5	600	600
Distribution Riser Cable Size 6	400	400
Distribution Riser Cable Size 7	200	200
Distribution Riser Cable Size 8	100	100
Distribution Riser Cable Size 9	50	50
Distribution Riser Cable Size 10	25	25
Distribution Riser Cable Size 11	12	12
Distribution Riser Cable Size 12	6	6
Distribution Riser Cable Investment per foot 1	42.75	42.75
Distribution Riser Cable Investment per foot 2	32.25	32.25
Distribution Riser Cable Investment per foot 3	21.75	21.75
Distribution Riser Cable Investment per foot 4	16.50	16.50
Distribution Riser Cable Investment per foot 5	11.25	11.25
Distribution Riser Cable Investment per foot 6	7.75	7.75
Distribution Riser Cable Investment per foot 7	4.25	4.25
Distribution Riser Cable Investment per foot 8	2.50	2.50
Distribution Riser Cable Investment per foot 9	1.63	1.63

Feeder Input	Current Scenario Value	Default Scenario Value
Copper Manhole Frame and Cover - 0	350.00	350.00
Copper Manhole Frame and Cover - 5	350.00	350.00
Copper Manhole Frame and Cover - 100	350.00	350.00
Copper Manhole Frame and Cover - 200	350.00	350.00
Copper Manhole Frame and Cover - 650	350.00	350.00
Copper Manhole Frame and Cover - 850	350.00	350.00
Copper Manhole Frame and Cover - 2550	350.00	350.00
Copper Manhole Frame and Cover - 5000	350.00	350.00
Copper Manhole Frame and Cover - 10000	350.00	350.00
Copper Manhole Site Delivery - 0	125.00	125.00
Copper Manhole Site Delivery - 5	125.00	125.00
Copper Manhole Site Delivery - 100	125.00	125.00
Copper Manhole Site Delivery - 200	125.00	125.00
Copper Manhole Site Delivery - 650	125.00	125.00
Copper Manhole Site Delivery - 850	125.00	125.00
Copper Manhole Site Delivery - 2550	125.00	125.00
Copper Manhole Site Delivery - 5000	125.00	125.00
Copper Manhole Site Delivery - 10000	125.00	125.00
Copper Manhole Excavate and Backfill - 0	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 5	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 100	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 200	2,800.00	2,800.00
Copper Manhole Excavate and Backfill - 650	3,200.00	3,200.00
Copper Manhole Excavate and Backfill - 850	3,500.00	3,500.00
Copper Manhole Excavate and Backfill - 255(	3,500.00	3,500.00
Copper Manhole Excavate and Backfill - 500(	5,000.00	5,000.00
Copper Manhole Excavate and Backfill - 100(	5,000.00	5,000.00
Fiber Pullbox Materials - 0	280.00	280.00
Fiber Pullbox Materials - 5	280.00	280.00
Fiber Pullbox Materials - 100	280.00	280.00
Fiber Pullbox Materials - 200	280.00	280.00
Fiber Pullbox Materials - 650	280.00	280.00
Fiber Pullbox Materials - 850	280.00	280.00
Fiber Pullbox Materials - 2550	280.00	280.00
Fiber Pullbox Materials - 5000	280.00	280.00
Fiber Pullbox Materials - 10000	280.00	280.00
Fiber Pullbox Installation - 0	220.00	220.00
Fiber Pullbox Installation - 5	220.00	220.00
Fiber Pullbox Installation - 100	220.00	220.00
Fiber Pullbox Installation - 200	220.00	220.00
Fiber Pullbox Installation - 650	220.00	220.00
Fiber Pullbox Installation - 850	220.00	220.00
Fiber Pullbox Installation - 2550	220.00	220.00
Fiber Pullbox Installation - 5000	220.00	220.00
Fiber Pullbox Installation - 10000	220.00	220.00

Hatfield Model Release 3.1
Staff Proposed Inputs

Distribution Input	Current Scenario Value	Default Scenario Value	Feeder Input	Current Scenario Value	Default Scenario Value
Distribution Riser Cable Investment per foot 10	1.19	1.19			
Distribution Riser Cable Investment per foot 11	0.76	0.76			
Distribution Riser Cable Investment per foot 12	0.63	0.63			
Distance Multiplier for difficult terrain	1.20	1.20			
Rock Depth Threshold, inches	24.00	24.00			
Hard Rock Placement Multiplier	3.50	3.50			
Soft Rock Placement Multiplier	2.00	2.00			
Difficult Surface Multiplier	1.00	1.00			
Sidewalk/Street Fraction	0.20	0.20			
Local RT - Maximum Total Distance	18,000	18,000			
Town Factor	0.85	0.85			
Maximum Lot Size, acres	3.00	3.00			
Town Lot Size, acres	3.00	3.00			
SAI Cable Size 1	2,400	2,400			
SAI Cable Size 2	1,800	1,800			
SAI Cable Size 3	1,200	1,200			
SAI Cable Size 4	900	900			
SAI Cable Size 5	600	600			
SAI Cable Size 6	400	400			
SAI Cable Size 7	200	200			
SAI Cable Size 8	100	100			
SAI Cable Size 9	50	50			
SAI Cable Size 10	25	25			
SAI Cable Size 11	12	12			
SAI Cable Size 12	6	6			
SAI Indoor Investment 1	1,052.00	1,052.00			
SAI Indoor Investment 2	864.00	864.00			
SAI Indoor Investment 3	576.00	576.00			
SAI Indoor Investment 4	432.00	432.00			
SAI Indoor Investment 5	288.00	288.00			
SAI Indoor Investment 6	192.00	192.00			
SAI Indoor Investment 7	96.00	96.00			
SAI Indoor Investment 8	48.00	48.00			
SAI Indoor Investment 9	48.00	48.00			
SAI Indoor Investment 10	48.00	48.00			
SAI Indoor Investment 11	48.00	48.00			
SAI Indoor Investment 12	48.00	48.00			
SAI Outdoor Investment 1	4,469.00	4,469.00			
SAI Outdoor Investment 2	3,569.00	3,569.00			
SAI Outdoor Investment 3	2,610.00	2,610.00			
SAI Outdoor Investment 4	2,028.00	2,028.00			
SAI Outdoor Investment 5	1,500.00	1,500.00			
SAI Outdoor Investment 6	1,071.00	1,071.00			
SAI Outdoor Investment 7	902.00	902.00			
SAI Outdoor Investment 8	642.00	642.00			
SAI Outdoor Investment 9	300.00	300.00			
SAI Outdoor Investment 10	250.00	250.00			
SAI Outdoor Investment 11	250.00	250.00			
SAI Outdoor Investment 12	250.00	250.00			

