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**BEFORE THE  
FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, D.C. 20554**

In the Matter of )  
)  
Application by SBC Communications Inc., )  
Michigan Bell Telephone Company d/b/a )  
Ameritech Michigan and Southwestern Bell ) CC Docket No. \_\_\_\_\_  
Communications Services, Inc. d/b/a Ameritech )  
Long Distance for Provision of In-Region )  
InterLATA Services in Michigan )

**AFFIDAVIT OF RICHARD J. FLORENCE  
ON BEHALF OF AMERITECH**

**STATE OF MICHIGAN )**  
)  
**COUNTY OF WAYNE )**

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COST AFFIDAVIT**

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I, Richard J. Florence, being first duly sworn upon oath, do hereby depose and state as follows:

1. My name is Richard J. Florence. I am Director – Cost Analysis and Regulatory at SBC Communications, Inc. My business address is 444 Michigan Avenue, Detroit, Michigan 48226.

2. As Director – Cost Analysis and Regulatory, I develop cost methods that determine the costs incurred by Michigan Bell Telephone Company, d/b/a/ Ameritech Michigan<sup>1</sup> or (“Ameritech”) among other SBC affiliates, for providing services, supervise the production of cost studies, and analyze cost study results.

### **PROFESSIONAL EXPERIENCE AND EDUCATIONAL BACKGROUND**

3. I graduated from Wayne State University in 1972 with a Bachelor of Science degree in electrical engineering. In 1976, I received a Masters degree in business administration from the University of Detroit. In 1998, I received a Masters of Science in Finance degree from Walsh College.

4. I also have attended numerous classes, seminars, and symposia to broaden my knowledge and help keep abreast of current issues impacting my job responsibilities. I am a licensed professional engineer in the State of Michigan, a member of the Engineering Society of Detroit, and the Institute of Electrical and Electronic Engineers. I have been employed by Ameritech and Michigan Bell since 1972. Until 1994, my duties primarily involved Michigan. From 1994 to 1999, my position’s responsibilities encompassed the Ameritech region. In 1999, my responsibilities were broadened to include the entire SBC thirteen-state region.

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<sup>1</sup> Michigan Bell Telephone Company, a Michigan corporation, is a wholly owned subsidiary of Ameritech Corporation, which owns the former Bell operating companies in the states of Michigan, Illinois, Wisconsin, Indiana, and Ohio. Ameritech Corporation is a wholly-owned subsidiary of SBC Communications, Inc. Michigan Bell offers telecommunications services and operates under the names “Ameritech” and “Ameritech Michigan” pursuant to assumed name filings with the state of Michigan.

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5. I have been responsible for service cost issues since 1976. Originally, I was given responsibility for the preparation of cost studies for private line services, basic exchange and local services, and customer premises equipment. In 1983, in addition to those services, I became responsible for the preparation of cost studies for intraLATA toll and WATS services, information and operator services, pay phone services, central office services such as Custom Calling and Touch Tone, and the central office portion of Centrex services. In 1991, I was assigned responsibility for the preparation of cost studies for all intrastate services. In late 1993, as a result of organizational changes in Ameritech, my new title became Manager – Regulatory. In that capacity, I served as the Michigan regulatory contact on various cost and other economic issues.

6. In September of 1994, I moved to the economic analysis group. My responsibilities were expanded to include providing economic analysis support to the entire Ameritech region. In addition, I was responsible for performing cost studies, assisting the Ameritech cost managers on cost study methodology issues, and reviewing cost studies performed by Ameritech personnel for consistency and accuracy.

7. In 1996, my responsibilities were broadened to include managing network cost model use and development for the entire Ameritech region and managing the development of cost studies for various services and Unbundled Network Elements (UNEs). I also have participated in workshops held with state commission staffs concerning cost methodology and cost models.

8. In 1999, I was appointed to my present position where I have cost analysis responsibilities for the entire 13-state SBC region.

9. I have testified on cost matters in numerous proceedings in Michigan, Illinois, Indiana

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and Wisconsin involving issues such as customer owned coin operated telephone service, message toll service, switched and special access services, directory assistance service, centrex service, E9-1-1 billing issues, UNEs, collocation, service provider number portability, pole attachments and conduit occupancy, basic local exchange service, and cost issues related to development of special construction charges.

10. Additionally, I have submitted testimony regarding the Total Service Long Run Incremental Cost (TSLRIC) methodology used for cost studies for services provided in Michigan. I also have submitted testimony on the Total Element Long Run Incremental Cost (TELRIC) methodology used for cost studies for UNEs, among other things.

## **PURPOSE OF AFFIDAVIT**

11. The purpose of my affidavit is to describe how Ameritech developed forward-looking costs in support of its interconnection, UNE and reciprocal compensation offerings in Michigan, and how these studies fully comply with Federal Communications Commission (“FCC”) rules and 47 U.S.C. § 271(c)(2)(B) of the Telecommunications Act of 1996 (the “Act”).

12. Specifically, my affidavit demonstrates that Ameritech’s costs for UNEs were developed in accordance with the FCC’s pricing rules and the Act. See, e.g., 47 U.S.C., § 251(c)(3)(4)(6) & 252(d)(1). I will describe, in broad terms, the bases for these cost studies and the methodology used to determine the costs for the elements. I also explain why the results reflect the forward-looking costs, as approved by the Michigan Public Service Commission (MPSC), of providing those elements – not actual or embedded costs. Finally, I will discuss the cost studies supporting Ameritech’s wholesale discount rate for resale services. To supplement my discussion, attached to the

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affidavit as Attachment A is an Ameritech document: *Description of Unbundled Network Element Cost Studies*. This document describes in significant detail the methodology that Ameritech has used when preparing its TELRIC studies in Michigan to determine the costs of providing UNEs including a description of study methods, models, input data, and results. A second attachment, Attachment B, lists the forward-looking cost studies for interconnection, UNEs, reciprocal compensation and avoided costs for wholesale services, generally described in Attachment A, which were recently prepared and submitted to the MPSC in Case Nos. U-11831, U- 12540, U-12622 and U-12696.

### **COST METHODOLOGY FOR NETWORK INTERCONNECTION, UNBUNDLED NETWORK ELEMENTS, LOCAL TRANSPORT AND TERMINATION, AND COLLOCATION**

13. 47 U.S.C. § 252(d)(1) requires that prices for interconnection and unbundled network elements be “based upon the cost” of providing these elements, products and services and “may include a reasonable profit.” The FCC’s Local Competition Order prescribed a methodology for identifying the costs on which these prices should be based.<sup>2</sup> The FCC has decided that TELRIC is the appropriate methodology, coupled with a reasonable allocation of forward-looking shared and common costs.

14. 47 U.S.C. § 252(d)(2) requires that the charges for local transport and termination recover the “costs” of transporting and terminating “calls that originate on the network facilities of the other carrier.” In the Local Competition Order, 11 FCC Rcd at 16024, ¶ 1056, the FCC specified that these costs were to be determined in the same manner as the costs for network interconnection, unbundled network elements and collocation.

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<sup>2</sup> First Report and Order, Implementation of the Local Competition Provisions in the Telecommunications Act of 1996:

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15. After passage of the Act, and in anticipation of the FCC's pricing regulations, Ameritech performed cost studies to determine the forward-looking economic costs of providing services to Competitive Local Exchange Carriers ("CLECs"). Following the issuance of the FCC's Local Competition Order and its accompanying regulations on August 8, 1996, Ameritech Michigan revised its studies to ensure that they conformed with the rules and principles articulated in the Local Competition Order. These costs were submitted to the Michigan Commission in January 1997 as part of the first Michigan biennial cost docket, Case No. U-11280. Following the issuance of the MPSC's July 14, 1997 order in that proceeding, Ameritech revised its studies to ensure that they conformed with the rules and principles enunciated in the MPSC's (and FCC's First Report and Order) Orders. The resultant studies were filed with the MPSC in July 1997.

16. In response to petitions for rehearing filed by both Ameritech Michigan and other parties to this proceeding (Case No. U-11280), the MPSC granted partial rehearing in its order issued on September 30, 1997. On January 28, 1998, the MPSC issued its order on rehearing which modified the economic lives used in the cost studies as well as the resale discount. Ameritech complied with the MPSC's order and made the necessary changes to its cost studies and the discount rate for resold services.

17. In January 1999, Ameritech submitted new TELRIC and resale cost studies to the MPSC as part of the second biennial cost docket, Case No. U-11831. These cost studies, and related cost models, were reviewed thoroughly by not only the MPSC Staff, but also by the other parties that were part of that proceeding such as AT&T, MCI/WorldCom, CenturyTel Wireless, CoreComm

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Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers, 11 FCC Rcd 15499 (1996) ("Local Competition Order").

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Newco, Michigan Exchange Carriers Association and the Michigan Cable Telecommunications Association.

18. During 1999, Ameritech responded to over a thousand data requests from these parties that inquired about the TELRIC methodology, cost study calculations and cost models. The information supplied by Ameritech includes investment studies, vendor prices, computer models, computer inputs, and factor development studies.

19. On November 16, 1999, the MPSC issued its order in U-11831. Ameritech made the changes to its studies required by the MPSC and filed revised costs and prices in compliance with the MPSC's order. Ameritech made these respective filings on December 16, 1999, January 10, 2000, and January 20, 2000.

20. A number of parties to Case No. U-11831 submitted petitions for rehearing relating to certain aspects of the MPSC's November 16, 1999 order. On May 3, 2000, the MPSC issued an order accepting some of the petitions, denying some of the petitions, requesting more information on certain cost study matters and also extended to the Staff and CLECs the opportunity to further review and comment on Ameritech's revised cost studies. Based on the Staff and CLEC's comments to the MPSC's May 3 order and the additional cost study information provided by Ameritech, the MPSC issued a third order on August 31, 2000 identifying further modifications that needed to be made to certain of Ameritech's cost studies.

21. Ameritech made the necessary changes to its cost studies and filed them on October 2, 2000, with the MPSC. These cost studies, along with all of the other cost studies filed on December 16, 1999, January 10, 2000 and January 20, 2000 (in response to the MPSC's November 16, 1999

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order), fully comply with the MPSC's final orders in Case No. U-11831. A list of the UNEs and interconnection cost studies that are part of this proceeding are included in Attachment B.

22. On August 9, 2000, in Case No. U-12540, Ameritech submitted new TELRIC compliant cost studies for line sharing and other related elements necessitated by the FCC's November 5, 1999 UNE Remand order and the FCC's December 1999 Line Sharing order. On March 7, 2001, the MPSC issued its order in U-12540. For some cost elements, the MPSC directed Ameritech to adopt the lower charges proposed by the CLECs. For other cost elements, Ameritech was ordered to adjust certain study assumptions which resulted in lower costs or charges. Ameritech submitted its revised cost studies on April 6, 2001 which complied with the MPSC's order. A list of the cost studies that are part of this proceeding is included in Attachment B.

23. On September 18, 2000, in Case No. U-12622, Ameritech submitted a cost study for unbundled local switching with shared transport (ULS-ST) to comply with one of the FCC's SBC-Ameritech merger conditions. Since this cost study reflects the annual cost factor and switching cost model input changes ordered by the MPSC in Case No. U-11831, the ULS-ST costs are lower than costs that would result from using Ameritech's proposed annual cost factors and switching cost model inputs reflected in its original TELRIC studies. On March 19, 2001, the MPSC issued its order approving Ameritech's ULS-ST cost study.

24. On September 25, 2000, in Case No. U-12320, Ameritech submitted its initial comments related to its UNE-Platform (UNE-P) combination offerings and the M2A. No new cost study nor cost methodology was filed, as Ameritech relied upon the costs developed in Case No. U-11831. Indeed, on January 4, 2001 and March 19, 2001, the MPSC issued its Orders in Case No. U-12320 stating that the rates in the M2A are in line with the costs approved in Case No. U-11831. In

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his affidavit, Mr. Scott J. Alexander describes the M2A offering.

25. On October 27, 2000, in Case No. U-12696, Ameritech submitted its application for approval to revise the rates and rate structure of reciprocal compensation for termination of local traffic compensation. This application relied upon approved costs in Case No. U-11831 and requested that the MPSC simply approve a new rate structure based on a “bifurcated approach,” that is, a per call set up charge and a per minute of use duration charge for reciprocal compensation for termination of all types of local traffic. On January 23, 2001, the MPSC issued its order, approving the bifurcated rate application and stated that the cost assumptions are consistent with the costs in Case No. U-11831.

26. All of the aforementioned studies, which were developed for Ameritech’s UNEs, are forward-looking, long run incremental cost studies considering “the total quantity of the facilities” as required by 47 C.F.R. § 51.505(b). See Attachment A.

