COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

Investigation by the Department on its own §

Motion into the Appropriate Pricing, based §

upon Total Element Long-Run Incremental §

Costs, for Unbundled Network Elements and § D. T. E. 01-20

Combinations of Unbundled Network Elements, §

and the Appropriate Avoided Cost Discount §

for Verizon New England Inc. d/b/a Verizon §

Massachusetts' Resale Services §

PANEL TESTIMONY OF VERIZON MASSACHUSETTS ON COSTS AND RATES FOR UNBUNDLED NETWORK ELEMENTS AND RELATED WHOLESALE SERVICES

Members of the Panel:

Donald Albert

Michael Anglin

John Livecchi

Nancy Matt

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I.purpose of the testimony

Q. What is the purpose of this testimony?

A. In accordance with the Department's *Vote and Order* of January 12, 2001, this testimony is submitted by Verizon Massachusetts ("Verizon MA" or the "Company") to present its recurring cost studies for network elements (and certain related services) offered by Verizon MA to its CLEC customers. Here we take a fresh look at costing and pricing issues, incorporating the latest available data, guided by all relevant rulings of the Department and the FCC (including the FCC's *UNE Remand Order*[(1)]*)*.

II. THE WITNESS PANEL

Q. Who are the members of the witness Panel sponsoring this testimony?

A. The members of this Panel are: Donald Albert, Michael Anglin, Nancy Matt, and John Livecchi. In addition, we rely on other testimony presented in this case. Dr. William Taylor is submitting testimony discussing the economic principles guiding the development of these studies. Dr. James Vander Weide is submitting testimony on the cost of capital. Mr. Allen Sovereign is submitting testimony on depreciation (asset lives).

Q. What role did each member of this Panel play in the preparation of this testimony and the associated studies?

A. Although all members of this Panel have reviewed and support this testimony in its entirety, each Panel member assumed primary responsibility for specific segments of the testimony. Each Panel member relies on the facts and analyses developed by the other Panel members in their areas of primary responsibility. Specifically:

- ***Mr. Albert*** *had primary responsibility for issues relating to the utilization factors and network architecture, with the exception of the loop.*

- ***Mr. Anglin*** *had primary responsibility for the development and review of the costing principles and methodologies used in the studies, as well as being specifically responsible for investment loadings, the development of Annual Cost Factors ("ACFs"), the local loop studies, and Enhanced Extended Link ("EEL") testing costs.*

- ***Ms. Matt*** *had primary responsibility for the cost studies for high capacity loops, switching, transport, signaling systems, and Service Management Systems ("SMS"), and miscellaneous studies.*

- ***Mr. Livecchi*** *had primary responsibility for issues relating to the utilization factors and network architecture associated with the loop.*

Q. ***Mr. Albert****, please describe those aspects of your professional background most pertinent to your testimony.*

A. I am Network Engineering Director of Competitive Local Exchange Carrier ("CLEC") Implementation for Verizon Services Corp. (formerly, Bell Atlantic Network Services, Inc.). In that position, I am directly involved in the negotiation of CLEC interconnection agreements and the network implementation of CLEC unbundling, interconnection and collocation arrangements throughout the former Bell Atlantic region. I earned my Bachelor of Science degree in Civil Engineering from Virginia Tech in Blacksburg, Virginia, in 1977. Since then, I have had over 23 years of telecommunications experience with Verizon, Bell Atlantic and the C&P telephone companies. During this time, I have held a variety of positions of increasing responsibility in Network Operations, Sales, and Network Planning and Engineering. I have been in my current position for four years. Prior to my present assignment, I was Director of Customer Network Engineering for Bell Atlantic. In connection with various CLEC arbitrations, and Section 271 local competition proceedings, I have previously testified before commissions in Massachusetts, Maine, New Hampshire, New York, Pennsylvania, New Jersey, Maryland, Virginia, Delaware, Washington, D.C., and West Virginia on a range of subjects associated with the design, engineering and operation of telecommunications equipment and networks.

Q. ***Mr. Anglin****, please describe those aspects of your professional background most pertinent to your testimony.*

A. I am a Director of Regulatory Support for the Verizon Service Cost organization. I have been employed by Verizon and its predecessor companies since 1971. In my current position, I am responsible for directing the development of service cost studies in support of regulatory filings throughout Verizon. Since 1991, I have held positions of increasing responsibility within Verizon's Service Cost organization. I have been responsible for developing cost methodologies, conducting cost studies, and supporting the Company's cost studies before state regulators throughout the Verizon region. I previously testified before this Department in Phase 4 of the Consolidated Arbitrations regarding TELRIC studies for unbundled network elements. I have also testified on similar matters in Maine, New Hampshire, Rhode Island, and Vermont. From 1987 to 1991, I was assigned to the Company's Network Operations Center, with the responsibility for providing expert technical support for the Company's switching network throughout the New England states. Prior to 1987, I held a variety of positions with New England Telephone in the areas of Network Operations and Network Engineering.

Q. ***Ms. Matt****, please describe those aspects of your professional background most pertinent to your testimony.*

A. I am a Manager within Verizon's Service Costs organization. I received a Bachelor of Science Degree in Applied Physics from Stockton State College in 1979 and a Master of Science Degree in Computer Science *from Stevens Institute of Technology in 1983. I am a Licensed Professional Engineer in the State of New Jersey.*

After receiving my Bachelor's degree, I spent five years working for various engineering consulting firms as a civil engineer. I began my career with NYNEX in August 1984, as a Central Office Equipment Engineer, and I was responsible for the implementation of carrier facilities installations for the West 50th Street Central Office. In October 1988, I was promoted to the position of Project Manager in the Project Management group within the Network Engineering Department. In July 1990, I was promoted to Engineering Manager of the Switch Engineering group within the Engineering Department. In this position, I was responsible for developing end-office switch engineering methods. In November 1991, I was reassigned as the Engineering Manager of the Outside Plant Planning group, responsible for analyzing and recommending new technologies for infrastructure deployment in the Midtown Manhattan market area. In December 1993, I was reassigned as the Engineering Manager of the Outside Plant Design group, responsible for all outside plant design and implementation for the Midtown West Manhattan market area. In April 1995, I was reassigned as Staff Manager, Service Costs, where my responsibilities included developing cost studies that served as the basis for tariff and regulatory filings. In January 1998, I was reassigned to my current position as Manager in the Regulatory Support group within the Service Cost organization. I have testified on service costs issues in New York's proceeding on resale and unbundled network elements.

*Q. **Mr. Livecchi**, please describe those aspects of your professional background most pertinent to your testimony.*

A. I am currently Director for FCC and Regulatory Support for Verizon's Outside Plant Engineering ("OPE") Organization. My group supports the field OPE groups, managing issues relative to FCC merger compliance, 271 long distance entry, joint use agreements, and State Regulatory support. In 1983, I earned a Bachelor of Science Degree in Industrial Engineering and Operations Research from Syracuse University and a Master of Science Degree in Management of Technology from the University of Pennsylvania in 1996. I have 17 years of experience in the design and planning of outside plant networks. I began my career in 1984 in the outside plant engineering department of the former NYNEX Company. Since that time, I have held a variety of positions of increasing responsibility in outside plant engineering with former Bell Atlantic and now Verizon.

III. scope of services considered in this filing

Q. What services are included in this filing?

A. In the revised version of Rule 319[(2)] set forth in the UNE Remand Order, the FCC identified six network elements to which incumbent LECs are required to provide access on an unbundled basis under § 251(c)(3) of the Telecommunications Act of 1996. These are local loops, Network Interface Devices, switching, interoffice transport, signaling systems and databases, and Operations Support Systems ("OSS"). Mr. Minion discusses the OSS network element in his testimony. We discuss the other five required elements separately below, certain element combinations, and miscellaneous services.

*1. The **local loop** studies included in this filing address the four basic types of loops addressed (two- and four-wire analog loops, and two- and four-wire digital loops), as well as DS1 loops and high-capacity loops (DS3 and above loops), dark fiber loops, subloops (including house and riser), and ADSL/HDSL-compatible loops.*

Studies of line sharing (i.e., situations in which a CLEC offers data services over the same physical loop as is used by Verizon MA to provide voice services), and of conditioning charges for DSL-compatible loops, are also included here.