Hatfield Model Release 3.1
Staff Proposed Inputs

Switching Input	Current Scenario Value	Default Scenario Value
Constant EO Switching Investment Term, small ICO	416.11	416.11
Constant EO Switching Investment Term, BOC and large ICO	242.73	242.73
Switch Capacity Real-Time (BHCA) - 1	10,000	10,000
Switch Capacity Real-Time (BHCA) - 2	50,000	50,000
Switch Capacity Real-Time (BHCA) - 3	200,000	200,000
Switch Capacity Real-Time (BHCA) - 4	600,000	600,000
Switch Capacity Traffic (BHCCS) - 1	30,000	30,000
Switch Capacity Traffic (BHCCS) - 2	150,000	150,000
Switch Capacity Traffic (BHCCS) - 3	600,000	600,000
Switch Capacity Traffic (BHCCS) - 4	1,800,000	1,800,000
Initial Switch Maximum Equipped Line Size	80,000	80,000
Switch Port Administrative Fill	0.98	0.98
Switch Maximim Processor Occupancy	0.90	0.90
Processor Feature Loading Multiplier - normal	1.20	1.20
Processor Feature Loading Multiplier - heavy business	2.00	2.00
Processor Feature Loading Multiplier - business penetration threshold	0.30	0.30
MDF/Protector Investment per line	17.50	17.50
Analog Line Circuit Offset for DLC lines, per line	5.00	5.00
Switch Installation Multiplier	1.10	1.10
Operator Traffic Fraction	0.02	0.02
Total Interoffice Traffic Fraction	0.65	0.65
Maximum Trunk Occupancy, CCS	** **	27.50
Trunk Port, per end	100.00	100.00
Entrance Facility Distance, miles	0.50	0.50
Direct-routed Fraction of Local Interoffice	0.98	0.98
POPs per Tandem Location	5.00	5.00
Tandem-routed Fraction of Total IntraLATA Traffic	0.20	0.20
Tandem-routed Fraction of Total InterLATA Traffic	0.20	0.20
Local Call Attempts	** **	9,394,922
Call Completion Factor	0.70	0.70
IntraLATA Calls Completed	** **	177,143
InterLATA Intrastate Calls Completed	** **	166,009
InterLATA Interstate Calls Completed	** **	739,823
Local DEMs, thousands	** **	37,570,456
Intrastate DEMs, thousands	** **	3,468,219
Interstate DEMs, thousands	** **	7,107,428
Local Business/Residence DEMs	1.10	1.10
Intrastate Business/Residence DEMs	2.00	2.00
Interstate Business/Residence DEMs	3.00	3.00
BH Fraction of Daily Usage	0.10	0.10
Annual to Daily Usage Reduction Factor	** **	270.00
Residential Holding Time Multiplier	1.00	1.00
Business Holding Time Multiplier	1.00	1.00
Residential Call Attempts per BH	1.30	1.30
Business Call Attempts per BH	3.50	3.50
ICO STP Investment, per line (equipment)	5.50	5.50
ICO Local Tandem Investment, per line	1.90	1.90
ICO OS Tandem Investment, per line	0.80	0.80
ICO SCP Investment per line (equipment)	2.50	2.50
ICO SCP - STP per line (wirecenter)	0.40	0.40
ICO Local Tandem Investment, per line (wirecenter)	2.50	2.50

Expense Input	Current Scenario Value	Default Scenario Value
Cost of Debt	0.076	0.077
Debt Fraction	0.420	0.450
Cost of Equity	0.124	0.119
Average Trunk Utilization	0.300	0.300
Tax Rate	0.384	0.393
Corporate Overhead Factor	0.165	0.104
Other Taxes Factor	** **	0.050
Billing/Bill Inquiry per line per month	1.220	1.220
Directory Listing per line per month	0.150	0.150
Forward-looking Network Operations Factor	1.000	0.500
Alternative CO Switching Factor	0.027	0.027
Alternative Circuit Equipment Factor	0.015	0.015
EO Traffic Sensitive Fraction	0.700	0.700
Monthly LNP cost, per line	0.250	0.250
Carrier to Carrier Customer Service, per line per y	1.69	1.69
NID Expense per line per year	1.00	1.00
DS-0/DS-1 Terminal Factor	12.4	12.4
DS-1/DS-3 Terminal Factor	9.9	9.9
Average Lines per Business Location	4	4
Distribution Aerial Fraction - 0	0.44	0.50
Distribution Aerial Fraction - 5	0.40	0.33
Distribution Aerial Fraction - 100	0.40	0.25
Distribution Aerial Fraction - 200	0.40	0.25
Distribution Aerial Fraction - 650	0.40	0.25
Distribution Aerial Fraction - 850	0.40	0.25
Distribution Aerial Fraction - 2550	0.40	0.25
Distribution Aerial Fraction - 5000	0.40	0.25
Distribution Aerial Fraction - 10000	0.40	0.25
Distribution Buried Fraction - 0	1.00	0.33
Distribution Buried Fraction - 5	0.33	0.33
Distribution Buried Fraction - 100	0.33	0.33
Distribution Buried Fraction - 200	0.33	0.33
Distribution Buried Fraction - 650	0.33	0.33
Distribution Buried Fraction - 850	0.33	0.33
Distribution Buried Fraction - 2550	0.33	0.33
Distribution Buried Fraction - 5000	0.33	0.33
Distribution Buried Fraction - 10000	0.33	0.33
Distribution Underground Fraction - 0	0.99	1.00
Distribution Underground Fraction - 5	0.99	0.50
Distribution Underground Fraction - 100	0.99	0.50
Distribution Underground Fraction - 200	0.99	0.50
Distribution Underground Fraction - 650	0.99	0.40
Distribution Underground Fraction - 850	0.99	0.33
Distribution Underground Fraction - 2550	0.99	0.33
Distribution Underground Fraction - 5000	0.99	0.33
Distribution Underground Fraction - 10000	0.99	0.33
Feeder Aerial Fraction - 0	0.40	0.50
Feeder Aerial Fraction - 5	0.40	0.33
Feeder Aerial Fraction - 100	0.40	0.25
Feeder Aerial Fraction - 200	0.40	0.25
Feeder Aerial Fraction - 650	0.40	0.25