27. Consistent with 47 C.F.R. § 51.505(b)(1), these studies reflect the use of efficient technology that currently is available and existing wire center locations. For example, the switching studies reflect forward-looking, digital switch technology for host and remote switches at existing wire center locations. The local loop cost studies reflect the use of a meld of forward-looking, digital loop carrier and copper technologies; while the interoffice transport study is based on SONET technology.

28. Ameritech’s TELRIC studies for unbundled loops and interoffice transport entrance facilities were geographically deaveraged to account for the different costs of building and maintaining networks in different areas with varying population density. Ameritech’s TELRIC studies for these unbundled network elements were geographically deaveraged based on three geographic zones or access areas, thus complying with 47 C.F.R § 51.507(f). Loop costs vary between the access areas -

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due to differences in loop length, cable mixes and sizes, among other factors that vary with density. See Attachment A.

29. In Case No. U-11831, Ameritech submitted a new methodology to derive shared and common costs. The MPSC, however, ordered that the shared and common cost factors approved in the first biennial cost filing docket, Case No. U-11280, continue to be used. The cost studies submitted in the compliance phase of the second biennial cost docket, Case No. U-11831, comply with the MPSC's decision.

30. The starting point for Ameritech's shared and common cost study submitted in Case No. U-11280 was 1997 budget data for the following four organizational units: (1) Ameritech Information Industry Services (which provides wholesale services); (2) Network Services; (3) Centralized Procurement Services; and (4) Corporate Headquarters. Each of the four budgets was evaluated for costs that are shared either by several UNEs, by both UNEs and other wholesale services or by both wholesale and retail services. Other costs in the budget data that do not provide shared benefits were excluded. Each cost was then allocated to each UNE using ratios based on direct expenses or TELRIC.

31. The MPSC, in its July 14, 1977 and January 28, 1998 orders in MPSC Case No. U-11280, required that Ameritech Michigan use different cost allocations, and that the shared and common costs be expressed as constant percentages that do not vary from one UNE to another.

32. Consistent with 47 C.F.R § 51.505(d)(1), Ameritech did not include embedded costs in its costs for UNEs. Ameritech does look to historical data for current efficient technologies already in use in the network to predict future costs for these same efficient technologies. The resulting costs

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developed from this data represent forward-looking costs. For example, Ameritech did not include the cost associated with older technology such as analog end office switches or analog carrier systems.

33. Ameritech's forward-looking methodology examined current costs solely as a basis for estimating future costs. For instance, Ameritech looked at the current maintenance expenses for fiber facilities to calculate future fiber maintenance costs. Likewise, Ameritech considers current maintenance expenses for digital switches as the best projection for future digital switching maintenance expenses. From current expenses, factors were developed representing these current efficient relationships as the best predictor of future costs for these same efficient technologies. These factors are then used with total forward-looking investment to calculate forward-looking costs. See Attachment A.

34. Consistent with 47 C.F.R. § 51.505(d)(2), Ameritech's cost studies do not include retail costs (e.g., marketing, billing, collection, etc.) associated with providing retail services to subscribers who are not telecommunications carriers.

35. Consistent with 47 C.F.R §51.505(d)(3), opportunity costs are excluded from the costs of unbundled elements.

36. Consistent with 47 C.F.R. §51.505(d)(4), revenues to subsidize other services are excluded from the costs of these elements.

37. Ameritech followed 47 C.F.R §51.511(a) by apportioning the cost over the total number of units of the element that Ameritech Michigan is likely to provide. Because of the uncertainty involved in determining future demand, Ameritech Michigan took the reasonable approach of relying on data that already reflects total demand for the equipment and facilities used to provide the services or network elements. See Attachment A.

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38. Ameritech's non-recurring TELRIC studies, originally submitted in Case No. U-11831, used the same forward-looking methodology that currently is used in its federal access filings. The methodology allows for the recovery of costs associated with the time required to install and disconnect a UNE. The methodology is best characterized as follows: (1) work groups involved in these tasks are identified; (2) the forward looking times, tasks and frequencies of occurrence required to perform each work function are identified, and the labor rate(s) associated with the employee(s) performing the work are determined; (3) the labor rate(s) are multiplied by the labor time(s) and frequencies of occurrence to arrive at the cost for performing the work function(s); and (4) work functions are then grouped by cost element and totaled to arrive at a forward-looking non-recurring cost per element.

39. The MPSC ordered that Ameritech make various adjustments related to the fallout rate as well as to other non-recurring cost study inputs. The MPSC also ordered that disconnect costs for UNEs be treated as separate elements rather than added together with the costs to install the service or amortized and included in the recurring costs. The revised cost studies Ameritech submitted in the compliance phase of Case No. U-11831 reflect these ordered changes. Additionally, separate rates were ordered for UNE-P migrations.

40. As required by 47 C.F.R. § 51.511(b), the cost units chosen corresponded to the discrete number of elements for flat-rate UNEs or the unit of measurement of the usage of the element for usage-based UNEs.

41. Ameritech employed in its initial cost studies submitted in Case No. U-11831, a forward-looking view of the Operations Support Systems (OSS) processes. Ameritech's approach was to recognize expected efficiencies in processes for which there were known plans to implement within the next three years from the date of the nonrecurring cost study. This is consistent with the

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FCC's intent as expressed in the First Report and Order, which states in Paragraph 685:

“The benchmark of forward-looking cost and existing network design most closely represents the incremental costs that incumbents actually expect to incur in making network elements available to new entrants. Moreover, 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.”

42. Because Ameritech's studies build in known efficiencies planned during the foreseeable future, the nonrecurring costs conservatively estimate what will actually be incurred to provide UNEs. Any changes to this approach ordered by the MPSC are reflected in the cost studies filed by Ameritech Michigan in the compliance phase of U-11831.

43. The pole attachment and conduit occupancy cost study submitted by Ameritech Michigan was performed using the FCC methodology, in place at the time, as modified by the Michigan Telecommunications Act (MTA) Section 361(1), Subsection (3) shown below. This subsection states that a rate for a pole attachment or use of conduit shall:

“... be just and reasonable if it assures the provider recovery of not less than the additional costs of providing the attachments, nor more than an amount determined by multiplying the percentage of the total usable space, or the percentage of the total duct or conduit capacity, which is occupied by the attachment, by the sum of the operating expenses and actual capital costs of the provider attributable to the entire pole, duct, or right-of-way.”

44. Ameritech developed cost studies for caged, cageless and virtual forms of collocation which it submitted in Case No. U-11831. These studies fully complied with the FCC's TELRIC methodology and the MPSC's almost identical TSLRIC methodology. Ultimately, however, the MPSC ordered that the methodology used in these cost studies should not be used as the basis for setting the collocation prices. The MPSC instead adopted the joint Collocation Cost Model (CCM) put forth by

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AT&T and MCI. Ameritech complied with the MPSC's directive. The cost outputs of that model, which are in many cases substantially lower than those developed by Ameritech, serve as the basis for the collocation rates now available to CLECs via both interconnection agreements and tariff.

45. Based on the foregoing, the costs provided by Ameritech, as modified by the MPSC, satisfy both the requirements of the Act and the requirements of the FCC's Local Competition Order.

### **WHOLESALE DISCOUNT RATES FOR RESALE SERVICES**

46. The Act requires that wholesale rates be determined "on the basis of retail rates charged to subscribers for the telecommunications service requested, excluding the portion thereof attributable to any marketing, billing, collection, and other costs that will be avoided." 47 U.S.C. § 252(d)(3). The resale pricing regulations issued by the FCC on August 8, 1996, interpreted this provision by applying an "avoidable cost" pricing standard. See e.g., 47 C.F.R. § 51.609. Ameritech Michigan performed its avoided cost study in compliance with the MPSC's and the FCC's rules and principles. The avoided cost methodology used by Ameritech Michigan and approved by the MPSC in Case No. U-11831 to calculate the resale discount follows the same methodology originally approved by the MPSC in the earlier cost proceeding, Case No. U-11280. This study yielded an average overall discount off retail rates for those services subject to resale.

47. In its order in Case No. U-11831, the MPSC also approved Ameritech's avoided cost methodology used to determine the resale discounts that apply to new individual case basis (ICB) contracts and assumed contracts (both existing ICB and tariffed contracts).

48. In light of the forgoing, the wholesale prices set out in Ameritech's resale tariff and

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interconnection agreements do not exceed, and the discounts on which they are based are not lower than, those required by 47 U.S.C. § 252(d)(3).

49. This concludes my affidavit.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on \_\_\_\_\_, 2001.

\_\_\_\_\_  
Richard J. Florence  
Director – Cost Analysis and Regulatory

STATE OF MICHIGAN  
COUNTY OF WAYNE

Subscribed and sworn to before me  
this \_\_\_ day of \_\_\_\_\_, 2001.

\_\_\_\_\_  
Notary Public

My commission expires:

**Florence Affidavit—Attachment A**

**Description of Unbundled Network Element  
Cost Studies**

Ameritech Michigan

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## **Introduction**

### 1.1 Purpose of this Document

The purpose of this document is to describe the studies performed by Ameritech Michigan to determine the costs of providing unbundled network elements (UNEs) in compliance with the Federal Communications Commission (FCC) order in CC Docket No. 96-98.<sup>1</sup> A network element is “a facility or equipment used in the provision of a telecommunications service.”<sup>2</sup> Costs determined in these studies are used in establishing proposed unbundled network element prices. This document describes the study methods, models, input data and results.

### 1.2 Cost Study Requirements

According to the Final Rules of the FCC Order, “An incumbent LEC must prove to the state commission that the rates for each element it offers do not exceed the forward-looking economic cost per unit of providing the element, using a cost study that complies with the methodology set forth in this section and 51.511 of this part.” (Page B-30 - B-31, Appendix B of Order.)

The FCC defined *forward-looking economic costs* as the sum of *total element long-run incremental costs (TELRIC)*, plus a reasonable allocation of *forward-looking common costs*. The Order calls for local exchange carriers to develop cost studies that compute TELRICs for network elements, forward-looking common costs and a reasonable allocation scheme for common costs.

In specifying the costing methodology for TELRIC, the FCC laid out the following conditions for cost studies.

- *Efficient network configuration.* Studies are to reflect forward-looking, efficient network technologies and configurations recognizing existing wire center locations.
- *Forward-looking cost of capital.* Capital costs are to reflect the costs of debt and equity anticipated in the future.
- *Depreciation rates.* Depreciation expense is to be based on economic depreciation rates and the economic lives of telephone plant.

Forward-looking common costs are to reflect costs efficiently incurred in providing a group of elements or services and are to exclude retail costs.

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<sup>1</sup> CC Docket No. 96-98, “In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996,” August 8, 1996.

<sup>2</sup> Page B-10, Final Rules, Appendix B of the FCC Order.

The FCC ordered that certain factors not be considered in network element cost studies. These included embedded costs, retail costs and opportunity costs, as well as revenues to subsidize other services. These are the broad requirements specified by the FCC for cost studies. *Ameritech Michigan's unbundled network element cost studies described in this document satisfy these requirements.*

### 1.3 Overview of Study Process

The Ameritech Michigan cost study process has evolved over many years. Its purpose has been to determine the costs of offering new and existing services in order to set tariffed rates. The cost methodology which has been used is called *total service long run incremental costing or TSLRIC*. This methodology determines the *direct and shared costs* which will be incurred by Ameritech Michigan in providing a service during a future planning period. These costs provide a floor for prices. They do not include costs which are common to services or network elements which also must be recovered by prices which exceed TSLRIC

The existing cost study process has been adapted to compute the costs of unbundled network elements consistent with the FCC requirements in CC Docket 96-98. For example, incremental costs are computed for the *total demand* of network elements, rather than an increment of the element. The study process also is modified to exclude certain operating expenses related to the retail marketing of services which would not apply to unbundled network elements.

However, many aspects of the study process remain the same.

- *Set of Cost Models.* Cost studies are performed using several cost models. Models such as Ameritech Facility Analysis Model or AFAM and the Ameritech Regional Partners in Provisioning Switching Model or ARPSM - were used to compute the capital investment required to construct local loop facilities and switching systems, respectively. Another model, the Network Cost Analysis Tool or NCAT, was used to compute the per minute and per message costs for routing different types of calls - through Ameritech Michigan's switched network. The Economic Cost of Network Services/Capital Cost Model or ECONS/CAPCOST - is used to compute the annual or monthly costs for a given investment dollar amount. The annual cost includes costs for depreciation, the cost of money and income taxes associated with the investment as well as costs for maintenance and ad valorem expenses. In addition to these "standard" cost models, cost analysts develop worksheets, tables and other costing tools as part of the costing process.
- *Team of Cost Analysts and Subject Matter Experts.* The cost study process involves - cost analysts with specialties in network cost analysis, capital cost development and other aspects of the studies. In addition, the studies require input from subject matter experts (SMEs) in marketing, engineering and operations. The team approach provides more realistic and more accurate estimates of costs.
- *Real Network Characteristics.* Cost studies are "forward-looking" in the sense that they calculate the cost to provide unbundled network elements using the latest plant technology for local loop facilities, switching, and other elements of the network. At the same time, the studies reflect relevant aspects of the existing network, such as locations of central

offices and customer premises, traffic characteristics, and others. Based on these characteristics which determine the network today and influence it in the future, the studies calculate the plant investment and operating costs which would be expected using forward-looking technologies to satisfy the demand for network elements.