*2. Studies are included in this filing for Network Interface Devices ("**NIDs")**.*

*3. The **switching** studies included here address both local and tandem switching. Separate rates are set for ports and switch usage, and feature costs are specifically identified.*

*4. This testimony presents a full range of unbundled **interoffice transport** offerings.*

*5. With respect to **signaling system and databases**, Verizon MA offers STP ports, signaling links, SS7 transport, and access to certain call-related databases in this filing. Also included in this filing are Service Management Systems ("SMS") costs.*

*6. **Element combinations.** This filing considers additional charges applicable to combinations (i.e., the EEL Testing Charge) beyond the sum of the recurring charges for the constituent elements. The NRCs are described in the testimony of Mr. Meacham.*

7. Our testimony also includes a number of cost studies to support miscellaneous charges such as customized routing and Daily Usage File ("DUF").

We note that Verizon MA has not included costs associated with Operator Services/Directory Assistance ("OS/DA") in this filing. The FCC determined in its UNE Remand Order that incumbent LECs are not required to offer unbundled access to OS/DA, as long as they offer customized routing, as Verizon MA does.

Q. Do the cost studies provided in this filing support all of the rates currently contained in Verizon MA's Wholesale Tariff ("D.T.E. - Mass. - No. 17")?

A. While most costs provided in this filing translate directly into wholesale rates contained in the Wholesale Tariff, the rates for certain rates (sometimes referred to as "composite" rates) are based on a combination of the costs of individual elements. For example, meet Point A and B intercarrier compensation rates are based on a combination of Local Switching and Interoffice Transport costs. Verizon MA will revise its Wholesale Tariff at the conclusion of this proceeding with new composite rates based on the costs which the Department sets for the individual elements.

IV. STRUCTURE OF THE FILING: testimony, exhibits, workpapers, and cost models

Q. How is the Panel Testimony and supporting documentation organized?

A. The Panel testimony is organized into the following sections:

- *Section V presents the Company's basic costing and pricing approach, including detailed discussions of the Company's approach to determining investments and expenses.*

- *Section VI presents the basic forward-looking network technology model that underlies Verizon MA's studies.*

- *Sections VII through XII present the investments and recurring (or usage-based) costs for each of the network elements, combinations, and miscellaneous services discussed above.*

Supporting materials for the Panel testimony are incorporated into a single Exhibit that is subdivided as follows:

- *Part A - Results/Index*

- *Part B - Local Loops*

- *Part C - Switching*
- *Part D - Interoffice Transport*
- *Part E - Signaling Systems and Databases*
- *Part F - Miscellaneous Services*
- *Part G - Factors*

Part A contains a summary of the results of each study element and a complete cost study index that contains references to all workpapers as well as the electronic files which accompany this filing.

Certain of the workpapers and exhibits are proprietary, and are being filed only with the Department and will be provided to other parties pursuant to a properly executed non-disclosure agreement.

The Company's studies were developed in part using two costing tools or models that the Company has developed -- a loop cost model ("LCAM") and an interoffice transport model. Copies of these models are included in this filing.

The Company also utilized two models developed by Telcordia Technologies (formerly known as Bellcore): Switching Cost Information System ("SCIS"), and Common Channel Switching Cost System ("CCSCIS"). Copies of the relevant versions of these models (on CD-ROM) will be provided on request to parties agreeing to a separate confidentiality arrangement.

Q. Has Verizon MA employed any other costing tools in this proceeding?

A. Yes. Verizon has developed a system called VCost.

Q. What is VCost?

A. VCost is an integrated decision support spreadsheet building tool designed to develop consistent, high-quality cost studies in reduced cycle times. It is the result of a series of continuous improvement efforts initiated to refine the cost-development process utilizing a common look and feel as well as a consistency of economic, engineering and computational assumptions. VCost is a spreadsheet building tool that facilitates development of new studies and study updates under differing scenarios. It enables and enhances the analysis of studies across products, jurisdictions, and time.

In addition to being a spreadsheet building tool, VCost contains a repository of commonly used current data. The repository ensures that the data sources and data are the most current available. The system performs processes such as levelization and inflation in a standard format, thereby promoting consistency and accuracy.

VCost is a client/server application, which resides, in part, on the personal computer of a user and interacts continually with a relational database that resides, relative to most users, on a server in a remote location. The databases contain the formulas and structure of each study defined in the system, common processes, and the data repository mentioned earlier. Finally, VCost will enable the parties to perform sensitivity analyses to assess the impact of modifying various study variables.

Q. How is VCost used to develop the recurring costs that are presented in this filing?

A. As explained more fully in the following section, the general approach to developing the recurring costs in this filing is: (1) determine the investment associated with a given element or service; (2) apply the appropriate loadings to the investment; and (3) calculate the appropriate capital costs and operating expenses associated with the investment. VCost computes the capital costs based on the plant account of the investment and inputs such as Asset Life, Future Net Salvage, Tax Life, Debt ratio, Cost of Debt, Cost of Equity, and State and Federal Tax rates. The property and other taxes, as well as operating expenses, are computed by extracting the appropriate factors from the database tables and applying them to the investment. The investment is then multiplied by the expense factor. To the annual expense calculated in the previous step, inflation and productivity are applied, where applicable, for each year of the study period. The expense is then levelized over the study period and aggregated to complete the cost development process for that particular investment. Each of these subjects is described fully in the following sections.

Q. Is VCost used to develop all of the costs presented in this filing?

A. No. Certain studies are produced using Microsoft Excel spreadsheets. VCost is, however, used to develop cost factors for these studies. This ensures consistency across all studies.

Q. Can the cost studies being filed using VCost be viewed electronically without loading the VCost system?

A. Yes. VCost has the ability to download any study in either a Word or Excel format. For purposes of this filing, the Company is providing the VCost generated studies within the VCost system to enable the Department to perform sensitivity analyses using the mechanized features of the VCost system. In addition, the Company is providing the VCost generated studies in Word format, so that they may be viewed electronically without the necessity of loading the VCost system. For illustrative purposes only, we have included the STP Port cost study in Excel version also.

V. BASIC COSTING AND PRICING APPROACH

A. The Cost Studies Are All Based on Long-Run Incremental Costs

Q. What costing approach is used for the elements and other services considered in this filing?

A. All of the cost studies included in this filing are based on long-run incremental cost.

Q. What is "incremental cost"?

A. As explained in the FCC's Local Competition Order[(3)]: "Incremental costs are the additional costs (usually expressed as a cost per unit) that a firm will incur as a result of expanding the output of a good or service. Incremental costs are forward-looking in the sense that these costs are incurred as the output level changes by a given increment. The costs that are considered incremental will vary greatly depending on the size of the increment."

Q. What size increment was assumed in the Company's incremental cost studies?

A. Verizon MA adopted a total service (or total element) approach, in which the increment was the total quantity of the relevant service or element currently being offered. In this respect, the Company's studies are consistent with the FCC's TELRIC methodology (a "total element" long-run incremental cost methodology). Paragraph 690 of the Local Competition Order supports this approach: "The increment that forms the basis for a TELRIC study shall be the entire quantity of the network element provided."

Q. What is "long-run" incremental cost?

A. The FCC defines long-run incremental cost, for TELRIC purposes, as follows: "In a TELRIC methodology, the 'long run' used shall be a period long enough that all costs are treated as variable and avoidable. This 'long run' approach ensures that rates recover not only the operating costs that vary in the short run, but also fixed investment costs that, while not variable in the short term, are necessary inputs directly attributable to providing the element."[(4)] In this type of long-run approach, technology choices are not constrained by any "embedded" technology already present in the network.

Such long-run approaches can easily veer off into attempts to determine the costs of "fantasy networks." Accordingly, even the FCC was careful to limit the TELRIC concept by adopting a forward-looking technology standard based on "the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the existing location of the incumbent LEC's wire centers."[(5)] Thus, neither speculative future innovations nor changes in wire center locations were to be considered in such a study.

Q. What long-run incremental costing approach is used by Verizon MA in these studies?

A. Application of the TELRIC methodology is currently required by the FCC's rules for those network elements that incumbent LECs are required to offer on an unbundled basis under § 251(c)(3) of the Act. Accordingly, we use TELRIC for those elements that are subject to mandatory unbundling under the UNE Remand Order. We do so, however, reserving the Company's objections to that methodology. We note that the FCC's TELRIC rules have been invalidated by the United States Court of Appeals for the Eighth Circuit, and the issues are currently scheduled to be heard by the Supreme Court of the United States. Changes in these studies may be appropriate if the Eighth Circuit's ruling is upheld.