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Staff Proposed Inputs

Switching Input	Current Scenario Value	Default Scenario Value
ICO OS Tandem Investment, per line (wirecenter)	1.00	1.00
ICO Tandem A Links and C Links per line (wirecenter)	0.30	0.30
Real-time Limit, BHCA	750,000	750,000
Port Limit, trunks	100,000	100,000
Common Equipment Investment	1,000,000	1,000,000
Maximum Port Fill	0.90	0.90
Maximum Real-time Occupancy	** **	0.90
Common Equipment Intercept Factor	0.50	0.50
STP Link Capacity	720	720
STP Maximum Link Fill	0.80	0.80
Maximum STP Investment, per pair	5,000,000	5,000,000
Minimum STP Investment, per pair	1,000,000	1,000,000
Link Termination, both ends	900	900
Signaling Link Bit Rate	56,000	56,000
Link Occupancy	0.40	0.40
C Link Cross Section	24.00	24.00
ISUP Messages per Interoffice BHCA	6.00	6.00
ISUP Message Length, bytes	25.00	25.00
TCAP Messages per transaction	2.00	2.00
TCAP Message length, bytes	100.00	100.00
Fraction of BHCA requiring TCAP	0.10	0.10
SCP Investment/Transaction/Second	20,000	20,000
Operator Investment per position	6,400	6,400
Operator Maximum Utilization, per position, CCS	32	32
Operator Intervention Factor	10	10
Public Telephone Investment, per station	760	760
Lot Size, Multiplier of Switch Room Size	2	2
Tandem/EO Wire Center Common Factor	0.40	0.40
Power 1	5,000	5,000
Power 2	10,000	10,000
Power 3	20,000	20,000
Power 4	50,000	50,000
Power 5	250,000	250,000
Switch Room Size, sq ft 1	500	500
Switch Room Size, sq ft 2	1,000	1,000
Switch Room Size, sq ft 3	2,000	2,000
Switch Room Size, sq ft 4	5,000	5,000
Switch Room Size, sq ft 5	10,000	10,000
Construction, sq ft 1	75.00	75.00
Construction, sq ft 2	85.00	85.00
Construction, sq ft 3	100.00	100.00
Construction, sq ft 4	125.00	125.00
Construction, sq ft 5	150.00	150.00
Land, sq ft 1	5	5
Land, sq ft 2	8	8
Land, sq ft 3	10	10
Land, sq ft 4	15	15
Land, sq ft 5	20	20
OC-48 ADM, installed, 48 DS-3s	50,000	50,000
OC-48 ADM, installed, 12 DS-3s	40,000	40,000
OC-3/DS-1 Terminal Multiplexer, installed, 84 DS-1s	26,000	26,000
Investment per 7 DS-1s	500	500

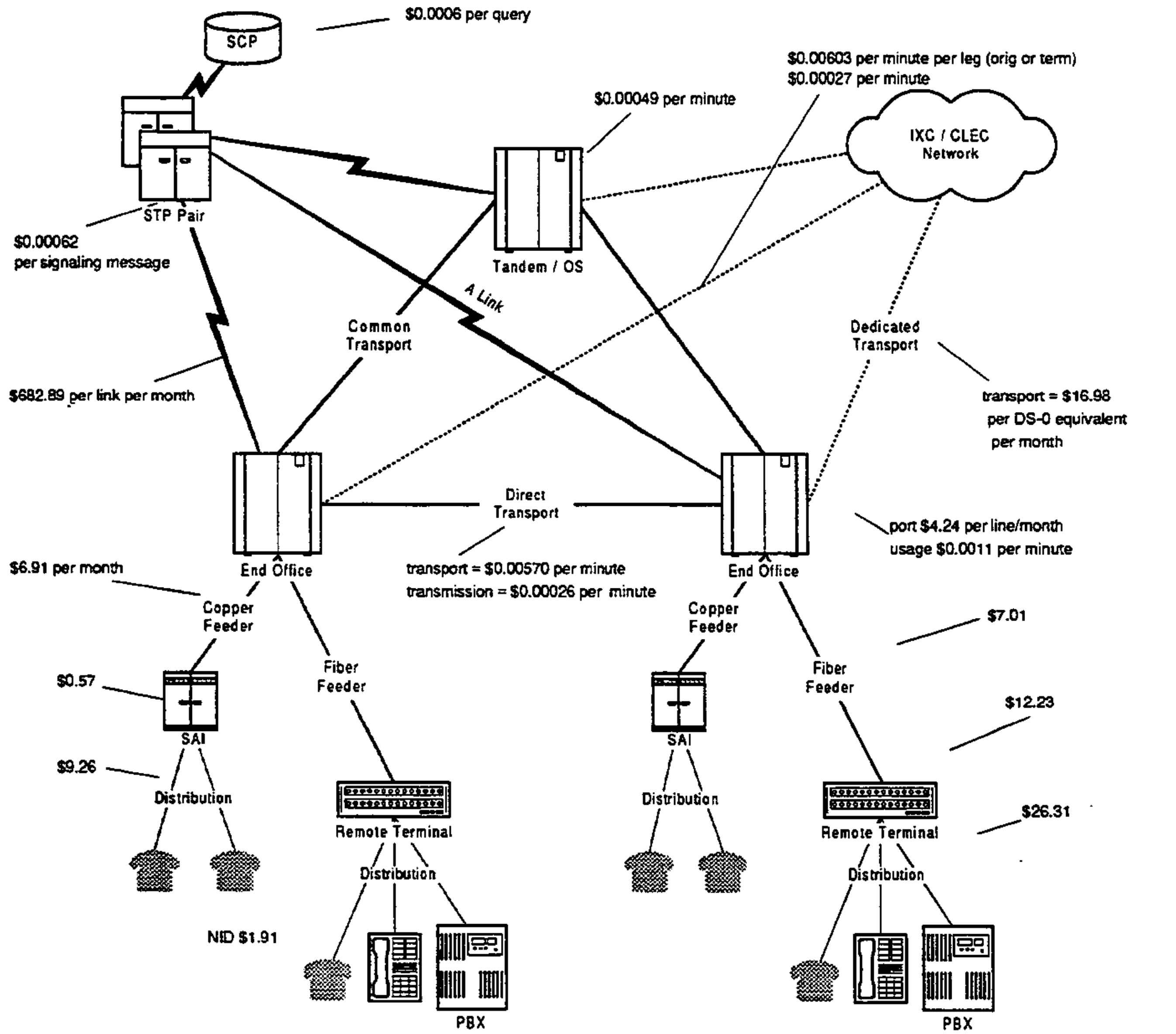
Expense Input	Current Scenario Value	Default Scenario Value
Feeder Aerial Fraction - 850	0.40	0.25
Feeder Aerial Fraction - 2550	0.40	0.25
Feeder Aerial Fraction - 5000	0.40	0.25
Feeder Aerial Fraction - 10000	0.40	0.25
Feeder Underground Fraction - 0	0.99	0.50
Feeder Underground Fraction - 5	0.99	0.50
Feeder Underground Fraction - 100	0.99	0.40
Feeder Underground Fraction - 200	0.99	0.33
Feeder Underground Fraction - 650	0.99	0.33
Feeder Underground Fraction - 850	0.99	0.33
Feeder Underground Fraction - 2550	0.99	0.33
Feeder Underground Fraction - 5000	0.99	0.33
Feeder Underground Fraction - 10000	0.99	0.33
Feeder Buried Fraction - 0	1.00	0.40
Feeder Buried Fraction - 5	1.00	0.40
Feeder Buried Fraction - 100	1.00	0.40
Feeder Buried Fraction - 200	1.00	0.40
Feeder Buried Fraction - 650	1.00	0.40
Feeder Buried Fraction - 850	1.00	0.40
Feeder Buried Fraction - 2550	1.00	0.40
Feeder Buried Fraction - 5000	1.00	0.40
Feeder Buried Fraction - 10000	1.00	0.40
Motor Vehicles	9.06	9.16
Garage Work Equipment	11.40	11.47
Other Work Equipment	15.50	13.22
Buildings	39.60	48.99
Furniture	16.10	16.56
Office Support Equipment	11.00	11.25
Company Comm. Equipment	8.30	7.59
General Purpose Computer	7.30	6.24
Digital Electronic Switching	9.80	16.54
Operator Systems	14.00	9.94
Digital Circuit Equipment	9.70	10.09
Public Telephone Terminal Equipment	8.00	8.01
Poles	8.40	16.13
Aerial Cable - metallic	9.40	16.80
Aerial Cable - non metallic	22.11	22.11
Underground Cable - metallic	12.80	21.17
Underground Cable - non metallic	24.50	22.87
Buried - metallic	14.20	19.86
Buried - non metallic	19.40	24.13
Intrabuilding Cable - metallic	16.50	15.64
Intrabuilding Cable - non metallic	16.50	23.65
Conduit Systems	41.60	51.35