- *Forward-Looking Cost Data.* Along with using forward-looking plant technologies, the studies use plant cost data (vendor prices, labor costs, etc.), capital cost factors and operating expenses which are reflective of these forward-looking technologies.
- *Quality Assurance.* Finally, an important part of the cost study process is “quality assurance.” Studies are reviewed several times for accuracy to ensure consistency in the application of costing methods, cost data, and completeness.

## **2.0 General Study Approach**

### **2.1 The Cost Question**

In calculating unbundled network element costs, the cost analysts answer the following question:

*What are the forward-looking, long run incremental costs for a network element recognizing Ameritech Michigan’s existing network and using forward-looking, efficient technologies, with network maintenance and operations reflecting these technologies?*

The cost analyst calculates the cost to provide an unbundled local loop, a minute of use on a local switch or other network element, not based on existing plant, investment and operating expenses, but rather using forward-looking design for local loop facilities, all digital switching, and other plant.

The cost analyst computes these forward-looking plant costs reflecting current vendor prices and discounts for equipment, current engineering and labor costs, etc. Plant maintenance and other operations reflect systems and procedures associated with these forward-looking technologies. In summary, unbundled network element costs reflect a forward-looking network operation designed to satisfy total demand, yet reflective of the way the network has evolved, particularly with regard to wire center locations.

Costs computed in this way are referred to TELRIC. It is important to recognize that TELRIC is a special case of incremental costs. Incremental costs typically reflect differences in future plant costs and operating expenses due to relatively small differences in demand caused by introducing a new service or changing an existing service offering. TELRIC is the incremental cost of the total demand for a network element.

### **2.2 Study Flow**

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

In the first step, plant investments per unit of a network element are then computed by dividing the plant investment necessary for each component by its *expected capacity utilization*. Expected capacity utilization is simply the *physical capacity* of the plant component divided by its *fill factor* or *utilization*. This gives a measure of the amount of investment which would be required (using forward-looking technologies) to provide a network element.

In the second step, *annual or monthly costs* are calculated. These include *depreciation expense* for the recovery of plant investment over its service life, a return requirement or *cost of money* associated with investor-supplied capital used to construct the plant, and an *income tax* obligation associated with the equity portion of the cost of money. Ameritech Michigan uses the ECONS/CAPCOST model to perform the capital cost calculations.

Network element costs also include *recurring operating expenses* associated with the maintenance of plant and other operating or ad valorem taxes. Operating expenses are computed using various expense factors which are unique to each type of plant, recognizing different levels of maintenance and network administration necessary for different plant types. Network element costs then are the sum of the recurring capital costs and operating expenses associated with the plant required to provide the network element.

In Sections 3 - 6, the unbundled loop, unbundled local and tandem switching, reciprocal compensation, transiting and unbundled transport cost studies are described. The same general approach for computing network element costs is followed, although the study methods and procedures are adapted to the specific requirements of each study. Section 7 provides an overview of the other network element cost studies.

### **3.0 Unbundled Loop Costs**

#### **3.1 Study Purpose**

The Unbundled Loop Cost Study calculates the cost to Ameritech Michigan to provide an unbundled loop assuming a local network based on forward-looking plant technologies and costs of plant construction. A loop consists of the telephone plant from the *network interface device* at a customer's premises to the serving central office of Ameritech Michigan. Loop costs are calculated for the following types of loops.

- *8dB POTS Loop*. A basic "two-wire" loop suitable for regular voice telephone service. Costs also are calculated for a four-wire loop.

- *Basic Rate Interface (BRI) Loop.* An Integrated Services Digital Network (ISDN) loop.
- *DS1 Loop.* A transmission path from the customer premises to the serving wire center capable of conveying digital signals of 1.544 megabits per second.
- *Ground Start Loop.* A two-wire loop suitable for PBX ground start trunks.
- *Electronic Key Loop.* A two-wire loop that also provides for the transmission of additional information in the 8 Khz range.
- *ADSL 2 Wire Loop.* A two wire 640 Kbps ADSL compatible loop.
- *HDSL 2/4 Wire Loop.* A two wire 768 Kbps or four wire 1.544 Mbps HDSL compatible loop.

For each type of loop, costs are computed for three geographic access areas based on access lines per square mile. - Loop costs vary among the geographic access areas due to differences in loop length, cable mixes and sizes, and other factors that vary among the access areas.

Loop costs are expressed as a *recurring monthly cost* which includes capital costs (depreciation, the cost of money and income taxes) and operating expenses for ongoing plant maintenance and ad valorem taxes. Non-recurring costs are computed for the activities necessary to order and provision unbundled loops.

In this document, the calculation of 8dB two-wire POTS loop cost is described, as well as the non-recurring provisioning costs for the 8dB loop. For details on the other loop costs refer to the Unbundled Loop Cost Study documentation provided in Case No. U-11831.

### 3.2 Loop Components

An 8dB POTS loop includes Ameritech Michigan plant from the customer premises, through distribution and feeder cable facilities, to the main distributing frame in the serving central office. The network components of an 8dB POTS loop are described below.

- *NID, Drop Cable and Terminal.* The network interface device (NID), drop cable and terminal - provide the transmission path from the last cable splice in the outside plant network to the customer's premises.
- *Distribution Cable.* The copper cable which runs from the feeder-distribution or serving area interface (SAI) to the terminal located near the customer's premises. *The SAI* is the "cross-connection" point between the feeder cable from the serving central office and the distribution cable. A mix of aerial, buried and underground non-loaded copper cables is used in the study. The cable mix varies by geographic access area. Pole and conduit investment to support distribution cable is also included in the loop cost calculation.

- *Digital Loop Carrier (DLC) System.* When loop feeder cable lengths exceed a certain threshold fiber feeder cable and digital loop carrier systems are used in the cost study as the most efficient loop design. The DLC system requires circuit equipment located in the field and at the central office as well. The DLC equipment provides multiplexing of voice channels over the fiber cable between the serving central office and the SAI. The study assumes multiple DLC system sizes. The amount of DLC investment per loop depends upon the frequency of fiber versus copper feeder, system size and expected utilization of the system (fill factor).
- *Feeder Cable.* Copper or fiber cable running from the serving central office to the SAI or remote DLC terminal. The cost study reflects a mix of copper and fiber aerial, buried and underground cables depending upon the geographic access area and overall loop length. As with distribution cable, pole and conduit plant investment is included in the loop cost calculation.
- *Main Distribution Frame.* Equipment located in the serving central office where the individual unbundled loops terminate. Includes a protector unit for loops served by copper feeder.

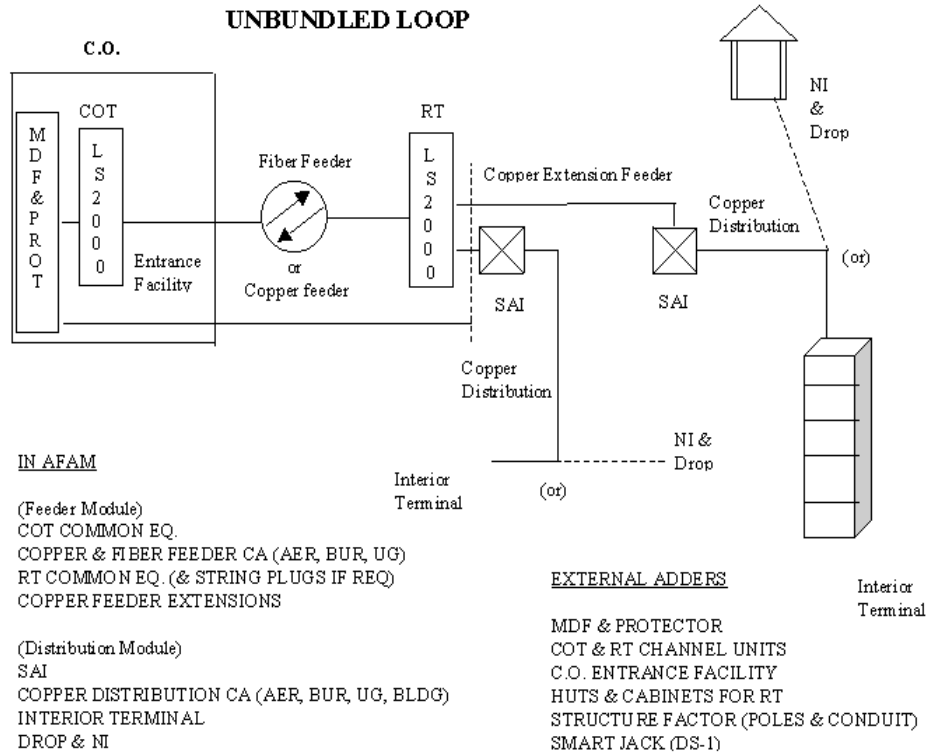
### 3.3 Study Flow - Recurring Monthly Costs

As described earlier, loop costs include the *recurring monthly costs* Ameritech Michigan incurs in providing loops and the *non-recurring costs* to order and provision the loop. In this section, the study flow for computing recurring monthly costs is described. AFAM is used to develop investments, by cable and equipment accounts, for the feeder, distribution, and drop portions of the loop using forward-looking designs and technologies. The capital investments produced by AFAM, along with other investments to complete the loop, are then converted to monthly costs using appropriate annual charge factors developed by the Economic Costs of Network Facilities/Capital Costs (ECONS/CAPCOST) model.

AFAM uses information from Ameritech's existing loop network and converts it into a forward-looking design by modeling Network's engineering practices as closely as possible. It takes a snapshot in time and builds a new/optimal network based on forward-looking technologies and guidelines.

Diagram #1 shows the components involved in an unbundled loop and defines which components are calculated in AFAM and which components are added later on to complete the loop cost study.

**DIAGRAM #1**



AFAM currently consists of two separate cost modules; one for feeder and the other one for distribution areas (DAs), the latter of which include both distribution and drop cables. AFAM is not a static model and has been improved and updated over time. Recent updates are shown below. These are incorporated in the cost studies submitted in U-11831.

**Feeder And Distribution**

- Equipment and facility unit investments updated to year 2000.

**Feeder**

- Includes significantly more feeder circuits.
- Updated design characteristics for remote terminals and feeder.
- Includes the full investment of all components in the resized, redesigned feeder network instead of part of the investment, as was done previously.
- Revised fiber/copper break points. Note that this enhancement was rejected by the Michigan Public Service Commission (MPSC) and not included in the cost studies submitted in the compliance phase of U-11831.

**Distribution**

- New distribution area module versus old samples.

- Inclusion of the CO entrance facility cables and equipment, such as interior terminals that were not reflected in the old distribution sample data.