However, services such as OS/DA, as note above, are not subject to mandatory unbundling requirements, and thus are not subject to TELRIC pricing under the Act.[(6)]

B. Recovery of Common Costs

Q. What provision is made in Verizon MA's TELRIC studies for the recovery of common costs?

A. The FCC concluded in the Local Competition Order that if prices are to be based on incremental costs, they should also include an allocation of forward-looking common costs.[(7)] The FCC's regulations define recoverable "forward-looking common costs" 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."[(8)] In keeping with these regulations, the Company's TELRIC studies provide for the recovery of an allocable share of such common costs.

Q. How did Verizon MA allocate common costs to particular elements?

A. Since common costs by definition cannot be directly assigned to particular elements, they must be allocated over elements in some reasonable manner in TELRIC studies. Any allocation methodology should ensure that the sum of common costs allocated to various elements does not exceed the Company's total common costs.[(9)] The method utilized by the Company, in which common costs are generally included as an Annual Cost Factor ("ACF"), so that such costs in effect "follow" the costs in each element, is consistent with what has long been used by the Company and recognized by this Department as reasonable. (The common-cost ACFs are only used to allocate overhead-type costs that are common to all elements. As is described below, certain costs common to two or more elements (e.g., poles and conduit that are shared by loop and transport facilities are addressed in a different manner.) The specifics of the Company's approach to calculating ACFs to identify and recover common costs are discussed in greater detail below.

C. Avoidance of Double Recovery

Q. How do Verizon MA's studies avoid double recovery?

A. The Company's general approach is designed to avoid the inclusion in rates for particular UNEs of costs that are already being recovered elsewhere.

For example, in determining the investment associated with particular elements, the Company determined the investment costs of the discrete, identifiable, separate components comprising those elements. The ability to assign particular investments unambiguously to particular elements is a key factor in avoiding double recovery under total-element costing approaches.[(10)] *In the uncommon case where a single network asset is shared between elements (e.g., sharing of structure between loops and transport, sharing of building and power costs between elements located in the central office), explicit allocation methodologies were used to ensure that only the total cost of the relevant investment was recovered, and no more.*

Similarly, Verizon MA's approach to the estimation of expenses, which depends on the application of ACFs, calculated as the ratio of total forward-looking expense (excluding retail expense) to total forward-looking investment or expense, ensures that no more than total forward-looking wholesale expense will be recovered in element rates.

D. Particular Issues Related To Determination of Investments

Q. In general, how are network-element investments determined?

A. The determination of such investments starts with the relevant materials costs. These costs are divided by utilization factors to develop materials cost per unit of the element in service. Finally, investment "loadings" are applied to determine the associated engineering, installation, power, and land and building costs associated with the material investment.

1. Material Investments

Q. How did Verizon MA determine the relevant material investments?

A. Switching materials investments were obtained from standard models developed by Telcordia, as described in more detail below. Investments for other elements were generally determined from Verizon MA's Engineering and Construction Records Information System ("ECRIS"), or from the vendor. In each case, however, the investments are based on, and fully reflect, the latest negotiated vendor prices (inclusive of all discounts) currently available to Verizon MA.

2. Utilization Factors

Q. What is a utilization factor?

A. The utilization of a particular facility is an "estimate of the proportion of [the] facility that will be 'filled' with network usage."[(11)] *Utilization has an impact on cost, since the total cost of a facility must be allocated over those units of service (e.g., subscribers, access lines, or minutes of use) that are actually "handled" by the facility in question and that are thus available to generate revenue if those costs are to be recovered.*[(12)] *Thus, the smaller the number of units that are actually handled by the facility (i.e., the lower the utilization), the greater is the fraction of the cost of the facility that must be assigned to each unit.*

Q. What are the factors that affect the utilization of network capacity?

A. Network elements and systems cannot be engineered to operate at 100 percent utilization. Forecast uncertainties, customer inward-outward movement, random fluctuations in demand, future growth, maintenance requirements, and other factors make it impractical and inefficient to allow elements to be completely utilized to meet the current network demand. A margin of unused capacity, usually called the "administrative spare," is included in engineering capacity planning to accommodate some of these factors. Although at times some of this spare is temporarily activated in response to one of these needs, on average this capacity is left unused. For this reason, the highest theoretical average utilization that an elements or system can reach is the total capacity less the administrative spare. This highest theoretical utilization, however, does not determine the actual average utilization level of an efficiently designed network. As described below, other factors are also relevant:

Demand growth. *Network demand grows at a gradual rate. New network capacity must be provided in anticipation of this growth. Network additions, however, must be placed in efficient increments depending on the technical characteristics of the system and the cost of the installation. Too small an addition will mean that the potentially expensive construction or other work associated with additions will have to be carried out too often. Too large an addition will mean that utilization will be unnecessarily low over the facility's life cycle. Engineering judgment must be applied to determine appropriate augmentation intervals -- and amounts -- for each type of network facility.*

At any point in time, some network systems will have just had a capacity addition, while others will be approaching exhaust. Across the whole inventory of network systems it is reasonable to expect that systems will be randomly distributed across this utilization continuum.

Customer Churn. *Customer outward/inward movement also affects utilization. Much of this outward/inward movement yields no net gain in lines and is referred to as "churn." For example, a customer moves out of a location and a new customer does not move into that location for some time. The time between disconnect and reconnect varies, but will always result in some idle time that will lower effective utilization levels. Switch ports, loop feeder plant, loop distribution plant, and interoffice facilities are examples of network components significantly impacted by churn.*

Increasing levels of local competition should increase customer churn and further reduce the average utilization of network capacity in the future.

Breakage. *The practical utilization level that can be achieved is also affected by "breakage." This term refers to the fact that many network components come in a limited set of capacity units. The simplest example is copper or fiber cable. Large fiber cable is manufactured in units of 12 fibers and not all possible multiples of 12 are provided. Copper cable normally comes in specific multiples of 100 pairs. Actual demand rarely conforms neatly to the available units of capacity. The difference between the developed engineering requirement and the actual size of the unit that must be placed is referred to as "breakage."*

Technological churn. *Technology evolution also affects the utilization experienced in any real operating network. Every technology is the "forward looking" choice only for a limited period of time. The accelerating pace of technology change has consistently reduced this period in recent years. For example, new generations of SONET systems have become available in recent years. In many instances, it becomes economic to install additional network capacity with the latest technology and thus to leave unutilized a portion of the facilities based on the older technology. This process facilitates the evolution of network technology and reduces the life cycle cost of network capacity. It also, however, reduces the average utilization experienced in real operating networks.*

Q. How were the utilization factors used in these cost studies determined?

A. Because the forward-looking TELRIC network does not yet exist, the utilization factors, like every other aspect of the construct, must be estimated by applying past experience to the forward-looking network *technology model. In some cases, the utilization factors used in this study were determined by starting with the theoretically highest administrative spare margins and adjusting these downward to reflect the factors just described. In other cases, based on the judgement of the Company's engineers, it was determined that the current actual utilization would be an appropriate starting basis for estimating the forward-looking construct. The Department agreed with this approach in the Consolidated Arbitrations when it stated that "there is no reason to believe that the same set of drivers that exist today when NYNEX plans its own network would not exist in a situation where it is the 'firm' building unbundled network elements under the TELRIC framework"[(13)].*

The calculation of utilization factors for specific elements will be described in the sections of the testimony devoted to those elements.

3. Investment Loadings

Q. What are Investment Loading Factors?

A. All of the investments used in Verizon MA's cost studies presented here reflect the total cost installed ("TCI") of the necessary facilities and equipment, including required support investment. The Company uses investment loading factors in order to translate investments based solely on materials prices into TCIs.

Q. Which investment loading factors are used in the Company's studies?

A. The Company has developed Engineer, Furnish & Install ("EF&I"), Land and Building ("L&B"), and Power factors for use with digital switching, digital circuit and originating/terminating plant accounts.

Q. Are these factors used for all investments?

A. No. Certain investments, for example, those investments derived from the ECRIS database, as described in greater detail below, already include installation and engineering costs. Application of an EF&I factor is unnecessary for those investments. As explained earlier, investment loading factors are applied within the VCost system. VCost determines which loadings are applicable based on the plant account of the investment.