Switching Input	Current Scenario Value	Default Scenario Value
Number of Fibers	24	24
Pigtails, per strand	60	60
Optical Distribution Panel	1,000	1,000
EF&I, per hour	55	55
EF&I hours	32	32
Regional Labor Factor	1	1
Channel Bank Investment, per 24 lines	5,000	5,000
Fraction of SA Lines Requiring Multiplexing	0.50	0.50
Regenerator, installed	15,000	15,000
Regenerator spacing, miles	40	40
DCS installed, per DS-3	30,000	30,000
Transmission Terminal Fill (DS-0 level)	0.90	0.90
Fiber Investment, fiber cable	3.50	3.50
Fiber Investment, number of strands per ADM	4.00	4.00
Fiber Investment, buried fraction	0.60	0.60
Fiber Investment, buried placement	1.77	1.77
Fiber Investment, buried sheath addition	0.20	0.20
Fiber Investment, conduit	0.60	0.60
Fiber Investment, spare tubes per route	1.00	1.00
Fiber Investment, conduit placement	16.40	16.40
Fiber Investment, pullbox spacing	2,000.00	2,000.00
Fiber Investment, pullbox investment	500.00	500.00
Fiber Investment, aerial fraction	0.20	0.20
Fiber Investment, pole spacing, feet	150.00	150.00
Fiber Investment, pole material	201.00	201.00
Fiber Investment, pole labor (basic)	216.00	216.00
Fraction Poles and Buried/Underground Placement Common with Fee	0.75	0.75
Fraction of Aerial Structure Assigned to Telephone	0.44	0.33
Fraction of Buried Structure Assigned to Telephone	1.00	0.33
Fraction of Underground Structure Assigned to Telephone	1.00	0.33

Expense Input	Current Scenario Value	Default Scenario Value

Unbundled Network Elements - SWBT's Inputs

Missouri / Southwestern Bell



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Network Diagram

COST OF NETWORK ELEMENTS - SWBT's Inputs

Missouri

Southwestern Bell

Loop elements	0-5 lines/sq mi	5-100 lines/sq mi	100-200 lines/sq mi	200-650 lines/sq mi	650-850 lines/sq mi	850-2550 lines/sq mi	2550-5000 lines/sq mi	5000-10000 lines/sq mi	>10000 lines/sq mi	Totals
NID										
Annual Cost	$ 645,636	$ 6,021,843	$ 2,356,647	$ 7,048,794	$ 1,922,147	$ 19,615,552	$ 16,955,910	$ 6,923,464	$ 2,937,919	$ 64,425,913
Unit Cost/month	2.94	2.51	2.02	2.06	1.99	2.04	1.99	1.76	0.85	$ 1.91
Loop Distribution (DLC)										
Annual Cost	$ 29,664,661	$ 154,139,134	$ 25,612,185	$ 37,733,445	$ 6,493,982	$ 36,218,088	$ 13,427,970	$ 3,912,138	$ 1,769,718	$ 308,971,321
Unit Cost/month	135.18	66.55	32.14	19.97	14.85	11.39	7.58	6.58	3.30	$ 26.31
Loop Distribution (non-DLC)										
Annual Cost	$ -	$ 3,885,870	$ 11,465,963	$ 26,389,920	$ 7,658,878	$ 68,529,021	$ 52,373,051	$ 22,949,833	$ 10,283,314	$ 203,535,849
Unit Cost/month	-	46.70	30.89	17.30	14.44	10.68	7.74	6.86	3.52	$ 9.26
Loop Distribution (all)										
Annual Cost	$ 29,664,661	$ 158,025,004	$ 37,078,147	$ 64,123,365	$ 14,152,859	$ 104,747,109	$ 65,801,021	$ 26,861,971	$ 12,053,032	$ 512,507,170
Unit Cost/month	135.18	65.86	31.75	18.78	14.63	10.90	7.71	6.81	3.48	$ 15.20
Loop Concentration (DLC)										
Annual Cost	$ 6,791,345	$ 38,324,887	$ 9,162,167	$ 20,441,895	$ 4,632,310	$ 33,902,528	$ 19,181,854	$ 6,518,615	$ 4,662,945	$ 143,618,546
Unit Cost/month	30.95	16.55	11.60	10.82	10.60	10.66	10.83	10.96	8.69	$ 12.23
Loop Concentration (non-DLC)										
Annual Cost	$ -	$ 80,379	$ 257,766	$ 906,180	$ 314,208	$ 3,682,249	$ 4,458,336	$ 2,060,971	$ 780,991	$ 12,541,081
Unit Cost/month	-	0.97	0.69	0.59	0.59	0.57	0.66	0.62	0.27	$ 0.57
Loop Concentration (all)										
Annual Cost	$ 6,791,345	$ 38,405,267	$ 9,419,933	$ 21,348,076	$ 4,946,518	$ 37,584,777	$ 23,640,190	$ 8,579,585	$ 5,443,937	$ 156,159,627
Unit Cost/month	30.95	16.01	8.07	6.25	5.11	3.91	2.77	2.18	1.57	$ 4.63
Loop Feeder (DLC)										
Annual Cost	$ 9,032,438	$ 29,581,864	$ 5,773,229	$ 8,972,692	$ 1,649,858	$ 14,338,566	$ 7,433,975	$ 3,026,945	$ 2,511,933	$ 82,321,500
Unit Cost/month	41.16	12.77	7.25	4.75	3.77	4.51	4.20	5.09	4.68	$ 7.01
Loop Feeder (non-DLC)										
Annual Cost	$ -	$ 844,293	$ 2,677,660	$ 10,863,088	$ 3,562,422	$ 41,743,843	$ 49,353,601	$ 26,730,813	$ 16,030,844	$ 151,806,564
Unit Cost/month	-	10.15	7.21	7.12	6.72	6.49	7.29	7.99	5.48	$ 6.91
Loop Feeder (all)										
Annual Cost	$ 9,032,438	$ 30,426,166	$ 8,450,889	$ 19,835,780	$ 5,212,280	$ 56,082,409	$ 56,787,576	$ 29,757,758	$ 18,542,777	$ 234,128,063
Unit Cost/month	$ 41.16	$ 12.68	$ 7.24	$ 5.81	$ 5.39	$ 5.84	$ 6.65	$ 7.55	$ 5.36	$ 6.94
Total Loop (DLC)										
Annual Cost	$ 46,134,080	$ 227,868,892	$ 42,155,345	$ 71,047,410	$ 13,644,702	$ 90,953,257	$ 43,659,574	$ 14,502,342	$ 9,400,274	$ 559,255,876
Unit Cost/month	210.22	98.38	52.91	37.60	31.21	28.59	24.60	24.38	17.51	$ 47.63
Total Loop (non-DLC)										
Annual Cost	$ -	$ 5,019,378	$ 15,160,272	$ 41,306,604	$ 12,589,102	$ 127,076,590	$ 119,625,123	$ 57,620,436	$ 29,577,391	$ 407,964,897
Unit Cost/month	-	60.32	40.82	27.08	23.74	19.77	17.67	17.21	10.12	$ 18.56
Total Loop (all)										
Annual Cost	$ 46,134,080	$ 232,878,271	$ 57,305,617	$ 112,354,014	$ 26,233,804	$ 218,029,847	$ 163,184,697	$ 72,122,778	$ 38,977,664	$ 967,220,772
Unit Cost/month	$ 210.22	97.06	49.06	32.90	27.11	22.69	19.11	18.30	11.26	$ 28.68