### 3.4 Feeder Module Overview

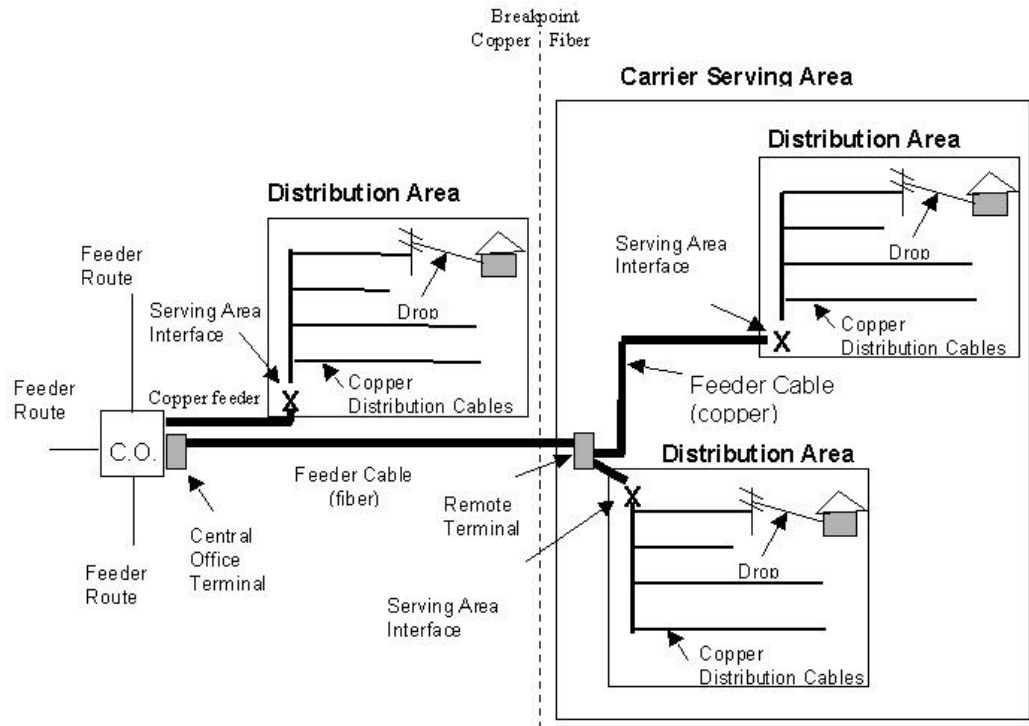
The AFAM feeder model develops feeder investments for each feeder route. Prior to running the AFAM feeder module, an inventory of Ameritech Michigan feeder route facilities is extracted from Ameritech engineering databases. This information creates the foundation for an unparalleled level of accuracy in the loop cost study because it captures the actual characteristics of Ameritech's feeder network, such as cable route path and plant type, cable section lengths, and circuit demands at each location.

In the design of the AFAM feeder module, Network Engineering's currently implementable and tested forward-looking practices, guidelines, and technologies were incorporated into AFAM's algorithms. This was the result of close coordination with, and input from, Ameritech's Network organization. When the AFAM feeder module is run, it takes the existing inventory of feeder facilities and converts it into a forward-looking design incorporating all the engineering guidelines mentioned previously. It determines where fiber and DLC electronics for Remote Terminals (RTs) and Central Office Terminals (COTs) should be placed and then optimizes the size/quantity of all the feeder components based on the circuit demand in the DAs, including objective utilization impacts. For unbundled loops, non-integrated or universal DLC service cards are used at the COT. Investments for the redesigned feeder network are then computed. AFAM aggregates this route-specific information for each of the three access areas.

#### **Important Recent Feeder Module Changes**

- Includes significantly more (over 4 million) feeder circuits.
- Updated design characteristics for remote terminals and feeder. AFAM now uses a feeder design that places a fiber fed RT at each Carrier Serving Area (CSA) instead of at each DA. A CSA can serve several DAs, and the feeder cables extending from the RT to the downstream DAs in the same CSA are copper cables. Diagram #2 below shows the basic loop architecture and components involved.

**DIAGRAM #2**



- Revised fiber/copper breakpoints. Previous loop studies using AFAM followed existing engineering practices to make decisions about the economic and practical thresholds regarding copper and fiber feeder facilities. At some distance from the central office, there is a threshold, which we refer to as a breakpoint, beyond which it becomes more economical to place fiber facilities rather than copper cables.
- Over time, this breakpoint has been moving closer to the central office as the cost of central office terminals and remote terminals have decreased. In order to determine the optimum breakpoint, AFAM feeder calculations were made using breakpoints of 0, 3, 6, 9, and 12 Kft.
- Includes the full investment of all components in the resized, redesigned feeder network instead of part of the investment, as was done previously. For example, if a demand of 250 circuits existed in a cable section after objective fill factor adjustments, AFAM picks the next available cable size to serve that fill adjusted demand, which is 300 pairs. Assume the cable costs \$1,000. The method ordered by the MPSC for use in the cost studies submitted in Case No. U-11831, however, only allows Ameritech Michigan to

include a portion of the investment attributed to the circuit demand ( $250/300 * \$1,000 = \$833$ ). The remaining portion of the cable cost ( $50/300 * \$1,000 = \$167$ ) is not included in the cost study.

### 3.5 Distribution Module Overview

The methodology used to develop DA investments reflected in the most recent cost studies submitted in U-11831 has been enhanced from that used in the past. In the past, loop samples were used as the basis to develop DA investments for each access area. The old samples were approaching 10 years old, would require significant time and effort to be redone, and did not allow for wire center specific loop costs to be developed as was required in cost studies for universal service filings. Therefore, Ameritech developed a new DA cost module as part of AFAM.

The old model used 1,800 samples. The new model uses over 4 million addresses, spanning almost 15,000 distribution areas. The new model also captures necessary loop components that were not listed or were omitted in the sample data such as interior terminals and cross-connect boxes. This model uses Network Engineering forward-looking practices and guidelines which have been incorporated into its design and algorithms.

Prior to running the DA module, all the customer addresses are extracted from Ameritech engineering databases for each DA. The addresses are geocoded into digital maps, and the DA boundaries are determined. Then, characteristics for each DA are calculated and stored, such as the optimal location of the serving area interface (SAI), number of lines, square miles, average length, etc. Using this information from each DA, the AFAM DA module is run to develop a modeled view of what the investments are in each DA. AFAM aggregates this DA-specific information for each access area.

### 3.6 Serving Area Interface Location

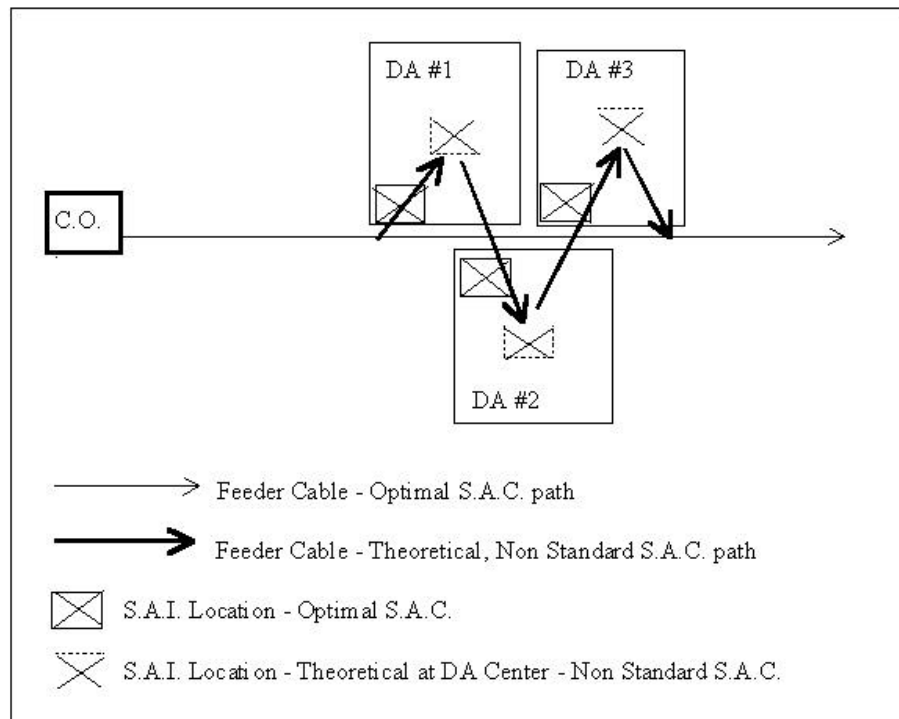
The placement location of the SAI is based on sound engineering principles. In fact, AFAM bases the SAI location on actual DA data.

The feeder/DA Serving Area Concept (SAC) design has its origins in AT&T and Bellcore loop design methods. Derivations from it are used in most telephone companies today. Ameritech's Modified Distribution Area Plan (MDAP) implements this design concept for DAs. The SAC loop design is the culmination of probably 100 years of practical loop engineering experience and research in order to efficiently and cost effectively design loop facilities. Engineers use the SAC because it is the optimal design, and within that design, they place feeder cables to each DA and place the SAI as near as possible to the feeder and DA boundary. An optimal design such as the SAC must consider all design parameters and develops a real world, least-cost network, taking into account, to the extent possible, all of the relevant variables.

Intervenors in other proceedings have attempted to argue that the SAI should not be placed at the DA boundary. Any assumption that the DA boundary is not the most cost effective SAI location fails to consider:

- Routing of feeder to an SAI at any point other than the DA boundary, such as the center of the DA, would require longer feeder lengths and more complex design. A new feeder branch would be required before the feeder could continue to downstream DAs, or the feeder would need to be routed into and out of a DA, as shown in Diagram #3 below. This would result in a non-standard SAC design and higher costs.

DIAGRAM #3



- Feeder cables use pressurized cables in a protective secured environment (conduit) in order to minimize maintenance and customer outages. They are usually large capacity cables and can be quite expensive per foot, much more than the smaller distribution cables. Increasing the length of these large capacity cables to feed an SAI at the center of a DA results in a larger feeder investment that would not be offset by the decreases in the investment in the smaller distribution cables. Total average loop length and investments are increased by placing the SAI at any point other than the DA boundary, such as the center of the DA.

- DA cables are smaller cables, which taper. As a result, the investment and size can be more easily optimized for a given area.
- The feeder end point and the SAI location are established before the DA is fully developed and populated.
- Public right of ways and availability of space for the SAI must be considered. Placing the SAI at the center of the DA may at first glance appear optimal in a theoretical design, but in reality, it may not be cost effective to establish the SAI at that theoretical location in a developed area.

### 3.7 Cable Mix Based On Age Of Construction In The Area

For construction in new developments, such as a new subdivision on previously unimproved land, buried cables are recommended in DAs. Therefore, buried cable would be recommended in a theoretical world in which one started from an entirely clean slate, or scorched earth. However, the forward-looking AFAM cost model does not assume a clean slate, but is based on existing locations of switches and feeder routes. As a result, it assumes a mixture of cable types that are reflective of actual DA conditions. This mixture in AFAM was determined by the cable types placed based on engineering guidelines in effect at the time the DA was constructed. New construction today in that same area would use approximately the same cable mix. In other words, if there are poles in alleys today, they will be there in the future. Therefore, aerial cable would be the forward-looking cable type in that DA. Ameritech or any new entrant will not normally dig up streets and alleys to bury cable in an environment that is predominantly aerial. Cost models would have to be adjusted to show the high cost of installing buried cables in such an environment. The AFAM cable type selection methodology appropriately reflects the forward-looking cable mix in each area.

Also, to the extent local communities may favor one type of plant over another, more recently placed plant may have a bias toward being buried cable rather than aerial cable. However, once an area has aerial cable, adding or replacing cable on poles tends to be acceptable in the communities. While this facet may be difficult to model, the average age of structures in an area such as a DA is most likely positively correlated with the relative share of aerial plant. Hence, further distinctions in plant mix can be captured by using the average age of housing and business structures in a specific area.

Given the large variety of circumstances that impact the efficient plant mix, the fact that these circumstances have existed over a long period of time, and that telephone companies have adapted their plant mixes over time to accommodate such circumstances, the relative plant mix in any specific geographic area should be regarded as *prima facie* evidence as reflective of the efficient plant mix.

### 3.8 AFAM Modifications Ordered by MPSC

The MPSC ordered the following changes to the AFAM cost model used to calculate unbundled loop costs:

- Eliminate the cable/equipment resizing approach used in the AFAM cost model
- Use recent vendor contract terms and prices to the greatest extent possible for the DLC equipment rather than Telephone Plant Indices ( TPIs ) or in-plant factors
- Assume the use of an integrated DLC line card at the central office terminal portion of a DLC system rather than a universal DLC line card.

The cost studies submitted in the compliance phase of U-11831 reflect these ordered changes.

### 3.9 Non-Recurring Costs

The non-recurring cost study identifies the costs for activities involved in ordering and provisioning an unbundled loop and disconnecting the loop when service is discontinued. The UNE nonrecurring cost study focused on the ordering and line connection processes for unbundled loops and unbundled ports. The UNE time and motion study began in September 1997 and was completed in December 1997. The study was further reviewed and updated during the time period of August through November 1998 based on input from various SMEs.

The functions involved in providing UNEs to CLECs are ordering, monitoring, central office provisioning, engineering, dispatch, and installation. The work groups which perform these functions and their descriptions are set forth below:

- The Ameritech Information Industries Service Center receives all UNE service orders. Service representatives then process and release the orders to downstream work groups for order completion and for entry in the billing, assignment, and maintenance systems.
- The Network Element Control Center (NECC) coordinates, monitors, and resolves problems with work groups responsible for translations, dispatch, central office work, and outside plant in order to support timely and accurate processing of UNE service orders. The NECC serves as the single point of contact to the CLEC for provisioning and maintenance.
- The Circuit Provisioning Center – Loop Assignment Center, when necessary, is responsible for the assignment of cables and pairs for unbundled loop orders.
- The Circuit Provisioning Center (CPC) – Design receives the service order via the Trunk Integrated Record Keeping System (TIRKS). Usually, the order will be designed in TIRKS and flow through with no manual involvement. Occasionally, even in simple dispatch situations, the order will require manual involvement. This could occur, for example, when the connecting facility assignments are either incorrect or associated with “already occupied” facilities. In those situations, the CPC personnel will spend time resolving the TIRKS problem, reverifying the data, and making any necessary changes before re-inputting into TIRKS.