Q. What does the EF&I factor represent?

A. The EF&I factor translates a material-only investment into an installed investment, including such items as vendor engineering, Verizon MA engineering, transportation, warehousing, vendor installation, Verizon MA installation, and acceptance testing. Separate EF&I factors are developed by Field Reporting Code ("FRC") for the following classes of investment:

- *Digital Circuit equipment (Subscriber Pair Gain - equipment at central office; Subscriber Pair-Gain - equipment at customer's premises; and other),*

- *Digital Switch, and*

- *SONET Circuit and other terminal equipment - CPE.*

Q. How are the EF&I factors developed?

A. The factors are developed on the basis of the data contained within the Company's Detailed Continuing Property Record ("DCPR") database. Specifically, the total installed investment for hardwired equipment *installed in calendar year 1998 was added to the plug-in equipment installed in calendar year 1998. (This was the latest year for which data were available at the time that the studies were done.) The sum of the installed investments was then divided by the sum of the material-only investments of the same equipment, also derived from DCPR. This yielded the final EF&I factor, which represents the relationship of TCI investment to materials investment for equipment in the future based on current relationships.*

Q. Why is it appropriate to base these factors on current relationships?

A. In general, the relationship between material costs and total installed costs based on 1998 data are representative of the relationships that the Company expects to experience on a going-forward basis. This will not be the case, however, if one has to assume significant decreases in the price of equipment purchased in the future. If as a result of projected increased discounts offered by vendors, the percentage discount applied to the material price is assumed to be significantly higher in the future than what the Company initially has used in the cost studies, an adjustment would be necessary. This is because the amount of time required to engineer or install the equipment would not change simply because the price of the equipment is reduced. As a result, an adjustment would be necessary to ensure that a factor applied to a lower material investment will still yield the correct identification of engineering and installation work.

Q. How would such an adjustment be calculated?

A. The adjustment would be calculated on the basis of the average discount initially used in the cost study and the forward-looking discount to be assumed in the material price studies. The material investment underlying the original factor development would be recast with the higher forward-looking discount level on, and the factor is recalculated using the original engineering and installation costs, but the recast material investment.

Q. Are the EF&I factors specific to Massachusetts?

A. No. The factors have been developed on a regional (i.e., Verizon-East-wide) basis. This is being done throughout the Verizon footprint to reflect more accurately how the costs are incurred. Certain investments, for example Service Management Systems, may be installed in one state to serve multiple jurisdictions. Additionally, not all types of investments are placed in each state during a given calendar year. Therefore, a regional approach ensures that all relevant investments are included in the EF&I loadings.

Q. What does the L&B loading factor represent?

A. The L&B factor identifies an amount of land and building investment that is required to support equipment housed in central offices ("COs"). A separate L&B factor is developed by FRC for:

- *Digital Circuit equipment (Subscriber Pair Gain - equipment at central office and Other), and*

- *Digital Switch.*

Q. How were the factors developed?

A. The factors were developed on the basis of the data reported in the Company's Financial Reports, specifically its A-817 reports. The steps were as follows:

- *The total telephone plant in service ("TPIS") balances as of the year ending December 1999 for land and buildings were determined.*

- *Building investments associated with collocation were subtracted out, in order to avoid any double-counts with respect to investments included in collocation rates.*

- *A factor based on Separations data, representing the portion of land, buildings, capital leases and leasehold improvements that is associated with central office equipment, was then applied to yield the assignable Central Office Equipment L&B investments.*

- *Investments in the electronic switching, operator systems, and circuit accounts were brought to forward-looking levels with the application of a forward-looking-to-current ("FLC") ratio, as explained below. These Central Office Equipment accounts were then added.*

- *The assignable Central Office Equipment L&B investments were then divided by the sum of the central office equipment accounts. The resulting factor was split between a land factor and a building factor on the basis of the investments in land and building relative to each other.*

Q. Are the land and building factors specific to Massachusetts?

A. Yes. The building factors are developed on a state-specific basis, since that most accurately reflects the current relationship between the central office L&B investments in a given state and the central office equipment investments that they support.

Q. What do the Power factors represent?

A. The Power factors represent a relationship between the amount of power investment necessary to support specific central office equipment and the investment in the equipment itself. Separate factors are developed for Digital Switch and Digital Circuit (both for subscriber pair-gain placed in central offices and other equipment).

Q. How were the power factors developed?

A. The factors were developed on the basis of the data contained within the DCPR database. The installed investment of power equipment placed in 1998 was identified by the type of equipment it is supporting. Next, the total installed investment for hardwired central office equipment installed in calendar year 1998 was added to the central office plug-in equipment installed in calendar year 1998. The sum of the installed central office investments was then divided into the installed investment of power equipment to yield the relevant power factors.

Q. Are the power factors specific to Massachusetts?

A. No. The factors were developed on a regional basis. This was done because for a given plant account, there can be relatively large variations from year to year in the amount of equipment being placed in any given state. However, the amount placed yearly across the footprint has less variability. As a result, in order to smooth out any anomalies while still maintaining the most up-to-date relationships, the factors were calculated on a region-wide basis rather than on a state-specific basis.

E. Deaveraging: General Issues

Q. To what extent is Verizon MA required to deaverage its rates for the network elements considered in this filing?

A. The FCC's TELRIC regulations require states to "establish different rates for elements in at least three defined geographic areas within the state to reflect geographic cost differences[(14)].

Q. Do Verizon MA's rates currently comply with the deaveraging requirements?

A. Yes. In the Consolidated Arbitrations, the Department determined that the appropriate number of zones for the state of Massachusetts is four. The Metropolitan zone consists of the four wire centers located in downtown Boston. Each of the remaining zones (Urban, Suburban, Rural) is determined based on access line density (Access lines per square mile). Current data supports the continued use of the four zone approach based on access line density.

Q. For what elements will the rates differ between the zones?

A. Verizon MA is proposing different zone-based rates only for loops (and certain subloop components). For reasons discussed below, it is not appropriate to develop deaveraged rates for other elements.

F. Annual Cost Factors

1. Introduction

Q. What is an Annual Cost Factor?

A. The previous sections of this testimony explained how Verizon MA, through the use of the initial material investment and investment loadings, developed a total installed investment. Annual Cost Factors ("ACFs") are used to translate this total investment into annual costs for UNEs. ACFs are ratios that represent relationships between a subset of expenses and (1) their associated plant account investments, (2) relevant expenses or (3) total revenues. The ACFs based on expense-to-investment ratios ("ACF_{EI}") are used to estimate the level of annual expense that the Company can expect to incur to provide a particular network element based on the investment of the element. The ACF based on expense-to-expense ratios is used to identify an allocation of Common Overhead ("ACF_{COH}"). The ACF based on an expense-to-revenue ratio identifies an assignment of Gross Revenue-related costs ("ACF_{GR}"), e.g., uncollectibles and regulatory assessments to develop TELRIC rates.

In the case of expense-to-investment ACFs, expenses that are incurred for specific plant accounts are directly attributed only to those investments, while expenses that are not specific to plant accounts are spread equally across all affected investments. This approach ensures that the expenses for each network element are driven to the greatest extent possible on a cost-causative basis, and non-specific costs are attributed in reasonable proportions.

In the case of expense-to-expense ACFs, the ACF expenses are spread equally over all relevant expenses, ensuring that each ACF expense will be driven to the greatest extent possible to the products/services/elements on a cost-causative basis.

Finally, in the case of the expense-to-revenue ACF, all recurring and non-recurring studies bear the relevant uncollectible revenues and regulatory assessments because these items are directly linked to the level of revenue generated.

Q. How are the ACFs used to convert the incremental investment costs of UNEs into annual UNE costs that are used for rates?

A. The incremental total installed investment for a UNE, which has been developed through the processes that have already been discussed, is first multiplied by the relevant $ACFs_{EI}$. The resulting amount is then multiplied by the ACF_{COH} and the ACF_{GR} to arrive at a UNE Annual Recurring Cost. When appropriate, the UNE Annual Cost is divided by twelve to establish monthly recurring UNE rates.