Total lines	18,288	199,949	97,330	284,576	80,627	800,683	711,582	328,501	288,361	2,809,897
Total lines served by DLC	18,288	193,015	66,401	157,471	36,433	265,080	147,545	49,568	44,725	978,524

	Annual Cost	Units		Unit Cost	
End office switching	$ 157,543,684				
Port	115,006,890	2,260,164	switched lines	$ 4.24	per line/month
Usage	42,536,795	39,846,598,049	minutes	$ 0.00107	per minute
Signaling network elements	$ 26,509,605				
Links	4,466,903	545	links	$ 682.89	per link per month
STP	20,752,991	33,725,345,715	TCAP+ISUP msgs	$ 0.00062	per signaling message
SCP	1,289,711	2,305,137,340	TCAP queries	$ 0.00056	per query
Transport network elements					
Dedicated					
Sw+Sp Transport	$ 125,388,134	615,485	trunks	$ 16.98	per DS-0 equivalent per month
Switched	13,395,161	65,752	trunks	$ 0.00211	per minute
Special	111,992,973	549,733	trunks		
Transmission Terminal	42,644,417	615,485	trunks	$ 5.77	per DS-0 equivalent per month
				$ 0.00072	per minute
				$ 0.00283	total per minute
Common					
Transport	$ 32,327,161	6,802,090,846	minutes	$ 0.00603	per minute per leg (orig or term)
Transmission Terminal	1,457,063	6,802,090,846	minutes	$ 0.00027	per minute
				$ 0.00630	total per minute
Direct					
Transport	$ 47,737,703	8,373,769,818	minutes	$ 0.00570	per minute
Transmission Terminal	2,197,839	8,373,769,818	minutes	$ 0.00026	per minute
				$ 0.00596	total per minute
Tandem switch	$ 2,056,035	4,182,983,688	minutes	$ 0.00049	per minute
Operator systems	$ 79,868,151				
Public Telephones	$ 22,705,799				
Total (w/ Public)	$ 1,507,676,364				
Total cost of switched network elements (w/o Public)	$ 42.24 per line/month				

		Interconnected at end office		tandem	wtd average
Local Interconnection					
EO switching	$	0.00107	$	0.00107	
ISUP	$	0.00062	$	0.00062	
Common Transport	$	-	$	0.00630	
Tandem Switching	$	-	$	0.00049	
TOTAL	$	0.00169	$	0.00848	n/a
IXC switched access					
EO switching	$	0.00107	$	0.00107	
ISUP	$	0.00062	$	0.00062	
Dedicated Transport	$	0.00283	$	0.00283	
Common Transport	$	-	$	0.00630	
Tandem Switching	$	-	$	0.00049	
TOTAL	$	0.00452	$	0.01131	$ 0.00609

Signaling detail		
cost per 800 call attempt (TCAP)	$	0.0023
ISUP cost/transaction	$	0.00379
ISUP cost/completion		0.0056
IXC switched access MOU/comp		8.91
ISUP cost/min	$	0.000625
D link per month	$	920.34
Dedicated Transport Costs Per Trunk		
DS-0 per month		
Transport per month	$	16.98
Terminal per month *	$	115.48
TOTAL	$	132.45
DS-1 per month		
Transport per month	$	407.44
Terminal per month	$	138.57
TOTAL	$	546.02
DS-3 per month		
Transport per month	$	11,408.46
Terminal per month	$	277.14
TOTAL	$	11,685.60
Trunk Port Costs		
per trunk port (DS-0 equivalent)	$	-
per trunk port minute		#DIV/0!
total EO usage per minute	$	0.001068
trk port/min		#DIV/0!
other		#DIV/0!

	0-5 lines/sq mi	5-100 lines/sq mi	100-200 lines/sq mi	200-650 lines/sq mi	650-850 lines/sq mi	850-2550 lines/sq mi	2550-5000 lines/sq mi	5000-10000 lines/sq mi	>10000 lines/sq mi	weighted average
calculated copper feeder fill (non-DLC)	0.0%	54.7%	60.6%	62.0%	63.1%	66.8%	68.7%	69.7%	71.4%	67.9%
calculated distribution fill (DLC)	31.1%	32.0%	31.7%	32.8%	30.9%	32.3%	32.8%	34.2%	34.0%	32.5%
calculated distribution fill (non-DLC)	0.0%	32.5%	32.2%	32.2%	32.3%	32.8%	32.7%	32.8%	31.8%	32.6%
										32.5%
calculated "mainframe fill" (non-DLC)	0.0%	42.6%	39.2%	27.6%	16.1%	12.0%	7.5%	8.9%	14.1%	12.2%

SWBT Deems the SWBT User Adjustable Inputs for Hatfield Model 3.1 to be Highly Confidential in their entirety.

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WHOLESALE DISCOUNTS FOR RESALE OF RETAIL SERVICES

Overview

The method used to establish SWBT's interim prices for wholesale discount for resale of retail services was designed by the FCC and is based on uniform accounting data. The process is to determine how much cost is avoidable if an incumbent telephone company were to become a wholesale company. This avoidable cost model was created by the FCC, although states have the ability to adopt an alternate method. The FCC provided presumed defaults to initialize the model, in essence a presumptive starting place - the cost categories that are presumed avoided and those presumed not to be avoided. Each can then be argued into or out of the study. Adjustments to the cost categories are also possible.

The initial interim rate of 21.61% was based on the default design with disallowing negative cost and considering uncollectible as 100% avoidable. This was modified by the Commission on January 22, 1997 to 20.32% discount for wholesale of retail services. This change was accomplished by reclassifying uncollectibles to be considered avoidable at the rate of the other indirect categories.