- The Recent Change Memory Administration Center performs all switch translation work that activates an unbundled local switch (ULS) port, including adding, changing, or rearranging all line features.
- The Centralized Translation Group writes and inputs translations, or “logic tables,” for ULS when a carrier requests routing that is not already available (custom routing). They are also responsible for translations required for ULS line and trunk ports.
- The Network Administration Center is responsible for assignment of telephone numbers and simulated facilities groups in provisioning ULS line ports.
- The Ameritech Facilities Resolution Center receives a request for manual assignment from the service center when there is a facilities conflict. The work group determines if spare facilities exist before cable pairs are provided for an unbundled loop.
- The Field Dispatch Center dispatches and monitors central office technicians in order to perform central office work related to unbundled network element orders.
- The Centralized Operations Group dispatches and monitors outside plant technicians when outside field work is required in simple dispatch situations.
- Central office technicians (Field Operations Group) are responsible for installation and maintenance activities taking place within Ameritech central offices. These technicians disconnect the Ameritech end user facilities at the main distribution frame and then run jumpers to the carrier’s connecting facility assignment. The cost study does not reflect any work that is required by the central office forces in those instances where the plug-in circuit equipment located at the central office terminal must be changed from an integrated to a non-integrated design before the loop can be provisioned on an unbundled basis. Today, the cost for this extra work is intended to be recovered through special construction charges.
- The Customer Provisioning and Maintenance Group is responsible for any outside field work required for unbundled network elements.

The cost study accounts for only those instances where an order is distributed to the installation field forces in simple dispatch situations. The field technician normally will drive to the customer’s premises and, in the simplest case, terminate the customer’s drop at the network interface device. In other situations, if the existing loop terminates on DLC at the customer’s premises, additional work is required to switch the loop to an existing copper-based facility.

The cost study does not account for the additional work required for more complex dispatch situations, such as those involving dead lug throws, wire out of limits, or no facilities available. The extent and amount of the additional work necessary to provision an unbundled loop in these special situations varies and are not included in the cost studies being submitted in this proceeding, since they are considered special construction situations.

The following steps were performed to conduct the time and motion study for each work group:

- Identification of process owners and work groups.
- Collection of existing documentation related to process flows.
- Direct observation of work.
- Interviews with process owners.
- Development of process mapping flowcharts and narratives.
- Process validation with applicable work group individuals.
- Summarization of activities, average time durations, percent probability of occurrence by unbundled network element, and order type.

The purpose of the activity time and motion study is to determine how long it takes to process certain types of UNE orders. Process completion times were broken down by work group and, additionally, by process step or activity. Direct observation of the process was performed, where possible. Interviews with SMEs were conducted when direct observation was not feasible.

Although average durations for every process step or activity can be derived from the analysis and methods described above, not every step or activity occurs on each order. As a result, the durations must be weighted based on a “probability of occurrence” factor. The probability of occurrence information was obtained based on certain common scenarios (i.e., type of unbundled element or type of order) to account for the fact that service orders can vary in terms of the steps required to complete them.

The activities observed at the UNE work groups are based on the current method of accommodating carrier orders. Forward-looking pricing principles dictate that efficiencies which can be realized through further automation of processes be reflected in the nonrecurring rates developed. A forward-looking overlay was employed in the cost study to reflect the effect of process automation.

Once the “current state” analysis was completed, it was determined which service center process steps would be minimized or eliminated in a “forward-looking” environment. A three-year time horizon was used for the forward-looking forecasts. In addition, the forward-looking analysis focused only on service order access systems used at the Ameritech Information Industries Service Center. Finalized service center flows were reviewed to determine those steps that will be eliminated or modified in a forward-looking environment. Based on this review, a forward-looking flow and narrative explaining process changes was developed. Additionally, a factor was used for time study reporting purposes to determine the effect of forward-looking changes on activity durations.

The forward-looking work group times are multiplied by an appropriate hourly labor rate to develop the dollar amount of the nonrecurring costs.

The Unbundled Port Nonrecurring Cost study was conducted by interviewing SMEs. The process flow, work groups, and SMEs required for provisioning ULS orders were identified. A description of the work groups and their functions was discussed earlier in my affidavit.

The same processes, functions, and work groups that were studied to develop unbundled loop nonrecurring costs, served as the starting point for this analysis. SMEs were asked to review the

processes, functions, and work groups and identify which would apply in provisioning ULS, which would not apply, and which time estimates would differ. They were then asked to provide average time estimates for processing a service order and provisioning for a basic line port and a complex line port. The average time estimates for processing a service order were on a per-order basis, while average time estimates for provisioning a line port were on a per-port basis.

Separate average time estimates for processing and provisioning basic line ports and complex line ports were requested because there is a significant difference in the amount of time needed to provision a basic line port in comparison to a complex line port. This is true for both the retail and UNE environments. Basic line ports, which generally flow through assignment and translation, require little or no intervention. These types of ports include basic residence or business ports, Centrex basic ports, and COPTS (coin functionality). Orders for complex line ports require intervention for the line translations because there are more features, options, and complexities per port. In addition, complex line ports also call for assignment of specialized physical ports. ISDN Direct, ISDN Prime, Centrex Attendant, and Centrex ISDN are examples of complex line ports.

### 3.10 Nonrecurring Cost Computation

The Summary of Flowchart Costs included in the cost study depicts the cost components for each unbundled network element by type of work required. The report shows each work group involved in provisioning the unbundled network element, the activity code assigned to the work function, the respective hourly labor rate, and the average weighted time in minutes. The weighted average time for each work group is multiplied by the hourly labor rate to determine the cost for that group.

### 3.11 Service Ordering

The service order cost includes the activities associated with the Ameritech Information Industries Service Center for initiating a UNE request, as well as the activities of the Service Order Error Correction Group associated with billing, plus the computer costs for processing a service order through various provisioning systems. The service order cost is on a per-order basis. For example, when an order from a carrier requires provisioning of three unbundled loops at the same location and time, one service order cost is applicable.

### 3.12 Line Connection

The line connection cost is comprised of the costs categorized under “Line” and “Customer Premises Work.” In order to develop a line connection cost per unbundled element, the sum of the “Line” and “Customer Premises Work” costs is divided by the average number of elements on an order. A line connection cost per unbundled element applies. For example, when an order from a carrier requires provisioning of three unbundled loops at the same location and same time, three line connection costs are applicable.

While the unbundled port included in the cost study has the capability of a featured rather than “bare” port, additional costs are incurred by Ameritech to assign and activate the specific features to a given port.

As a result, nonrecurring costs have also been developed for the translations or software instructions required to add the initial and subsequent features to the unbundled port. These costs are not included in either the service order or line connection associated with the port. The only translation costs included in the line connection nonrecurring cost are those necessary to associate a specific port with a specific CLEC. Once this is done, additional translation costs are incurred to activate the associated features.

### 3.13 Non-Recurring Costs for Digital Loops & Entrance Facilities

Cost studies have also been completed for the non-recurring administrative, design and central office connection, and carrier connection costs for unbundled digital loops such as a DS-1 unbundled loop and for unbundled digital entrance facilities used to provide unbundled local transport.

Both the service ordering and line connection activities are significantly more complex for these types of unbundled digital loops. Separate nonrecurring cost studies were submitted in U-11831 for these more costly unbundled digital loops.

There are three different nonrecurring costs associated with unbundled local transport and unbundled digital loops: administrative cost, design and central office connection costs, and carrier connection costs.

The administrative costs are for the activities performed to initiate the service request by the service center and for any order-related activities performed by the “downstream” work groups. The costs associated with these tasks are incurred on a per order basis.

The design and central office connection costs are for the activities associated with analyzing the CLEC’s request for service, design of the circuit to meet transmission requirements, selection and assignment of local facilities, connection of equipment at the central office, and testing of the connections within the central office. The costs associated with these tasks are incurred on a per termination basis.

The carrier connection costs are for the activities required to make the physical connections from the serving wire center to the CLEC or end user, including the coordination and testing necessary to ensure that all transmission parameters have been achieved consistent with specifications set forth in the tariff and associated technical references. The costs associated with these tasks are incurred on a per termination basis.

The nonrecurring costs were developed based on a task oriented costing (TOC) methodology. Once the weighted mean time durations for provisioning unbundled digital loops or unbundled local transport were calculated, they were summarized by work group and cost category. The time estimates were then multiplied by the appropriate directly assigned hourly labor rate to determine the costs.

### 3.14 Non-Recurring Costs for Changes & Cancellation of Service Orders

Ameritech Michigan introduced in the U-11831 proceeding cost studies for the cancellation and change of service orders for unbundled loops, unbundled local switching, unbundled tandem switching and unbundled local transport.

### **Cancellation Costs**

Costs are incurred by Ameritech when a customer cancels an order for unbundled network elements. Costs are incurred from the date the order is placed up to the point at which the order is canceled. This study identifies the applicable costs for cancellation with the “critical dates” associated with the provisioning process. Since the costs increase as successive critical dates are reached, this study forms the basis of future costs incurred when an order is canceled. The costs used here are the same costs and involve the same work groups as those shown in the UNE service order and line connection nonrecurring cost studies.

### **Change Costs**

Changes in an existing order also result in additional costs to Ameritech. The study identified two varieties of change-related costs. The first is an “alternate due date request,” which involves either a change of date to a pending order or a request for a date earlier than the standard interval. In this instance, only the service center costs are applicable.

The second variety of a change-related cost involves a change in service or equipment which is requested subsequent to the placing of the initial order. As with cancellation costs, this study associates the costs of the order process with several “critical dates.” Since only one set of critical dates is applicable to the order process, the costs by critical date for changes is identical to those for cancellations.

### **3.15 Other Unbundled Loop Cost Studies**

In addition to the 8dB 2 Wire and 4 Wire POTS unbundled loops, monthly costs are also computed for ISDN basic rate interface (BRI), DS1, Ground Start, Electronic Key, 2 Wire ADSL and 2 Wire and 4 Wire HDSL unbundled loops. The study methodologies are similar to the methodology used in the 8dB POTS unbundled loop cost study, although cost data are unique to each type of unbundled loop. For details on these cost studies, refer to the documentation titled Unbundled Loop Cost Study submitted in Case No. U-11831.

### **3.16 Nonrecurring Cost study Modifications Ordered by MPSC**

The MPSC in its order in U-11831 ordered that the changes shown below be made to the cost studies originally submitted by Ameritech Michigan. Ameritech Michigan complied with the Commission order and revised its cost studies accordingly.

- A 2% fallout rate is applied once to the entire provisioning process for simple or complex services to account for all resolution of system related errors in all applicable work groups.

- Redefines certain nonrecurring costs as recurring costs, removes them from NRCs with no additions to recurring costs.
- Reduced time estimates of various network functions
- 50% reduction of certain costs such as NECC coordination costs
- Elimination of computer service order processing costs.
- Elimination of the inside and outside manual dispatch functions.
- Elimination of the CPC design function.
- Treat disconnect costs separate from the costs to install. Identify the costs and recover them at time of service disconnection.

## **4.0 Switching Costs**

### **4.1 Study Purpose**

The purpose of this study is to determine the costs for the unbundled line side and trunk side end office and tandem ports. Additionally, this study determines the costs for the various usage based UNEs.

### **4.2 Study Flow**

In order to understand Ameritech's unbundled port cost study, it is critical to know that Ameritech now procures switching equipment and related traffic engineering services in an entirely different manner than it did when Ameritech Michigan last submitted its cost studies in Case No. U-11280 in January, 1999. The cost studies for unbundled ports submitted in Case No. U-11280 were based on the "old" switch vendor pricing arrangements or contracts. These contracts typically reflected individual prices for each discrete component of central office switching equipment, along with discounts for each of the Ameritech operating companies, such as Ameritech Michigan. At that time, the Switching Cost Information System (SCIS) cost model was used to identify the investments for central office services or elements. The contracts Ameritech has with its switch vendors, referred to as Partners in Provisioning (PIP), are entirely different in structure as compared with the old. As a result of these changes, a new cost model had to be developed to match the latest agreements between Ameritech and its central office switch equipment vendors. This new model is called the Ameritech Regional PIP Switching Model (ARPSM).