Q. What costs are captured in the calculation of the ACFs?

A. The costs identified by the ACF_{EI} include the capital- and investment-related costs (i.e., depreciation, rate of return, federal income tax and property and other taxes), and the operations costs (i.e., network, and certain administrative and support functions) that can be ascribed to purchasing and operating a UNE investment. These costs reflected in the ACF_{EI} are incurred as a result of acquiring the UNE investment and placing it into service for the CLEC. In addition, the Company has identified the factors to reflect common overhead (i.e., ACF_{COH} that identifies expenses associated with certain general administrative activities, such as, executive, legal, and human resources, and gross revenue-related costs (i.e., ACF_{GR} that allocates uncollectibles and regulatory assessments).

Q. How does the methodology used in the development of the ACFs compare to the methodologies used in the Consolidated Arbitrations?

A. The methodology used for developing the ACFs for UNE recurring charges is consistent with the methodologies used in the Consolidated Arbitrations to convert investments into annual costs. Briefly, as with the Carrying Charge Factor ("CCF") approach previously used, the ACFs are generally ratios of plant account-related expenses to plant account investments. The ACF components for depreciation expense, return, interest and taxes, property and other taxes, network, marketing and other support are developed in essentially the same manner as their CCF equivalents and applied in the same way. Certain ACF names have changed in order to ensure consistency in terminology used across the Verizon footprint. The Gross Revenue Loading ACF is also developed and applied in essentially the same fashion as its CCF counterpart. The only ACF that is calculated on a different basis is the factor used to identify common overhead. As a CCF, this factor was applied to investment to identify an assignment of overhead expense; as an ACF it is applied to expense, and it identifies overhead expense.

In addition, the ACF methodology in this filing, unlike the method used in previous filings, explicitly reflects inflation, productivity, and other adjustments designed to ensure that the ACFs are forward-looking.

Q. Why is it more appropriate to develop the ACF_{COH} on an expense basis rather than on an investment basis?

A. All products, services and elements utilize to some extent Company resources (i.e., Company facilities and equipment, Company labor such as installation and maintenance forces, etc.). As such, all products, services and elements should pick up a share of overhead costs. Since some products (most significantly non-recurring charges) do not contain investments, applying an ACF_{COH} developed on an investment basis would result in those products necessarily not picking up their appropriate shares of overhead costs. Developing the ACF_{COH} on an expense basis and applying that factor to all expenses yields a more equitable, cost-causative result that ensures that all products, services, and elements will pick up their appropriate shares of overhead costs.

Q. Please describe the data sources used to develop the ACFs.

A. The ACFs developed in this proceeding and the CCFs filed in the Consolidated Arbitrations use the same basic data sources. That is, the Network ACFs in both cases are Verizon MA specific, derived from relationships between expenses in the Company's financial system, and the investments related to those expenses. However, in this case, the Company has determined that the customer interfacing portion of the Wholesale Marketing ACF and the Common Overhead ACF should be based upon the expenses incurred across the Verizon footprint. The organizations that support these functions have undergone consolidations within Verizon. As a result, the expenses and investments, and the affected ACFs, now reflect the regionalization of the costs they were designed to identify (i.e., the ACF for Common Overhead is based on the ratio of total Common Overhead expense divided by Total Operating expense less the Common Overhead expense). Applying a Common Overhead factor, developed in such a manner, to the element and activity sub-expenses of a particular jurisdiction, will assign the appropriate portion of Common Overhead allocable to that jurisdiction and no more.

Q. What are the ACFs used by the Company in this filing?

A. The following forward-looking ACFs were developed for this filing:

1) Depreciation, Return, Interest and Federal Income Taxes ACFs;

2) Property and Other Taxes ACFs;

3) Network ACFs;

4) Wholesale Marketing ACF;

5) Other Support ACF;

6) Common Overhead ACF;

7) Gross Revenue Loading ACF, and

8) Right to Use (RTU) ACF.

2. Depreciation, Return, Interest, and Federal income Tax ACFs

Q. What depreciation parameters were used in calculating these ACFs?

A. Verizon MA's calculation of depreciation reflects the forward-looking depreciation lives and net salvage values presented in Mr. Sovereign's testimony filed separately in this proceeding.

Q. What cost of capital was used in the studies presented in this proceeding?

A. The studies reflect the use of a 12.6 percent cost of capital. As shown by the testimony of Dr. Vander Weide, the use of this cost of capital is conservative and serves to understate Verizon MA's forward-looking cost of capital.

Q. How were the Depreciation, Return, Interest and Federal Income Tax ACFs calculated in the TELRIC studies presented here?

A. The forward-looking depreciation lives were used as inputs to VCost, which calculated for each year of the plant asset's life the book depreciation and tax depreciation as well as the associated return, interest and federal income tax requirements. These results were then levelized over the life of the asset.

Q. How else is the cost of capital used in the Company's studies?

A. Besides being used in determining the return, interest and federal income tax components associated with plant investments, this cost of capital is employed in the various levelizing algorithms used throughout the Company's cost studies.

3. Property Tax and Other Tax ACFs

Q. What is included in the Property Tax and Other Tax ACFs and how is it accounted for in the TELRIC studies presented here?

A. Taxes included in these ACFs include special franchise taxes, property taxes on the taxable plant, and other miscellaneous taxes imposed upon the Company by the various taxing authorities (e.g., municipalities and counties) in the state. The ACF is based on the assignment of the tax expense to the class of plant that is being taxed.

4. Network ACF

Q. What types of expenses are in the Network ACF?

A. The Network ACF includes repair expenses, rearrangement expenses, testing expenses, testing equipment capital costs (i.e., depreciation, return, interest and federal income tax on the equipment used for testing), plant or equipment specific loadings and general network loadings.

Q. Please describe the methodology that the Company employed to develop the Network ACF.

A. The starting point for the Network ACF is the set of expenses that have been incurred in 1999 for repairing and rearranging our plant and equipment. It includes the cost associated with responding to subscriber trouble reports ("R" Dollars), as well as the cost associated with moves, changes, rearrangements and upgrades to the Company's network ("M" dollars). These expenses, which are captured by plant account, are divided by the investments in the associated plant accounts to calculate the base Network ACF for each plant account. The Network ACF also includes costs associated with testing and plant account loadings. The Network ACF also reflects an adjustment for non-recurring revenue since some network expenses are also being recovered through non-recurring charges.

Q. Did you adjust the 1999 base-year network expenses in the calculation of the ACFs?

A. Yes. For copper outside plant facilities, newly placed cables would be expected to experience fewer troubles related to equipment/facility deterioration versus the plant that is currently in place. In order to reflect this potential reduction in subscriber troubles due to newly placed copper plant, Verizon MA has adjusted the forward-looking assessment of "R" dollars downward by 5 percent for copper cables and drop wire.

The Company did not adjust the "M" dollars because these reconfiguration dollars reflect moves, changes and upgrades that are done on an as required basis, independent of technology or age of plant; i.e., even if the Company has in place an optimally designed network, it will still be required to reconfigure its facilities to reflect new municipal ordinances and movement of customers.

Q. How did the Company treat the costs related to testing expenses in the Network ACFs?

A. It is assumed that a purchaser of network elements will perform its own subscriber trouble testing. Therefore, the expenses associated with the testing activity associated with subscriber trouble reports have been removed from the overall testing expense. In addition, an adjustment was made to remove testing expenses that are for non-regulated services. The remaining testing expenses are spread over the appropriate investment accounts. In addition, the circuit investments associated with the testing equipment needed to test the network have been identified. The circuit capital cost factors are applied to these investments to estimate the annual costs associated with this testing equipment. Similar to the reductions made in the testing expenses, reductions are made to the capital costs of the equipment to reflect an allocation of the equipment to subscriber trouble testing and to reflect non-regulated activities. The resulting amounts of testing expense and capital costs of testing equipment are then combined to derive the basis of the forward-looking estimate of testing that will be required for unbundled network elements. This estimation is then added to the Network ACFs.

Q. Please discuss what plant account loadings are also added to the Network ACFs.

A. There are two additional loadings for the Network ACFs. The first loading is specific to either outside plant or central office investments. This central office or outside plant loading identifies those expenses that can be directly assigned to either segment (central office or outside plant) of the asset accounts, but not to specific plant accounts within the segment. For example, central office engineering expense is added to the Network ACF for all central office plant accounts (i.e., switching and circuit investments). The second loading, the general loading, identifies those network expenses that cannot be assigned to only outside plant or only central office accounts. For example, provisioning and material management expenses are included as a general loading, not as a specific outside plant or central office loading.