In designing the avoidable cost model, the FCC attempted to identify the costs that would be avoidable when an incumbent wholesales a service to a competitor instead of retailing that same service to the customer. The concept is to determine, "If SWBT were to fully convert to a wholesale operation, having no retail customers, what costs should it be able to avoid?" The underlying idea and the reasonableness of any calculation should be related back to this key point. The discount is based on existing retail prices and calculated from uniform accounting data. Decisions have to be made on fifty-eight different cost categories, whether to exclude, include or partially include as avoidable. In addition, there are three variations in methods of calculation.

Both AT&T and MCI advocate the basic FCC method. While MCI advocates the default positions as outlined by the FCC, AT&T advocates some adjustments that would increase the discount above the default values. MCI believes the appropriate discount should be 19.63% discount while AT&T believes the appropriate discount should be 28.61% (each using 1995 ARMIS data).

In the initial phase of arbitration, SWBT proposed a Service-by-Service cost study as an alternate to the FCC designed model. This approach was rejected in favor of the FCC method. SWBT has substantially revised that study and again proposes that a service specific model should be used instead of the basic FCC model.

SWBT proposes that, if the FCC model is used, that the FCC defined defaults be used but that the final calculation of determining the percentage discount use local, toll and access revenue instead of only revenue from local and toll, I. e., services for which the discount would apply. SWBT's modification is at odds with the FCC methodology and is inconsistent with the logic of the model. The SWBT proposed calculation method assumes that access charges are to be discounted, which is not correct. SWBT does not advocate applying the resulting discount to access.

Avoided or Avoidable

SWBT contends that avoidable cost should be defined as costs that the company determines it will actually avoid. The FCC defines it as costs that can be avoided, whether the company chooses to avoid it or not. This is one of the most critical assumptions in the study.

There is the obvious problem of a company that no longer provides a service but contends it will not reduce its costs at all. SWBT contends that, for example, if every SWBT customer is attracted away by a reseller and that reseller provides 100% of the customers operator services directly (not using SWBT's service), no operator service costs should be considered avoidable. The FCC approach is to consider services that would not be performed for the reseller as avoidable and 100% of operator services would be assumed avoided. The definition chosen on "avoided" verses "avoidable" largely determines the outcome of the avoidable cost study.

Analysis of Key Variables

Of the many individual cost account variables, perhaps the greatest effect on the model output is how the five direct cost categories are treated. The standardized accounting system was not designed to particularly separate costs of services being resold from services not being resold. Ideally, avoidable costs should be matched with the services being resold. Since the avoidable cost model concept is relatively new, companies have limited experience in this effort.

The largest service not being resold is access. It theoretically should be possible to separately identify costs associated with access and exclude them from the model. Thus the allocated costs for access in these categories can be removed from the total category costs in order to better reflect the costs associated with only the services being resold. SWBT admits that it is unable to identify costs associated with access at this time. This is largely because the ARMIS accounting categories were never designed to separately track costs by services. However, this imprecision might not be a concern. Not all direct costs are considered fully avoided in the default setting of the model. It may be that by leaving some direct costs as not avoidable serves as a compensation.

Likewise, the entire fifty-eight cost categories could be further scrutinized in the attempt to separate costs for services that will be resold and those that will not. Should this be done, clearly the revenue categories will have to be better subdivided to match costs and revenues. While this would be a theoretical improvement in the study, the ARMIS data underlying the cost study is not generally differentiated enough to allow these separate calculations. The Staff analysis consistently takes a conservative approach and, therefore, does not assign costs as avoidable in thirty-seven of the fifty-eight cost categories. If, in the future, data is sufficiently detailed to analyze the subcategories with confidence, all of the categories where no costs are currently considered avoided must be reconsidered.

Product Management

Product management (6611) is the development and management of the various services offered for retail, including costs incurred in performing administrative activities related to marketing products and services. The default FCC recommendation is 10% is allocated to the competitor and 90% is avoidable in wholesale. SWBT proposes 90% avoided be assumed if the FCC model is used.

Staff suggests considering the assumed avoided cost in this category in more detail. As products are developed, both SWBT and a competitor, through resale of the product, may receive benefits. Therefore this cost should be shared. SWBT has control over the design of its products. It can time their introduction and with trade marked names, could easily receive relatively more benefit from product management expenses than a competitor. All this argues for SWBT sharing proportionally more of the cost than competitors, that is, avoidable cost being greater than 50%. Assuming, at the extreme, equal benefits, this account is assumed to be avoidable at a 50% rate. (It should be noted that this adjustment deviates from the theory of "avoidable" cost and enters the more murky realm of "benefit" assignment. It might well be appropriate to remain with the default assignment of 90% avoidable. If this adjustment is set at 90% avoidable, then the resulting wholesale discount rate increases by about one-third of one percent (.34%).)

Sales

Sales (6612) is the cost of selling the retail services and includes such costs as determination of individual customer needs, development and presentation of customer proposals. The default FCC recommendation is 10% is allocated to the competitor and 90% is avoidable in wholesale. SWBT proposes 90% avoided be used if the FCC model is used.

These sales costs are those that will naturally shift to the wholesale customer and should be largely avoidable. Retail customer contact will be the responsibility of the company reselling SWBT's service. Some wholesale sales contact will be required. Leaving 10% of the cost in the category as unavoidable is to recognize that not all cost can be avoided. The costs associated with this category is assumed to be 90% avoidable.

Product Advertising

Product advertising (6613) includes costs incurred in developing and implementing promotional strategies to stimulate the purchase of products and services. The default FCC recommendation is 10% is allocated to the competitor and 90% is avoidable in wholesale. SWBT proposes 90% avoided be assumed if the FCC model is used.

SWBT will advertise its services in competition with the competitor's resold service. Joint advertising will not likely occur, as every customer the competitor serves in SWBT territory through resale is a customer SWBT would otherwise serve. SWBT proposes that joint advertising will occur. As an analogy, they cite "Intel inside" joint advertising by a computer chip wholesaler that benefits the manufacturer of computers selling to the end user. This analogy is flawed. The chip maker does not compete with the computer maker for retail sales to the same customers. SWBT also cites Proctor & Gamble and Lucent in a similar fashion.

There is no compellingly rational reason SWBT would assist a competitor by jointly advertising that competitor's product in direct competition to its own. Every sale the competitor makes through resale is one that SWBT could make directly. If it is true that SWBT would want to have the resellers make sales in leu of SWBT directly, then it must be that SWBT will make increased profits from shifting direct retail provision of service to wholeselling the service through resellers. This is contrary to SWBT's stated position. This account is assumed to be avoidable at a 90% rate.

Operator Services

Call Completion:
Call completion (6621) includes costs incurred in helping customers place and receive calls, except directory assistance. The default FCC recommendation is 0% is allocated to the competitor and 100% is avoidable in wholesale. SWBT proposes 100% avoided be used if the FCC model is used.

Number Services:
Number services (6622) includes costs incurred in providing customer numbers and classified listings. The default FCC recommendation is 0% is allocated to the competitor and 100% is avoidable in wholesale. SWBT proposes 100% avoided be used if the FCC model is used.