### **4.3 ARPSM Methodology**

The current switch vendor contracts provide separate prices for "cutover" lines, or those lines currently served by an analog switch which is to be replaced by a new digital switch, and

“growth” lines, defined as additional lines installed on existing digital switches. These line prices are specific to the vendor, and do not vary by the number of lines purchased, the year purchased, nor by the Ameritech operating company in which the lines are installed. For each vendor, the price for growth lines is greater than the price for cutover lines, and each vendor will, of course, only install growth lines on its own digital switches.

Although Ameritech faces two contractual prices per line, per vendor for switching, one for growth lines and another for cutover lines, it faces only a single implicit price for switching, which should be passed on to all customers, including CLECs. This is due to the fact that the capability being provided to end users by both growth and cutover lines is functionally equivalent. Therefore, reasonable projections of future capacity needs and the cost of capital used in the cost studies are used to blend the two line prices together into a single implicit price.

The contracts cover both analog lines; i.e., those lines which terminate at the switch that are served by copper facilities, and digital lines; i.e., those lines served by digital loop carrier systems. The vendors charge Ameritech different prices for analog and digital growth lines in existing digital switches. However, the end user sees no difference between analog and digital lines; only engineering principles dictate which line to use in a particular situation. Therefore, it would be inappropriate to price the two lines differently to end users. ARPSM separately calculates the implicit vendor portion of investment for analog and digital lines based on analog and digital-specific prices and quantity estimates for each of the three separate switch vendors.

As I described earlier, the prices for cutover lines for each vendor were specified in the switch replacement contracts. Also known is the number of cutover lines served by each replacement switch and included in the 1A switch replacement contracts.

Additionally, the prices for growth lines for each vendor were specified in the PIP contracts. The number of growth lines was estimated by applying the expected annual growth rates for 1998 to the 1997 total switched access lines in service, as reported by Ameritech Michigan in the FCC’s Automated Reporting Management Information System (ARMIS) Report 43-03. Next, the expected annual growth rate for 1999 was applied to the resulting total switched 1998 lines. This process was repeated through 2003, the length of the contracts. These expected growth rates were obtained from Ameritech’s Local Area Forecasting Group. The 1997 ARMIS data and 1996-1997 growth rate was also used to estimate 1996-1997 line growth so that all years addressed by the vendor contracts were included in the analysis.

Weighting factors were then applied to these estimates of total growth lines to determine the number of growth lines by vendor. These weighting factors were calculated from data obtained from network engineering regarding the quantity of lines served by the different switch types; i.e., Lucent, Nortel, and Siemens.

Before melding together the costs of analog and digital lines, one final adjustment was required to the quantity of digital growth lines. The contracts specify a price for a DS-1 digital line, which contains 24 digital channels. However, Ameritech’s growth estimates were measured in number of DS-0 channels, which are single voice grade digital channels. Therefore, the prices specified for a DS-1 line had to be converted into DS-0 prices. No such adjustments were required for digital replacement lines or any analog lines, as the prices for these lines were calculated on a per-line basis.

Once the implicit prices of analog and digital lines were calculated, they were melded together into a single price per line. This was done by applying a weighting factor calculated from actual digital and analog line growth during the period between April and December 1997. These costs were blended to produce vendor-specific costs per line.

In addition to the per line prices, the vendor contracts specify a fee per cutover line for the central office switch right-to-use (RTU) software. These RTU fees do not apply to growth lines under these contracts. As explained earlier, a single price per line, regardless of whether it is a cutover or growth line, is calculated in ARPSM. Therefore, RTU fees were spread over all lines.

The switch vendors also assess “revenue ready” (RR) fees. These are assessed on a per-line, per-year basis by the switch vendors to compensate them for the traffic engineering and provisioning functions now provided by the vendors, as well as for any processor upgrades and new switch generic releases. Previously, Ameritech handled these functions. Each year, Ameritech pays a RR fee for each working line in service. The contracts specify RR fees for 1997 through 2000. ARPSM assumes that the RR fees would remain constant between 2001 and 2003, at the same level as specified for the year 2000 in the contracts. RR fees do not vary by type of line (cutover versus growth, analog versus digital), and so no melding or averaging was necessary.

Next, the costs of interoffice trunk ports were calculated. The vendors price trunk ports on a DS-1 basis. Consequently, the trunk price was divided by 24 to convert trunk prices into DS-0 prices. ARPSM then calculates a weighted average of the trunk price relevant to growth lines and the trunk price relevant to cutover lines (which is zero, since trunk ports are included in the switch replacement costs). The weights are the discounted present value of the number of additional trunks needed each year to accommodate growth lines and the discounted present value of the number of trunks installed each year as part of an analog switch replacement.

The line termination, RTU, and RR outputs of the ARPSM model, when added together, equal the investment used to develop this portion of the costs for unbundled local switching line ports. These costs are added to the costs of a main distributing frame termination, telephone number, intercept, directory, and other additional expenses related to methods and procedures development, reports processing, and billing systems development to arrive at the overall TELRIC of the unbundled port. The investment per trunk output of ARPSM is used to develop the costs for ULS trunk ports.

The investment-per-CCS output of the ARPSM model is one of the inputs used in the NCAT model to develop the TELRICs for usage related costs for unbundled local switching, unbundled tandem switching, transiting, reciprocal compensation.

#### 4.4 ARPSM As Contrasted With Other Cost Models

Since ARPSM is an entirely new cost model from those used in Case No. U-11280, the following explains how ARPSM fits into the family of cost models. ARPSM is a model that processes switch vendor contract data to produce forward-looking vendor prices for switching components

that are subsequently used as investment inputs to other Ameritech Michigan cost models, such as NCAT, which calculates average costs for usage services and UNEs.

The SCIS model used in the past was developed to convert very detailed component-by-component vendor pricing data into a format that was usable in TSLRIC studies. SCIS used engineering rules to assemble and develop investments for the switching components that make up network functions and services that are the subject of TSLRIC studies. ARPSM plays the same role in today's cost study process, given the current procurement arrangements. ARPSM is a tool used to convert the flat per line pricing structure contained in current switch vendor contracts into a form that is usable for various TSLRIC/TELRIC cost studies. Hence, the intent of both the SCIS and the ARPSM models is identical.

Both ARPSM and SCIS outputs provide the vendor portion of investments for lines, trunks, and CCS. These outputs are used as one of the inputs to other cost models, such as NCAT or the Common Channel Signaling Cost Information System (CCSCIS) models. These outputs are also used in conjunction with cost models such as AFAM in developing TELRIC/TSLRIC studies.

Finally, SCIS and ARPSM are consistent with respect to the model office approach previously used in SCIS. The methodology employed by SCIS used the characteristics of all the digital switches in Ameritech's network to develop a typical or "model office." The model office characteristics were used only to determine how many individually priced vendor switching components on average across Ameritech Michigan's network were required to provide the functions and services that are the subject of the TSLRIC or TELRIC analyses. Under the ARPSM methodology, however, there is no need to create an average or model office because the contracts specify one flat price per line for all switches in all states. The same flat pricing applies whether or not Switch A is configured differently from Switch B. This flat per line pricing structure functionally replaces much of the SCIS methodology, as it already reflects the vendor's view of the Ameritech model office and the average Ameritech requirement for central office equipment components required by various UNEs or services.

#### 4.5 Changes Ordered by the MPSC to the ARPSM Cost Model

The following changes to the ARPSM cost model were ordered by the MPSC:

- Change the meld of cutover vs. growth lines.
- Change the portion of the line cost that is assumed to be CCS related.
- Remove an amount of costs from the price per cutover line to account for the trunk costs that are implicitly included in those prices.

Ameritech Michigan modified the algorithms in ARPSM to comply with the Commission's order and reran the model. The revised model outputs were then flowed to the various cost studies in Case No. U-11831 that use the outputs.

#### 5.0 Unbundled Local Switching, Reciprocal Compensation, Unbundled Tandem Switching, and Transiting

## 5.1 Study Purpose

The purpose of these cost studies is to determine the costs for these usage based UNEs. The cost studies submitted in Case No. U-11280 for these elements utilized the NCAT model to develop these per minute of use costs. NCAT also was used to develop the costs submitted for these same items in U-11831 proceeding. The NCAT model has been updated to reflect current annual cost factors and investments.

## 5.2 Cost Study Flow

NCAT produces set up costs per call and duration costs per minute for six basic usage network cost categories. These categories are the end office switch; tandem office switch; interoffice facility; facility termination; SS7 signaling; and measurement costs. Billing related expense per message costs are then added to the network costs produced by NCAT. NCAT calculates the incremental usage costs by dividing the incremental investment, translated to annual costs, over the traffic load to derive a precise approximation of the incremental cost per message or per minute.

NCAT is a Telcordia developed and maintained model that has been used in the past by Ameritech to develop both LRSIC/TSLRIC and TELRIC costs associated with network usage. It determines the network resources required based on the busy hour usage of the network components. The model then calculates the cost associated with using these resources on a minute-of-use (MOU) basis for all calls. The developed costs include those for switching at end offices and tandems including the cost of recording details for billing as well as the cost of trunking between switches including SS7 costs.

The system consists of a database and a calculator. The database contains information regarding network configuration end office and tandem switches, facilities between these switches, and the procedures for routing calls over these facilities. The database also contains the forward looking unit investments for these resources. The switching and SS7 investments are developed in ARPSM and CCSCIS respectively. Facility and termination investments are developed outside the NCAT model for the unit investment in cable and wire facilities as well as the related electronics required to connect the various switches. The database also contains usage data, some assumptions regarding the network (for example, complete SS7 deployment), and factors which relate these investments to costs.

The calculator portion of the system completes calls between each pair of originating and terminating points for each traffic record in the usage data. Based on the routing priorities, the routes actually available, and their capacities the traffic for the studied service is routed over the network using the time of day usage generated by the service and busy hour resource requirements are determined.

Costs are based on the busy hour capacity of the various resources consumed by the particular service being studied. The final costs are then a composite representative of the traffic between all pair points in the studied network developed as a MOU for all calls.

By studying the forward-looking investments associated with carrying traffic over the actual network configuration that is used in providing service, the system provides costs specifically related to the service being studied.

NCAT develops these costs in a very granular form. The overall cost per MOU can be separated into costs associated with setting up the call and the duration of the call. These can further be broken into various switching, facility, termination, measurement, and SS7 components. This allows flexibility in examining the various piece parts of the network and ensures that only the appropriate components are included in the development of costs for any studied service.

### 5.3 Unbundled Local Switching Usage

The starting point for developing this “per minute of use” cost is the NCAT analysis performed for business and residence local usage. The end office trunk termination cost component was then “zeroed out.” This was done since the cost for the trunk termination is associated with a different UNE. The resultant end office switching costs were then combined with the measurement, SS7 signaling, and the bill inquiry portion of the billing expense costs to produce an overall average cost per minute for this UNE.

### 5.4 Reciprocal Compensation

The starting point for this study is an NCAT analysis performed for Feature Group D (FGD) service. The non-conversation time related cost, however, was excluded at the end office since it does not apply to the terminating part of the call. The NCAT cost categories were then mapped to the reciprocal compensation elements as follows:

- End Office Local Termination – End office switching, measurement, SS7 signaling, billing expense.
- Tandem Switching – Tandem switching only.
- Tandem Transport Facility Mileage – Facilities only, per mile.
- Tandem Transport Termination – Facility termination only.

### 5.5 Unbundled Tandem Switching

The starting point for this study is the NCAT analysis performed for reciprocal compensation. The tandem office trunk termination cost component was then “zeroed out.” This was done since the cost for the trunk termination is associated with a different UNE. The resultant tandem switching cost was then combined with the measurement, SS7 signaling, and bill inquiry portion of the billing expense costs to produce the overall average cost per minute for this UNE.

## 5.6 Transiting

The starting point for this study is the NCAT analysis performed for reciprocal compensation. The end office costs were then removed. The NCAT cost categories were then mapped to the transiting elements as follows:

- Tandem Switching – tandem switching, measurement, SS7 signaling, and billing inquiry part of billing expense.
- Tandem Transport Termination – facility termination only.
- Tandem Transport Facility Mileage – facilities only.

In addition to these costs, costs per minute of use were also developed for the Ameritech Michigan portion of the regional costs for customer bill accounting, ITAC resources, and ITAC/CAMPS methods and procedures.

## 5.7 Changes Ordered by the MPSC to the Unbundled Local Switching, Reciprocal Compensation, Unbundled Tandem Switching, and Transiting

The MPSC ordered Ameritech Michigan to develop a single cost for local switching and a single cost for tandem switching and map those costs to any service that uses switching. Ameritech Michigan complied with the MPSC's directives and submitted revised cost studies in January, 2000. In its August 31, 2000 order, however, the MPSC required that Ameritech instead use the usage costs submitted by ATT for these elements.