Q You stated that non-recurring revenues were subtracted from the Network ACF. Why is it appropriate to subtract out non-recurring revenues?

A. By subtracting non-recurring revenues from the Network ACFs, the Network ACFs reflect only the expenses associated with recurring activities. Thus they represent the appropriate starting points for estimating the recurring costs of the UNEs presented in this case, and the possibility of recovering the same expense in both a recurring rate and a non-recurring rate is eliminated.

Q. How do the Network ACFs in this proceeding adjust for the non-recurring revenues?

A. The Company examined all of the 1999 regulated non-recurring revenue by a functional or product classification. Non-regulated revenues are excluded, since the expenses associated with those non-recurring activities are not included in the Network ACFs. From this classification, the non-recurring revenue was categorized as either provisioning-related (e.g., field installation, central office wiring, etc.) or customer interfacing (e.g., service ordering or service restoral). In those instances where the classification could not be used to firmly distinguish between provisioning or customer interfacing, the revenue was split 50 percent into each category. All of the provisioning non-recurring revenue was subtracted from the Network ACF, while the customer interfacing non-recurring revenue was subtracted from the wholesale marketing ACF, as will be discussed elsewhere in this testimony. Although it is not possible to directly associate the tariff rates or revenue to their respective cost components (in that many of the retail rates have been in effect for long periods of time) allocating these revenues to their respective functions, i.e., provisioning and customer interfacing, ensures that the necessary offset or credit is being given to the appropriate ACF components and guarantees that there is no possibility of double recovery of these expenses.

Q. Why was it appropriate to subtract the provisioning non-recurring revenue from the Network ACF?

A. The Company wanted to explicitly reduce the network expenses to reflect its best estimate of all of the network provisioning expenses that are associated with non-recurring activities. The provisioning non-recurring revenues received were used as the Company's best approximation of such expenses. This was done since provisioning non-recurring revenues recover the costs of activities that are captured by the expense accounts contained within the Network ACFs.

Q. Did the Company also adjust the Network ACFs to reflect the receipt by the Company of pole and conduit rental and/or attachment fees?

A. Yes, the Company specifically adjusted both the "M" and "R" dollars of the pole and conduit expense accounts to reflect the rentals and fees collected by the Company, thereby avoiding any double recovery of structure costs. Here too, the revenues were from the 1999 Company data, to reflect our best estimate of future structure revenues. This way, only the structure costs utilized by Verizon MA are reflected in the Network ACFs and not the structure costs that are supporting other companies' plant.

5. Wholesale Marketing ACF

Q. What does the Wholesale Marketing ACF represent?

A. The Wholesale Marketing ACF represents the expenses associated with product management, advertising and customer interfacing functions associated with the wholesale market.

Q. How did the Company develop the Wholesale Marketing ACF?

A. The wholesale marketing factor includes the wholesale marketing expenses and wholesale customer care expenses that will be incurred in a forward-looking wholesale environment divided by revenue-producing only investments. How Verizon MA divided investments into revenue producing and non-revenue producing is described later. Only revenue-producing investments are used since support investments (i.e., non-revenue producing investments such as motor vehicles) are not included as investments in any of the UNE recurring studies. Because only revenue-producing investments are included in the UNE studies, the factor development must be done in a consistent manner.

Q. Specifically, how were the wholesale marketing expenses treated?

A. The wholesale marketing expenses were based upon the 1999 Verizon-East regional expenditures adjusted by avoided retail costs. The adjustment for retail avoided costs was based on the avoided cost study methodology presented by Mr. Minion in Part B of this proceeding. The investments were based upon the 1999 revenue-producing only investments.

Q. Specifically, how were the customer care expenses treated?

A. The customer care expenses and investments were aggregated on a Verizon-East regional basis. Retail expenses are excluded, again based on Verizon MA's avoided cost methodology in Part B, and only those expenses associated with the wholesale "customer care" function are captured in this ACF.

6. Other Support ACF

Q. How was the Other Support ACF developed?

A. The Other Support ACF includes support expenses in information management, research and development, procurement and expenses and the capital requirements associated with non-revenue producing investments in motor vehicles, special work equipment, land and buildings (excluding central office buildings), general purpose computers, furniture, and official communications and support equipment. The other support costs are incurred in support of all classes of plant and are attributed to all revenue-producing investment categories. The factor is developed on the basis of Verizon-East regional costs and investments.

Q. What are non-revenue producing investments and how are they determined?

A. All of the assets of the Company can be categorized either as revenue-producing (i.e., associated with products, services or elements for which the Company earns revenue) or non-revenue producing (i.e., support investments not associated with any revenue-generating products, services or elements). Certain items are taken as 100 percent non-revenue producing, such as official communications equipment, vehicles, furniture, and garage and work equipment. In the case of General Purpose computers, the Service Costs organization identified products for which computers are an integral part of the service. Finally, in the case of Land and Buildings, all investments in central office equipment buildings are considered revenue-producing, and they are identified as part of the costs of other products, services or elements. The remainder of land and building investments (i.e., other than buildings housing central office equipment) are considered support investments.

Q. What other adjustments are made to the Other Support costs in the development of the ACF?

A. As discussed elsewhere, the Company also excludes the retail avoidable costs to identify wholesale-only other support costs. Furthermore, the Company also subtracts an estimation of costs that are associated with access to OSS. Costs associated with access to OSS are further discussed in Mr. Minion's testimony.

7. Common Overhead ACF

Q. What is included in the Common Overhead ACF?

A. The Common Overhead ACF includes common overhead expenses.

Q. What is included in common overhead expenses?

A. Common overhead expenses are composed of expenses that had previously been described as General and Administration ("G&A") functions. These expenses include the Executive, Planning, General Accounting and Finance, External Relations and Human Resources, Legal, and Other G&A. The Company, in this proceeding, has modified its methodology used in developing the Common Overhead ACF in two ways. In previous Company filings the G&A expenses were related to total company investments. Verizon MA has concluded, however, that it would be more appropriate to express and recover these expenses as a relationship to total Company expenses (not including the common expenses). This more closely assigns the expenses to all categories of services, products and elements. In this manner, all charges, including non-recurring charges, pick up a share of these overhead organizations, rather than only recurring rates bearing the responsibility for carrying these overhead organizations. This is appropriate because overhead expenses, for example, in Human Resources bear a relationship to the number of employees in the Company. Since employees in the installation forces are dedicated to non-recurring activities, it would be appropriate that the non-recurring rates that reflect recovery of these employees' costs bear their fair share of Human Resources and the other common overhead expenses. Secondly, these overhead expenses were aggregated on a Verizon-wide basis. This more accurately reflects the consolidated operations of a multi-state business organization, for these overhead functions.

Q. What adjustments were made to the common overhead expenses?

A. As with other ACFs, the common overhead expenses were reduced by a Resale Avoided Cost Discount percentage.

8. Gross Revenue Loading ACF

Q. What is the Gross Revenue Loading ACF?

A. Gross Revenue Loading ("GRL") is a factor that is applied against the Company revenue to account for regulatory assessments and uncollectibles. Both of these expenses are associated with the level of revenues that the Company actually receives.

9. Right to Use (RTU) ACF

Q. How were software costs (RTU fees) treated in this study?

A. All software RTU fees were capitalized, based on recent changes in accounting rules.

Q. Please explain the recent accounting changes concerning the classification of software costs.

A. On March 4, 1998, the American Institute of Certified Public Accountants ("AICPA") issued SOP 98-1, which recommended changes in the requirements for capitalization of software. As a result, effective January 1, 1999, the vast majority of software used for operating systems and applications in Verizon MA's *network has been capitalized. In Verizon MA's accounting system, the software is capitalized in the Intangible Asset Account 2690.*

Q. How will this accounting change affect Verizon MA's cost studies?

A Previously, only a portion of Verizon MA's software costs were capitalized; for example, the RTU fees associated with the initial purchase of the switch, and certain software that added new functionality to an existing switch. All other RTU costs associated with adding software to an existing switch were treated as an expense. With SOP 98-1, all switch software costs will be capitalized and booked to the Intangible Asset Account 2690.