Operator services, collectively call completion and number services, poise a particular dilemma for calculating the wholesale discount. The default FCC recommendation is 0% is allocated to the competitor and 100% is avoidable in wholesale. This recognizes that competitors will provide their own operator services. In resale, operator services has its own separate charge and represents an additional revenue flow to SWBT and an additional cost to the reseller.

Assuming a 100% discount is equivalent to assuming the reseller is providing all of its own operator services. Assuming a 0% discount is equivalent to assuming the reseller is not providing any of its own operator services. Likely the reality is that some resellers will be providing operator services and some will not. Since the discount, if assumed 100% avoidable, has already eliminated the cost of operator services, there might be an incentive for the reseller to not provide its own operator services. Thus SWBT would be providing a service at a price where its cost has been removed. Likewise, if the operator service costs are not removed when establishing the wholesale rate, and the reseller does provide operator services, that company would be paying SWBT for service it does not receive.

There are at least three methods of correcting this mismatch of what the reseller pays and the service it receives. The first, and simplest, is to assume a mix of reseller customers who will be receiving SWBT operator services and will be receiving the reseller's operator services. Assuming, for example, 75% of the resale customers receive operator services from the reseller, then 75% of SWBT operator services should be considered avoidable. Accurately selecting the proper percentage absent any history is obviously difficult. This analysis also assumes that all, or at least most, of the cost of operator services is covered by the additional charge the reseller must pay. Should the charge not cover the expense, then any shortfall in cost recovery is being shifted to other services. It is not clear if this situation exists in SWBT. No such adjustment has been attempted in the current analysis.

The second method is to establish two wholesale discount rates applying to al services; one rate if the resale customer service is provided with operator services and a separate one without. If the reseller provides its own operator services it will receive a larger discount which recognizes that SWBT can avoid more costs for this reseller. The reseller that uses SWBT operator services will receive a lower discount, recognizing the added cost of serving these customers. These discount rates for SWBT would be:

Operator services 100% avoidable, the reseller providing operator services = 19.20%
Operator services 0% avoidable, the reseller NOT providing operator services = 13.91%

There is at least one significant criticism of the full service two-tiered approach. One reseller would receive, say, a discount of almost 14% for a service like toll if it also used SWBT operator services. Another reseller would receive, by virtue of providing its own operator services, a higher discount for toll - over 19%. But the avoidable cost for toll, as a specific service, did not necessarily change. Any two-tier discount encounters this problem. One solution is to set an entire schedule of discount rates for all components of resale. This is the approach SWBT takes in its Service Group Analysis. Any attempt at this approach quickly encounters the problem that standardized accounting was not designed to differentiate between the many services being offered the retail customer.

The third method, a variation on the full two-tier approach, is to establish one overall discount rate but separate only operator services into a distinct category with its own discount rate. (If the operator services discount rate is identical with the general discount, the solution degenerates to be identical to that of a single discount rate.) In determining the separate discount rate, the one overall rate generated by not excluding operator services, that is, the model calculated as above with 0% operator services avoided, is used. This discount rate would only apply to operator services as an individual service. This approach is practical as operator service is separately charged for and represents an additional revenue stream to the wholeselling company. The separate discount that would apply only to operator services would be 13.91%.

Staff advocates this last method, the variation of the two-tier approach, having an overall discount rate for all services excepting operator service be 19.20% and a separate discount, for operator service only, be 13.91%.

Customer Services

Customer Services (6623) includes costs incurred in establishing and servicing customer accounts, such as collecting pay station receipts, account collection costs as well as operator service commissions. The default FCC recommendation is 10% is allocated to the competitor and 90% is avoidable in wholesale. SWBT proposes 90% avoided be used if the FCC model is used.

These services are those that will naturally shift to the wholesale customer and should be largely avoidable. Retail customer contact will be the responsibility of the company reselling SWBT's service. Some wholesale customer contact will be required. Leaving 10% of the cost in the category as unavoidable is to recognize that not all cost can be avoided. Customer Services is assumed to be 90% avoidable.

Indirect Costs

Over fifty indirect costs are identified by the FCC for determination of whether they contain avoidable costs. These costs include uncollectibles as well as four network cost and ten corporate overhead cost categories. The default method proposed by the FCC is to assume uncollectibles, four network and all corporate overhead costs are potentially avoidable. The default method of determining the appropriate level of avoidable costs is to take the percentage of direct costs of total costs and assume that portion of those identified are in the fifteen categories. The amount of the fifteen overhead costs calculated as avoided is dependent on the costs considered avoided in the direct cost categories. Since the allocator for indirect costs is derivative of decisions made in determining avoidable direct costs, no adjustments to the method of assigning indirect costs is suggested.

There is a slight ambiguity in the FCC method of calculating the indirect cost allocator. Staff calculates it as avoided direct costs divided by total costs. SWBT calculates it as avoided direct costs divided by total direct costs. The SWBT method results in a higher percent allocator while Staff's method results in a lower rate. Staff's method lowers the overall discount in SWBT's favor by about one-half of one percent. While SWBT's interpretation of the FCC method may be correct, Staff maintains its conservative position that is, by comparison, more beneficial to the incumbent.

Revenue Base

The final critical decision is to determine the revenue base, the denominator in the equation of avoidable costs over revenue. Since the avoidable costs are those avoidable in wholeselling retail services, the revenue base used in the calculation should be those same retail services, i.e., local and toll. This is consistent with the FCC calculation method. SWBT proposes that in addition to local, toll, that access revenue also be added to this calculation. By adding access revenue to the calculation, SWBT decreases the discount rate by greater than 6 percentage points (19.20% drops to 13.14%). This method is invalid because it assumes, incorrectly, that the discount applies to access charges. It does not. Therefore, only the revenue for which the discount applies is used in the calculation, I. e., local and toll.

SWBT's Service Group Study

SWBT advocates that a Service Group analysis be substituted for the FCC method. While the concept in attractive, that is, developing different discounts for different services, the present development of the method does not allow for Staff support at this time. The Service Group study requires similar assumptions about direct cost categories as is necessary when using the FCC method. SWBT's assumptions are:

6611 Product Management	0% avoidable
6612 Sales	80% avoidable
6613 Advertising	0% avoidable
6621 Call Completion	0% avoidable
6622 Number Services	0% avoidable
6623 Customer Services	75% avoidable
Indirect Costs, 6121-6124 only	

This approach results in different discounts for each of the 25 Service Groups defined by SWBT (see chart below).

To understand the magnitude of these multiple discount rates, it is important to determine the overall discount achieved by this method. Two different methods were used to estimate this overall discount. Inputting the above assumptions into the FCC model results in an estimate of a maximum overall discount of 9.2%. A more detailed calculation of avoided costs supplied by account from SWBT divided by the appropriate revenue results in a 9.0% overall discount. The more detailed method is consistent with the first approach and should be more accurate. It is no surprise that the overall discount of 9% is so much lower than the FCC method as the assumptions concerning avoided direct costs are so different.