## 5.8 Other End Office Switching Costs

In addition to unbundled local switching, unbundled tandem switching, reciprocal compensation transiting and the analog line- and trunk-side ports, which are the primary switching network elements, there are other network elements for which costs have been computed at this time. They include the following:

- *Basic Rate Interface Port and Primary Rate Interface Port.* Basic rate interface (BRI) and primary rate interface (PRI) ports provide access to end offices for the use of Integrated Services Digital Network (ISDN) features and functions. The BRI port provides the capability for two 64 kilobit per second channels and one 16 kilobit per second channel. The PRI port provides for 23 64 kilobit per second channels and one 16 kilobit per second channel. The two ports are elements of ISDN services that can be used to provide end-users with voice and data communications.
- *Two-Wire Analog Trunk Port (Direct Inward Dial).* The study determines the recurring and non-recurring costs to provide an end office trunk connection capable of providing direct inward dialing (DID). DID is a central office feature which enables incoming calls to private branch exchanges (PBXs) located on customers premises to be handled without the assistance of an attendant. Calls are routed directly to the PBX that

provides answering and supervision of calls. The study determines the incremental investment and recurring monthly costs for equipment necessary to provide this feature. Non-recurring costs for providing switch translations at service activation also are included in the study. Recurring and non-recurring costs also are developed for unbundled DS1 trunks.

- *Feature-Related Non-Recurring Costs.* There are several studies that develop the costs of activating central office features. These include features available on analog DID line ports (e.g., custom calling and CLASS features), ISDN port features and Complex Centrex features. The studies identify activities, such as performing switch translations, necessary to activate features and the time required to perform the activity. Direct labor rates are used to compute non-recurring costs.

The study documentation for each of these network elements provides details on input cost data, calculations and results. In each case, the general approach described in section 2 is followed. Refer to the individual study documentation for additional information.

## **6.0 Transport Costs**

### **6.1 Study Purpose**

*Transport* refers to cable facilities, circuit equipment and other plant providing communications paths among Ameritech Michigan's central offices. Transport facilities are used to provide *dedicated transport* for private line and other special services and *shared transport* for local and toll message traffic. Dedicated transport unbundled network element costs are computed in Ameritech Michigan's Unbundled Inter-Office Transport cost study, and common transport costs are computed in the Unbundled Local Switching-Shared Transport cost study. The studies provide recurring costs and non-recurring costs for service activation of transport network elements.

### **6.2 Unbundled Inter-Office Transport**

The Unbundled Inter-Office Transport cost study calculates the cost to provide network elements for dedicated entrance facilities of varying bandwidths and lengths and inter-office transmission facilities between Ameritech Michigan's central offices. The network elements included in the study are:

- *Entrance Facilities.* Cable and circuit equipment for access from a customer's premises to the Ameritech Michigan serving central office. Access is provided via a dedicated channel with bandwidth at the DS1 level (1.544 megabits / second), the DS3 level (45 megabits / second or equivalent to 28 DS1 channels), OC3 (155Mbps), OC12 (622 Mbps) and OC-48 level. The DS-1 and DS-3 entrance facilities costs are geographically deaveraged by Access Areas A, B and C.

- *Interoffice Transmission Facilities.* Inter-office (IO) facilities are the cable and circuit equipment between Ameritech Michigan's central offices that provide communications paths among the offices. Fiber optic transmission facilities are assumed. Costs are computed for the DS1 DS3, OC3, OC12 and OC-48 bandwidths. Interoffice facilities require circuit equipment at each central office. Between central offices are fiber optic cable facilities. The amount of cable depends on the route mileage between offices. Recognizing these factors, the study determines interoffice facilities costs per central office termination and per mile.
- *Multiplexing.* The capability of combining multiple transmission channels over the same transmission facilities. Costs are provided for DS1 to DS0 multiplexing (i.e., combining 24 voice grade channels to form one 1.544 megabit channel) and DS3 to DS1 multiplexing (28 DS1s for one DS3), OC-3 to DS-3, OC-12 to OC-3 and DS-3, and OC-48 to OC-12, OC-3 and DS-3.

### 6.3 Entrance Facilities Costs

Entrance facilities consist of loop plant from a customer's premises to the Ameritech Michigan serving central office and circuit equipment located at the customer's premises and the central office. For a DS1 entrance facility, examples of circuit equipment include DLC equipment, office repeaters and smart jacks.

The loop portion (copper/fiber cable and DLC circuit equipment) of entrance facilities costs is computed in the same manner as unbundled loop costs described in Sections 3.2 - 3.8. The AFAM model is used to compute the loop investment per entrance facility. The DS1 cable investment reflects a mix of copper and fiber cables and cable types (aerial, underground and buried). For DS1 entrance facilities, fiber feeder cable is assumed for feeder cable over a certain breakpoint. DS3, OC3 and OC12 entrance facilities are assumed to be all fiber.

The circuit equipment investments for copper and fiber facilities are weighted based on the prospective mix of these cable types to compute average circuit equipment investments.

### 6.4 Inter-office Transport Costs

The unbundled interoffice transport studies provide current and accurate estimates of forward-looking interoffice facilities. These studies, utilizing a bottom up approach, develop the costs for each unbundled interoffice transport element.

The study is the result of collaboration among many teams and subject matter experts (SMEs) involved with those facilities. Forward-looking technologies and weightings were determined by Network engineers and SONET and inter-office Product Managers. Inter-office network characteristics, configurations, and equipment prices were obtained from Network engineers and vendors. All elements were defined, configurations and weightings determined, components costed, and all components added together to produce results for each element. This process produces the most accurate estimate of UNE costs available because it builds all configurations

using a bottom up approach and uses the most current engineering practices and forward-looking technologies. The unbundled interoffice transport cost study reflects updated technology configurations from those used in the studies submitted in Case No. U-11280.

This study assumes an all fiber digital, SONET-based, interoffice network. The forward-looking technologies employed by Ameritech Michigan are the Fujitsu FLM2400, FLM600, and FLM150, which have capacities of OC-48, OC-12, and OC-3 respectively. Each of these technologies has its own set of common hardware and other plug-in cards and equipment required to provision the various bandwidths and services required. A weighting of these three technologies is used which represents the forward-looking mix that is expected for this equipment.

With help from the vendor, Ameritech product managers, and Network SMEs, the equipment configuration(s) for each unbundled interoffice transport element were determined. These configurations include all relevant equipment such as the Fujitsu FLM equipment, fiber cross-connects, DS-1 and DS-3 cross-connects, fibers, entrance facilities, etc.

#### 6.5 Changes ordered by the MPSC to the Unbundled Inter-Office Transport

The MPSC ordered that Ameritech Michigan rely on its equipment vendor contracts when determining the underlying investments. If the vendor contracts do not provide the necessary detail, Ameritech Michigan is to reduce its investments for the circuit equipment by 30% and its in-plant factors by 15%. Also, TPI factors should not be used for this type of equipment.

The revised cost studies submitted by Ameritech Michigan in the compliance phase of U-11831 incorporate these ordered changes.

#### 6.6 Unbundled Local Switching-With Shared Transport (ULS-ST)

The ULS-ST cost study, submitted and approved by the MPSC in Case No. U-12622, combines two unbundled network elements, local switching and shared transport. Local switching provides access to the features, functions and capabilities of the local switch while shared transport provides access to the local transmission facilities that connect Ameritech Michigan's network of end office and tandem switches.

In its order, the MPSC also reaffirmed its prior decision in Case No. U-12465 to require Ameritech Michigan to make its shared transmission facilities available for routing intraLATA traffic, including traffic that would be rated as toll calling under Ameritech Michigan's tariffs.

#### 6.7 Non-Recurring Transport Costs

Non-recurring costs are computed for the entrance facilities used for unbundled inter-office transport as described in Section 3.13. These non-recurring costs are for the administrative, design and central office connection and carrier connection cost elements.

Activity times are applied to direct labor rates for each work group to calculate activity costs, and these amounts are adjusted by the probability the activity occurs each time a network element is ordered. Activity costs for all work groups are summed to compute the non-recurring cost.

## **7.0 Other Network Element Costs**

### 7.1 Overview

The FCC Order requires incumbent local exchange carriers to provide access to a number of unbundled network elements besides local loops, end office switching and transport.<sup>3</sup> Ameritech Michigan has completed cost studies for these other network elements, and in this section, a brief description of the studies is provided. For further information, refer to the documentation for each study provided in Case No. U-11831.

### 7.2 Access To Signaling System 7 (SS7)

Access to SS7 provides the ability for CLECs to obtain access to the Company's SS7 network including access to signaling ports and links.

Cost studies have been completed for elements of Ameritech's SS7 network.

- *SS7 Transport.* This study determines the *cost per octet* for use of signal transfer points (STPs) and links in the SS7 network. An octet is the measure of usage in a packet data network such as the SS7 network. An STP is a packet switch that routes signaling messages among the points in the SS7 network. SS7 transport is required by local exchange carriers for call processing and other networking functions.
- *STP Port.* The STP port cost study computes the *recurring monthly cost per port* for a termination on a signal transfer point through which signaling messages enter Ameritech's signaling network. The study also includes non-recurring costs for activities necessary to establish the port connection.
- *Queries.* Costs are determined for SS7 queries on a *cost per query* basis. The first, access to Line Information Data Base (LIDB), provides access to billing validation data to support alternate billing services such as calling card, collect and third number billing.

The second, access to 800 Data Base, provides access to the Company's 800 Service which is an originating offering that provides a carrier identification function for numbers using toll free service access codes. The carrier identification function is performed using queries which are routed using the Company's SS7 network to the Company's Service Control Point.

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<sup>3</sup> See paragraph 51.319 of the FCC Order (Appendix B, pages B-20 - B24) regarding specific unbundling requirements.

The Telcordia Technologies Common Channel Signaling Cost Information System (CCSCIS) is used extensively in the SS7 cost studies to compute investments per unit of demand (octets, ports and queries).

CCSCIS is an interactive PC based computer model which develops investments of the Signaling System 7 (SS7) network that is used to both establish the connection of various types of calls and provide Advanced Intelligent Network (AIN) services.

CCSCIS contains seven models. These models include two Signal Transfer Point (STP) models, three Signal Control Point (SCP) models, an SS7 link model and an aggregation model. The system models STPs manufactured by two different vendors: DSC Communications Corp. and Nortel. The SCPs modeled include three versions of SCPs: Lucent Technologies, Digital Equipment Corporation (DEC) and Ericsson. The Link Model examines several types of CCS links, each of which can contain many different transmission technologies. The Aggregation Model combines the outputs of each of the other models to determine combinations useful to calculate costs for various services or UNEs. Cost results are based on relative usage. That is, the model expresses the cost of the shared switching equipment as a function of the capacity consumed to provide various features and functions studied.

CCSCIS incorporates a “bottom up” approach to provide detailed forward looking costs of individual parts of the CCS network. The objective is to develop basic common denominators of cost that can be combined in various ways to obtain the costs of various services or UNEs

Equipment prices are regularly updated, and the models are revised to include additional functions and engineering changes necessary to keep pace with the rapid evolution of the SS7 network and services that require its use. The investment drivers or “cost primitives” calculated by CCSCIS are: the cost of transporting one octet (8 bits) of an SS7 message on various types of links, the cost of processing one octet of a message by STP link termination equipment, the cost of processing some special types of messages (database queries of various services, global title translations, and gateway screening), the costs of storing database records in SCPs, and the costs of terminating SS7 links on STPs.

A CCSCIS model study is used to calculate costs for either a single piece of STP or SCP equipment as well as for all or part of an entire CCS network. If multiple STPs or SCPs are present in the network, weighted averages are calculated in the CCSCIS Aggregation Model using weights derived from user data entered in the individual studies. These values are combined using network parameters entered by users or derived from input data. The final outputs of the aggregation process are combined unit investments. These values are calculated for messages between switching entities, for SCP database queries from switches or from outside the company’s SS7 network. These investments are then translated into monthly or annual costs using annual cost factors obtained from the ECONS/CAPCOST model.

## **8.0 ECONS/CAPCOST**

### **8.1 Overview**

A computer program called Economic Costs of Network Services (ECONS) performs the calculations required to develop the investment and recurring incremental costs for the product or service under study. At a point during its processing, ECONS accesses the Capital Cost (CAPCOST) program to perform capital cost calculations. CAPCOST is a program which determines capital costs using cost of money rates, and federal and state tax regulations. ECONS has been used by Ameritech Michigan for many years.

## 8.2 Investment

ECONS derives total unit investment from material and labor related inputs.

If the material investment is circuit equipment, an inventory factor is applied to the projected material price to account for the material held for anticipated service requirements. The factor may be product specific, or it may represent an account average value.