Q. How has Verizon MA captured the capitalized RTU costs in its TELRIC studies?

A. Verizon MA has developed a RTU ACF. This ACF is based on a ratio of Annual RTU software costs and total investment associated with either switching or digital circuit equipment. The RTU ACF is applied to the appropriate investments throughout the study. A more detailed explanation of the application of this factor as it pertains to switching investments can be found in the switching section of this testimony.

10. Generic Adjustments to Annual Cost Factors

Q. What generic adjustments are made to the Network, Wholesale Marketing, Wholesale Other Support, and Common Overhead ACFs?

A. There are three types of adjustments that are made generically: avoidance of retail-related costs, inflation/productivity considerations and a forward-looking to current conversion.

Q. The TELRIC ACFs reflect only wholesale costs. How did you adjust for retail-related costs?

A. As mentioned earlier, retail-related costs have been excluded based on the retail avoided cost methodology submitted by Mr. Minion in Part B of this proceeding.

Q. How has Verizon MA adjusted the ACFs for inflation and productivity considerations?

A. As described earlier, ACFs have been developed using expenses for calendar year 1999. In order to project these expenses into the future, Verizon MA has included as inputs to the VCost system, estimates of Labor Inflation (Labor Cost Index), general inflation (Consumer Price Index) and productivity for each of the next three years (2001-2003). VCost uses these inputs to develop levelized ACFs, which are then applied to the forward-looking TELRIC investments. The Common Overhead and GRL ACFs are not adjusted in this manner, since these factors are multiplied against costs resulting from the application of adjusted network, marketing, and support factors, and they will follow accordingly.

Q. Can the ACFs developed up to this point be used to identify forward-looking TELRIC costs?

A. No. Before the ACFs can be used to identify forward-looking costs they must be adjusted by a Forward-Looking Conversion ("FLC") factor.

Q. Why is it appropriate to employ a FLC factor?

A. The use of ACFs based on a current expense-to-investment relationship understates the identification of forward-looking costs. To this point, the use of ACFs by the Company to reflect the expense of providing UNEs results in purchasers of UNEs realizing expense savings that have not been identified or ascribed to any particular actual cost-cutting initiative of the Company. This is due to the fact that the use of the TELRIC construct generally results in reduced levels of investment and expenses. This reduction of *investment and expenses, given the relationship between investment and expense reflected in the ACFs, causes an artificial reduction in expenses.*

In the past, the CCFs were computed on the basis of current expense-to-investment ratios that provided a relationship used against cost study-related investments that were unlikely to change dramatically from those used to develop the factors. The CCFs provided a means by which to identify reasonable estimates of expense. However, when ACFs developed in this manner are applied to a significantly smaller or larger investment base, the result is an estimate of operating expenses that falls considerably below or above current levels. In the present situation, if the expense numerators in the ACF ratios are made forward-looking through the use of productivity factors, technology-related efficiencies, and other projected savings, the reductions in estimated expenses represent highly aggressive cost-reduction goals that are highly unlikely to be achieved or achievable. For example, there is no reason to believe that the replacement of one loop technology by an alternative technology with a 10 percent lower investment per loop would reduce the Company's legal or executive expenses at all, much less by 10 percent. Furthermore, it is unlikely that reflecting aggressive discounts in material prices of equipment will subsequently produce concomitant reductions of like magnitude in the maintenance and administration of the equipment. In order to avoid a gross under-identification of cost, some of the factors used to identify carrying costs must be adjusted to ensure the proper identification of costs. Looked at another way, since Verizon MA has made adjustments to the expense levels in the numerator of the ACF development, an imbalance occurs in the ACF ratio if a similar forward looking adjustment is not made in the ACF denominator. The FLC Factor accomplishes this by making the ACF truly forward looking and appropriately applicable to the forward looking incremental investments developed for the UNE products and services. A further demonstration of the need of this kind of adjustment is illustrated below.

Application of a Forward-Looking Conversion ("FLC") Factor

Line	Item	Source	Amount	Comments
1	Forward-Looking Expense		$300	Estimate of True Forward-Looking Expense
2	Current Investment		$1,000	Investment denominator of ACF ratio
3	Annual Cost Factor (ACF)	L1 / L2	.3000	Calculated ACF
4	TELRIC Investment		$800	Forward-Looking Investment
5	Purported TELRIC Expense	L4 x L3	$240	Pseudo - "Forward-Looking" Expense
6	Shortfall	L1 - L5	$60	Unidentified True Forward-Looking expense

Q. To which ACFs should the Forward-Looking Conversion Factor apply?

A. The capital-related components (i.e., Depreciation, RIT, and Property and Other Taxes) should not be adjusted because their associated carrying costs are directly caused by the level of investment identified. Likewise, the Gross Revenue Loading factor does not need to be adjusted because the Gross Revenue Loading identifies costs directly linked to the overall level of expense identified. However, the other components (i.e., Network, Wholesale Marketing, Other Support, and Common Overhead) are associated with expense levels that are not explicitly caused by the value of the investment. That is, it would probably cost the Company the same level of network-related expense to maintain or administer the same piece of equipment whether it costs $10,000 or $6,000. The Marketing effort to support a wholesale offering is independent of how much equipment material prices fluctuate. Finally, Common Overhead expense may vary with the level of business volume but is probably not highly correlated to material discount levels or any efficiencies achieved through the deployment of different technologies.

Q. How was the FLC factor used by Verizon MA developed?

A. A proper calculation of the FLC ratio would require the Company to examine the total plant investments in the TELRIC filing to the total plant investments contained in the Massachusetts accounting records. Since this calculation cannot be developed until the TELRIC investment studies are completed, the Company relied on an evaluation of data supplied in the recently litigated New York UNE proceeding. This data suggests that a ratio between 75 percent and 80 percent is a reasonable approximation going forward. Verizon MA conservatively used an 80 percent ratio in this filing.

Q. Please explain the effects of employing the ACF FLC Factor.

A. The FLC Factor adjusts each component part of the ACFs to properly match the investments or expenses used to create the ACFs with those used to identify the forward-looking expenses in the recurring studies. The table below shows the consequences of a FLC Factor that adjusts for a situation where the level of forward-looking investment in the studies is less than the level of investment used to develop the ACFs.

Application of a Forward-Looking Conversion ("FLC") Factor

(Example Correcting for a Shortfall)

Line	Item	Source	Amount	Comments
1	Forward-Looking Expense		$300	Estimate of True Forward-Looking Expense
2	Current Investment		$1,000	Investment denominator of ACF ratio
3	Annual Cost Factor (ACF)	L1 / L2	.3000	Calculated ACF
4	TELRIC Investment		$800	Forward-Looking Investment
5	Purported TELRIC Expense	L4 x L3	$240	Pseudo - "Forward-Looking" Expense
6	Shortfall	L1 - L5	$60	Unidentified True Forward-Looking expense
7	FL/C Adjustment Factor	L4 / L2	.8000	Forward-Looking Conversion Factor
8	Adjusted ACF	L3 / L7	.375	Identifies appropriate amount of expense
9	TELRIC Expense	L4 x L8	$300	Appropriate level of Forward-Looking expense
10	Shortfall	L1 - L9	$0	Shortfall eliminated

Q. The above example shows an adjustment made where the forward-looking investment is less than the investment used in the development of the ACFs. Would an adjustment be appropriate if the forward-looking investment were greater?

A. Yes. In that instance, the adjustment factor would be greater than one and consequently the adjusted ACF would be less to avoid the over-identification of expense. Likewise, if the investments used to build the ACFs and the forward-looking investments were comparable, no adjustment would be called for.

Q. What kind of an adjustment is made to ensure that as ACFs are applied to lower TELRIC investments and expenses (in the case of overhead and gross revenue loadings), the correct amount of forward-looking expenses is identified?

A. The Network, Wholesale Marketing, and Other Support factors are divided by this ratio in order to yield equivalent TELRIC ACFs that are to be appropriately applied to TELRIC investments. The ACF_{COH} is also adjusted but in a different manner as described below.

Q. Please describe the adjustment to the $ACF_{COH.}$

A. The same concepts that relate to the other ACFs are applicable to the Common Overhead ACF. However, since in some studies this factor is applied to the identified costs (expenses as well as capital costs), it would be inappropriate to apply a forward-looking adjustment to the ACF_{COH} for the portion of the identified costs that already reflect a apply a forward-looking adjustment. That is, it would be inappropriate to adjust the ACF_{COH} when it is applied to the network, wholesale marketing or wholesale other support components of the identified costs. Therefore, a weighted average adjustment is created for the ACF_{COH}. In developing the ACF_{COH}, the Company identified expenses (which would be adjusted with a FLC Factor) and capital costs or other expenses (which would not be adjusted by FLC Factor) to be used in the denominator. The relative percentage of adjusted expenses to non-adjusted expenses/capital costs is used to come up with a weighted average for the forward-looking adjustment for the ACF_{COH}.