Taking the SWBT Service Group method and extrapolating it to reach the overall discount of 19.20% results in what the Service Group analysis might provide if the assumptions were the same as the FCC method. This extrapolation provides an estimate and is only used as an illustration. If SWBT had used the same avoidable costs used to reach the overall 19.20% discount, the discounts by service would not necessarily be identical to a simple extrapolation.

The SWBT Service Group analysis results in some unusual relationships between residential and business. The discount is based on charges, therefore is sensitive to different retail rates. While the "lines" discount is consistent with the fact that business charges are higher, the same cannot be said of "MTS." Besides the overall low discount based on assuming little avoidable costs, the inconsistent relationship between the discounts suggests that the Service Group method is not yet perfected.

Staff does not recommend the Service Group approach be used for establishing the wholesale discount at this time.

SWBT Service Group Analysis

Adjusted to match overall discount implied by SWBT by Group

	SWBT Proposed Discount	Adjusted to Discount of:
Overall Discount:	9.00%	19.20%
RESIDENCE:		
Lines	16.28%	34.73%
Optional Exchange Service	7.35%	15.68%
Call Management Service	11.60%	24.75%
Caller ID Services	16.53%	35.26%
Other Vertical Services	29.90%	63.79%
Remote Call Forwarding	21.11%	45.03%
Wide area Telephone Service	15.02%	32.04%
Toll Optional Calling Plans	10.46%	22.31%
MTS	7.98%	17.02%
OPERATOR SERVICES:		
Operator Services	3.15%	6.72%
BUSINESS:		
Lines	7.05%	15.04%
Optional Exchange Service	6.07%	12.95%
Call Management Service	8.65%	18.45%
Caller ID Services	9.15%	19.52%
Other Vertical Services	11.98%	25.56%
Remote Call Forwarding	9.27%	19.78%
Wide area Telephone Service	8.10%	17.28%
Toll Optional Calling Plans	14.09%	30.06%
MTS	4.11%	8.77%
Plexar 1	10.13%	21.61%
Digital Link Services	23.62%	50.39%
Plexar 2	24.64%	52.57%
Trunks	8.56%	18.26%
ISDN	14.80%	31.57%
Analog Private Line	6.90%	14.72%

Final Calculation Method, Results and Recommendation

The basic FCC defined method of calculating a discount rate was used. The FCC default avoidable rate for avoidable direct costs was adjusted. A default calculation results in a discount of 19.54%. By lowering the product management avoidable cost to 50% avoided on the basis of reasonableness and fairness, not strictly an avoidable criteria, the discount is lowered to 19.20%. Thirty-seven cost accounts were not considered to have avoidable costs. This analysis represents a conservative approach.

There is benefit to be derived from a multi-tiered discount rate. It recognizes the concept that different services will likely have different percentage of avoidable cost. The revised Service-by-Service study, now termed Service Group method, of SWBT is an attempt to develop these separate discounts. However, the method does not appear robust enough to be recommended at this time.

Incorporating the decisions as detailed above, Staff recommends that the wholesale discount for resold services be 19.20% for all services except operator services. Taking the basic method and adjusting the operator service categories to 0% avoided results in a discount of 13.91% that can specifically be applied to operator services. Staff recommends a discount of 13.91% for operator services only.

Calculation Detail by Account of Development of Wholesale Discount:

Resale Study for SWBT

Avoided Cost Study, 1996 ARMIS Data

	Costs:	Total Missouri Regulated ($000)	% Avoided	SWBT Avoided ($000)
	Direct:			
6611	Product Management	7206	50%	3603
6612	Sales	22214	90%	19993
6613	Product Advertising	11022	90%	9920
6621	Call Completion services	11181	100%	11181
6622	Number Services	34145	100%	34145
6623	Customer Services	95206	90%	85685
	Indirect:			
5301	Uncollectible Revenue	16669	15.67%	2612
6112	Motor Vehicle Exp.	826	0.00%	0
6113	Aircraft Exp.	0	0.00%	0
6114	Spec Purpose Vehicle	0	0.00%	0
6115	Garage Work Equipment	14	0.00%	0
6116	Other Work Equipment	141	0.00%	0
6121	Land & Buld Exp.	-9877	15.67%	-1548
6122	Furniture & Artwork	-219	15.67%	-34
6123	Office Exp.	2552	15.67%	400
6124	Gen Purpose Computers	-23693	15.67%	-3713
6211	Analog Electronic Exp.	15021	0.00%	0
6212	Digital Electronic Exp.	42980	0.00%	0
6215	Electro-mech Exp.	93	0.00%	0
6220	Operators Exp.	300	0.00%	0
6231	Radio System Exp.	358	0.00%	0
6232	Circuit System Exp.	19641	0.00%	0
6311	Station Apparatus Exp.	1	0.00%	0
6341	Lg PBX/Exp.	201	0.00%	0
6351	Public Tel Term Eq Exp.	4163	0.00%	0
6362	Other Terminal Eq Exp.	20051	0.00%	0
6411	Poles Exp.	1684	0.00%	0
6421	Aerial Cable Exp.	47185	0.00%	0
6422	Underground Cable Exp.	6641	0.00%	0
6423	Buried Cable Exp.	66906	0.00%	0

6424	Submarine Cable Exp.	0	0.00%	0
6425	Deep Sea Cable Exp.	0	0.00%	0
6426	Intrabuilding Network Cabl	36	0.00%	0
6431	Aerial Wire Exp.	27	0.00%	0
6441	Conduit Systems Exp.	806	0.00%	0
6511	Telecomm Use Exp.	0	0.00%	0
6512	Provisioning Exp.	28	0.00%	0
6531	Power Exp.	4598	0.00%	0
6532	Network Admin Exp.	13298	0.00%	0
6533	Testing Exp.	38402	0.00%	0
6534	Plant Operations Admin	29487	0.00%	0
6535	Engineering Exp.	17813	0.00%	0
6540	Access Exp.	53298	0.00%	0
6561	Depreciation Telecom plan	347816	0.00%	0
6562	Depreciation Future Telec	0	0.00%	0
6563	Amortization Exp. - Tangit	683	0.00%	0
6564	Amortization Exp. - Intang	0	0.00%	0
6565	Amortization Exp. - Other	5298	0.00%	0
6711	Executive	5562	15.67%	872
6712	Planning	1727	15.67%	271
6721	Accounting & Finance	12106	15.67%	1898
6722	External Relations	19542	15.67%	3063
6723	Human Resources	16480	15.67%	2583
6724	Information Management	43707	15.67%	6851
6725	Legal	5192	15.67%	814
6726	Procurement	3682	15.67%	577
6727	Research and Developmer	5739	15.67%	900
6728	Other Gen & Admin	31882	15.67%	4997
	Total	$868,667		$185,069

Revenues:		% Included:	Included:
Local Service	807299	100%	807299
Toll Network Service	156649	100%	156649
Network Access Service	444248	0%	0
Miscellaneous	172704	0%	0
Total	$1,580,900		$963,948

Resale Percentage Discount on Revenue:

% of Resold Services Revenue	19.20%
(Local & Toll Network Service)	