Sales tax expenses are calculated by applying a sales tax factor to the material price and the inventory loading. The last consideration related to material investment is supply expense. Supply expense is the cost incurred by Ameritech for delivery of material from the distribution center to company-specific and customer locations. Supply expense is calculated in ECONS by applying a factor to the material cost and sales tax expense components derived above.

Labor related investment inputs consist of plant installation hours, engineering hours, plant labor rates, plant vehicle rates, engineering labor rates and installation factors. For many products, work times for the specific installation function are obtained from engineering evaluations and special studies. Engineering activities include design and ordering of equipment configurations and job scheduling. Hourly labor rates include the basic operational salary, plus loadings for Social Security, Relief and Pension, and motor vehicles used by the motorized plant forces who perform installation activities. ECONS computes total labor costs by multiplying the product specific work time by the appropriate labor rate, or by applying a factor to material cost. Estimates of labor rates were derived from special studies. ECONS will then capitalize the labor costs to reflect the appropriate accounting treatment. Capitalized labor costs are added to the material investment to obtain the total unit investment.

When the investment is obtained directly from other cost models such as SCIS, AFAM, CCSCIS, or FIC, the investment is often multiplied by an annual cost factor derived from ECONS rather than run separately through the ECONS model. The annual cost factor captures the capital cost and operating expenses related to the investment under study.

When applicable, a power and floor space factor is applied to the material price to account for the investment related to power equipment such as generators and the investment related to the floor space required to support central office switching and/or circuit equipment.

## 8.3 Definition of Capital Costs

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

- *Depreciation* is the annual expense of recovering the original construction cost of telephone plant, less any net salvage, over the service life of the plant. Depreciation is computed for each plant account based upon the prospective lives and expected net salvages.
- *Cost of money* is the annual return required on investor supplied capital used to construct telephone plant. The return requirement includes the prospective costs of debt and equity, weighted by the proportion of debt and equity anticipated in Ameritech's forward-looking capital structure.
- *Income taxes* represent the amount of income taxes that would be owed on taxable income from revenues sufficient to cover the cost of equity after taxes.

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

#### 8.4 Capital Cost Calculation

The first component of capital cost is book depreciation expense. Leading to this calculation, CAPCOST first calculates plant investments for the total demand units in each vintage year of the forecast period. Book depreciation amounts are determined by total investment, less future net salvage, and the estimated economic life characteristics. The depreciation reserve accrues the book depreciation expense amounts and at a given time represents the total of all prior accruals.

#### **CAPCOST - Cost of Money**

The second component of capital cost is the cost of money, which is based on the net investment. Before it can be computed, a deferred tax reserve due to accelerated depreciation must be considered since it impacts the net plant investment. With accelerated tax depreciation, tax deduction amounts are claimed in greater amounts during the earlier years of an asset's life than during the later years. The Accelerated Cost Recovery System (ACRS) is the method of accelerated depreciation used by CAPCOST. With ACRS, the cost of plant is recovered over a 3 year, 5 year, 7 year, or 15 year tax life depending on the type of plant. CAPCOST computes the annual ACRS tax depreciation deduction by multiplying the tax basis of the investment by a statutory percentage. The percentage to be applied depends on the plant's ACRS property class. The deferred tax reserve is computed by subtracting the annual tax depreciation deductions that would have been declared if book depreciation had been used for tax purposes, from the deductions arising from accelerated depreciation (ACRS). The deferred tax reserve and the book depreciation reserve are subtracted from the gross plant investment to produce the net plant balance. The annual cost of money is then computed by multiplying the net plant balance by the forward-looking cost of money rate.

#### **CAPCOST - Income Tax Expense**

The last component of capital costs is income tax expense. Income tax expense is computed by multiplying the income tax rate by the equity portion of the cost of money. The annual debt interest portion of the cost of money is not taxable.

### **Further Steps in the ECONS Process**

At this point, CAPCOST has computed the capital costs, year-by-year, for the cumulative sum of investments required to serve the forecast demand. Its last function is to time-value average these annual costs over the life of the asset. These capital costs are then passed back to the ECONS program.

#### **8.5 Operating Expenses Calculations**

Next, the ECONS program will calculate the recurring operating expense of *ad valorem* taxes and maintenance. *Ad valorem* taxes are directly related to the level of investment on a factor basis; i.e., *ad valorem* taxes equal the unit investment times the factor. The *ad valorem* tax factor is a ratio of property taxes paid to investments for plant in-service.

Other expenses such as marketing, advertising and sales expenses are identified for each service studied and are summarized and displayed outside of the ECONS model.

Maintenance expenses consist of labor and material costs incurred in the upkeep of plant. Where specific maintenance information is not available, maintenance factors are multiplied by investment to compute annual maintenance costs. This is generally the case with outside plant and central office studies. These factors are derived by dividing average annual maintenance dollars by average annual investment on a plant account basis.

The total annual cost is the sum of all recurring cost components; i.e., depreciation, cost of money, income tax expense, *ad valorem* taxes, maintenance expense, power, and floor space costs. Where applicable, non-recurring expenses may be identified as separate cost items.

### **9.0 Investment Loadings**

#### **9.1 Definition of Investment Loadings**

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

Investment loading factors represent the ratio of these additional costs to the primary plant construction costs, such as the ratio of power equipment cost for switching systems to the cost of the switching system itself.

## 9.2 Description

Investment loading factors are used in the unbundled network element cost studies. The factors are based on special studies of financial and engineering records and vary by state.

- *Inplant factors.* These factors are used to translate material prices into installed component unit investments. The in-plant factors are developed separately for hardwired and plug-in equipment and includes telco engineering and installation, sales tax, supply expenses, shipping and common equipment. The factors are based on a special study using data from the Plug-in Inventory Control System and Detailed Continuing Property Record database for a three consecutive year period.
- *Investment Weighting factors.* These factors are used to compute the portion of total installed costs or investment that is material, contractor installation, contractor engineering and telco specific labor and engineering. The factors are based on special studies utilizing information in the Ameritech Standard Detail Transaction File database.
- *Loop Installation factors.* These factors are similar to In-Plant factors in that their application translates outside plant cable (copper and fiber) material prices into total installed costs. These factors are based on a special study using data from the Financial Common Presentation System for a three consecutive year period.
- *Power equipment factor.* The power equipment factor is used to compute the costs of electrical equipment, such as generators, batteries, etc., needed to operate central office switching and central office transmission equipment. It is based on a special study.
- *Floorspace factor.* A floorspace factor is used to calculate the forward-looking investment in building space needed for central office switching and transmission equipment. Costs for central office floorspace are based on RS Means Building Construction Cost Data.

## 9.3 Inflation Factors

Unbundled network element costs reflect telephone plant investment and operating expenses assuming forward-looking network technologies, construction costs and operating labor costs. For example, material, labor and other cost data used in the cost analysis, though, reflect recent and current price levels during the 1995 - 1996 timeframe. Inflation factors are used to reflect inflation in prices from 1995 - 1996 to the present and, if appropriate, to the mid-point of a future planning period. The Ameritech Michigan cost studies submitted in Case No. U-11831 reflects costs at a year 2000 point in time.

In the MPSC's order in that proceeding, it required that Ameritech Michigan use the Commission Staff's proposed inflation factors, rather than those proposed by Ameritech Michigan. The MPSC also ordered that inflation factors not be used for digital equipment, where it concluded, the market is changing rapidly. The Commission instructed Ameritech Michigan to rely on recent vendor contract information, rather than an index.

## **10.0 Operating Expense Factors**

### **10.1 Definition of Operating Expenses**

Operating expenses are the *maintenance and ad valorem recurring* costs attributable to a network element. Recurring expenses are generally computed using operating expense factors applied to network element investments, although recurring expenses may be computed based on special studies of recurring work activities and associated costs.

### **10.2 Description of Operating Expense Factors**

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

- *Maintenance factor.* The maintenance factor includes *plant specific* expenses for a type of plant (expenses of maintaining and repairing) telephone plant in service), power expense, and testing expense. Special studies are performed to identify the portions of power and testing expenses attributable to switching, circuit, cable and wire, and other types of plant. Maintenance factors vary by plant account recognizing, for example, that aerial and underground cable have different maintenance requirements and costs. The maintenance factors are computed as the ratio of prior year maintenance expenses to average book investment for three consecutive years of data, *adjusted to a current cost basis*. Current cost to book cost ratios are used to express plant investments in terms of current costs.
- *Ad Valorem expense factor.* A single factor is applied to all plant types to compute property taxes.

## **11.0 Revenue Related Expense Factor**

### **11.1 Definition of Revenue Related Expense Factor**

The revenue related expense factor is used to capture the impact of the Michigan Single Business Tax. Since the revenue related expense is not a volume sensitive cost but an adjustment to revenue, it is applied to recurring and non-recurring revenues.

## 12.0 Forward-Looking Common Costs

### 12.1 Definition of Forward-Looking Common Costs

The total element long run incremental costs of network elements include only costs directly attributable to the individual network elements. There are substantial resources and business activities that are not directly attributable to a single network element, but rather are either shared by more than one UNE or are common to all network elements or services. The costs of these resources and activities also must be recovered for the business to sustain itself. In its Order, the FCC used the term common costs to apply to what are commonly called shared and common costs and recognized the need for unbundled network element prices to recover a “reasonable allocation” of *forward-looking common costs* which it defined as,

“economic costs efficiently incurred in providing a group of elements or services which may include all elements or services provided by the incumbent LEC that cannot be attributed directly to individual elements or services.”<sup>4</sup>

The FCC also indicated forward-looking common costs are to exclude retail costs. Ameritech Michigan’s methodology for computing these costs is consistent with the FCC’s definition and requirements for a reasonable allocation of common costs.

### 12.2 Common Cost Calculation and Allocation

In Case No. U-11831, Ameritech Michigan submitted a new methodology to derive shared and common costs. The MPSC, however, ordered that the shared and common costs factors approved in the first biennial cost docket, Case No. U-11280, continue to be used.

The starting point for Ameritech Michigan’s shared and common cost study submitted in Case No. U-11280 was 1997 budget data for the following four organizational units: Ameritech Information Industry Services which provided at that time wholesale services, Network Services, Centralized Procurement Services and Corporate Headquarters. Each of the four budgets was evaluated for costs that are shared either by several UNEs, by both UNEs and other wholesale services or by both wholesale and retail services. Other costs in the budget data that did not provide shared benefits were excluded. Each cost was then allocated to each UNE using ratios based on direct expenses or TELRIC.

The MPSC in its order in that proceeding required that Ameritech Michigan use different cost allocations and that the shared and common costs be expressed as constant percentages that do not vary from one UNE to another.

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<sup>4</sup> FCC Order, paragraph 51.505 (c), Appendix B, page B-30.

## **Florence —Attachment B**

## MICHIGAN COST FILINGS

### 1. Case No. U-11280, First Biennial Cost Filing

#### TELRIC Cost Studies

##### . Unbundled Network Elements

- Unbundled Loops
- Unbundled Ports
- Unbundled Local Switching
- Unbundled Inter-Office Transport
- Unbundled Tandem Switching
- Unbundled SS7/STP Access
- Unbundled 800 Access
- Unbundled LIDB Access
- Unbundled AIN
- Unbundled OS/DA
- Unbundled 911

##### . Interconnection

- Physical Caged Collocation
- Cross Connection
- Virtual Collocation
- Reciprocal Compensation

### 2. Case No. U-11831, Second Biennial Cost Filing

#### TELRIC Cost Studies

##### . Unbundled Network Elements

- Unbundled Loops
- Unbundled Ports
- Unbundled Local Switching
- Unbundled Inter-Office Transport
- Unbundled Tandem Switching
- Unbundled SS7/STP Access
- Unbundled 800 Access
- Unbundled LIDB Access
- Unbundled AIN
- Unbundled OS/DA
- Unbundled 911
- Unbundled ENSA
- Unbundled WENSA

##### . Interconnection

- Physical Caged and Cageless Collocation
- Cross Connection
- Virtual Collocation
- Reciprocal Compensation



3. Case No. U-12540, UNE Remand Filing

TELRIC Cost Studies

- . Line Sharing
- . Line Splitting
- . High Frequency Portion of Loop
- . Loop Qualification
- . Loop Conditioning
- . Dark Fiber
- . Subloop Unbundling

4. Case No. U-12622, Unbundled Local Switching-Shared Transport (ULS-ST)

TELRIC Cost Studies

- . ULS-ST

5. Case No. U-12696, Revise Rate Structure for Reciprocal Compensation

TELRIC Cost Studies

- . Set-up Cost and Cost Per Minute for Reciprocal Compensation Cost Elements