Q. For any given study, when is it appropriate to use the ACF_{COH} that reflects the full forward-looking adjustment versus the ACF_{COH} that reflects, instead, the weighted average application of that adjustment?

A. If the study contains expenses that have already been adjusted with a FLC Factor, then the ACF_{COH} with the weighted average adjustment is appropriate. If the study does not contain expenses that have already been adjusted with a FLC Factor (e.g., non-recurring studies), then the unadjusted ACF_{COH} (i.e., the one with the same adjustment factor used for the Network, Wholesale Marketing and Other Support ACFs) is most appropriate.

VI. Overview of THE NETWORK TECHNOLOGY MODEL ON which THE COST STUDIES ARE BASED

Q. Please provide a general description of the forward-looking network technology architecture that forms the basis for the cost studies submitted in this proceeding.

A. The Massachusetts' network is composed of a complex array of technologies and systems that inter-operate to provide telecommunications services. It is best understood when subdivided into its major functional components:

(a) local loop transport facilities,

(b) local switching facilities, and

(c) the facilities that interconnect Massachusetts' wire centers with each other and with the networks of other carriers.

Q. How do the three major functional components relate to the unbundled network elements identified in the Company's cost studies?

A. "Local loop transport" is the loop element; "Local switching" is the local switching element; and the "interconnection" category includes tandem switching, interoffice transport (dedicated and common, and signaling systems (signaling links, STPs, and SCPs) each of which is separately considered.

VII. Local loops

A. In General

Q. What is the "local loop" network element?

A. FCC Rule 319(a) defines the unbundling requirement for the "local loop" network element as follows:

(a) Local Loop and Subloop. An incumbent LEC shall provide nondiscriminatory access, in accordance with § 51.311 and section 251(c)(3) of the Act, to the local loop and subloop, including inside wiring owned by the incumbent LEC, on an unbundled basis to any requesting telecommunications carrier for the provision of a telecommunications service.

(1) Local Loop. The local loop network element is defined as a transmission facility between a distribution frame (or its equivalent) in an incumbent LEC central office and the loop demarcation point at an end-user customer premises, including inside wire owned by the incumbent LEC. The local loop network element includes all features, functions, and capabilities of such transmission facility. Those features, functions, and capabilities include, but are not limited to, dark fiber, attached electronics (except those electronics used for the provision of advanced services, such as Digital Subscriber Line Access Multiplexers), and line conditioning. The local loop includes, but is not limited to, DS1, DS3, fiber, and other high capacity loops.

(2) Subloop. The subloop network element is defined as any portion of the loop that is technically feasible to access at terminals in the incumbent LEC's outside plant, including inside wire. An accessible terminal is any point on the loop where technicians can access the wire or fiber within the cable without removing a splice case to reach the wire or fiber within. Such points may include, but are not limited to, the pole or pedestal, the network interface device, the minimum point of entry, the single point of interconnection, the main distribution frame, the remote terminal, and the feeder/distribution interface.

B. Types of Loops Considered in this Testimony

Q. What types of loops are considered in this testimony?

A. This testimony addresses all of the loop types described in Rule 319(a). Specifically, costs are determined for:

- *Two- and four-wire analog loops and two-wire digital loops;*

- *Four-wire digital (DDS) loops;*

- *Four-wire digital (DS1) loops;*

- *ADSL-compatible loops, two-wire HDSL-compatible loops, and four-wire HDSL compatible loops;*

- *Conditioning charges for DSL-compatible loops;*

- *Line sharing;*

- *High-capacity (DS3 and above loops);*

- *House and riser and other "subloops"; and*

- *Dark fiber loops.*

C. Technical Assumptions, Utilization Factors, and Costs for Specific Loop Types

1. Two- and Four-Wire Analog Loops; Two- and Four-Wire Digital Loops

Q. What is a two-wire analog loop?

A. A two-wire analog loop is a transmission circuit consisting of two wires that is used to both send and receive voice conversation in the 300-3000 Hz frequency range. This is the basic loop type used for providing voice-grade "POTS" service.

Q. What is a four-wire analog loop?

A. A four-wire analog loop consists of two pairs, one to transmit and one to receive. It is used in certain private line and data service applications.

Q. What is a four-wire digital (DDS) loop?

A. A four-wire digital (DDS) loop is a four-wire loop "conditioned" for the transmission of digital data service applications.

Q. What is a two-wire digital loop?

A. A two-wire digital loop is a two-wire loop "conditioned" for the transmission of certain high-speed data services. In particular, Verizon MA's two-wire digital ("premium") loop can be used to provide ISDN - Basic Rate Interface ("BRI") service to an end user customer.

Q. What is a four-wire digital loop?

A. This is a conditioned, four-wire loop that will support DS1 transmission. It can be used, among other things, to provide ISDN - Primary Rate Interface ("PRI") service to an end-user customer.

a) Technical construct

Q. Describe the forward-looking loop infrastructure that will be used to provision loops.

A. The first major functional component of a local exchange network, local loop transport, comprises all the physical transport facilities that connect an end-user customer location to a wire center. These facilities are commonly referred to as "loops" in the telephone industry.

Q. What is a wire center?

A. A wire center is typically a building where loop facilities serving a particular geographic area, and interoffice cable facilities, terminate on physical arrays called "distribution frames." The building also contains switching equipment and other electronic equipment that provide telecommunications functions.

Q. How has the geographic area served by each wire center been determined?

A. Determinations as to the areas to be served by particular wire centers have been based on a trade-off between the number of customers in the area and the length (and transmission characteristics) of the loop facility needed to reach the most distant customer. In other words, while expanding the service area covered by a wire center to encompass more distant customers might reduce the number of wire centers required, it would also necessitate longer, more expensive loops. In large cities, the density of customers has been the overriding factor, and wire center service areas are no more than a few miles in radius, typically serving 100,000 lines and more. Outside the large cities, one wire center has usually been created in each significant town. The size of the areas served by wire centers varies widely today. Heavily populated suburban wire centers typically have shorter loops, whereas rural loops are often much longer and a wire center may have only a few hundred to a few thousand lines.

Q. What function is performed by a loop?

A. The purpose of a loop is to carry a signal (for example, representing a voice communication) between a customer's premises and a central office, with distortion and diminution of the signal maintained at an acceptable level.

Q. What facilities are required to provide this functionality?

A. The primary components of a loop are:

(a) cable (i.e., the physical medium that actually carries the signal);

(b) structure facilities that physically support the cable (e.g., poles, conduit, etc.);

(c) additional support facilities that may be necessary to provide protection against water and other factors that could impair signal transmission (e.g., air pipe, load coils, repeaters, surveillance alarms); and

(d) electronic elements needed to convert and combine signals (e.g.,multiplexers).

Q. What types of cable are utilized in loops?

A. In general, loop cable can be either copper (which conducts signals as electrical impulses) or optical fiber (which conducts signals as light pulses).

Q. What is the design that the Company has utilized for its existing copper loop plant?

A. The wire center is usually located in the approximate center of the area served to minimize the average length of the loop facility needed to reach each customer location. Most of the existing loop facilities were constructed with copper cables, which consist of an outer plastic tube or sheath containing hundreds or even thousands of individual copper wires. Working telephone circuits are served with a dedicated pair of these copper wires, extending from the customer's premises to the main distribution frame in the local wire center. To make construction and administration manageable, the cable emerges from the wire center in large size sheaths and is tapered to smaller and smaller cables as it branches out to the customers. A typical loop facility route may be thought of as a tree with the trunk rooted in the wire center and the branches spreading out to the customers. Cables are divided and spliced to smaller units at each of the branches. In residential or small commercial zones, a "serving area interface" or SAI is usually established at a point where the main cable from the wire center, called the "feeder", branches to a smaller area, called a distribution area, typically containing a few hundred customers. The SAI has the functionality of a flexible splice and is used to manage growth in a distribution area. More pairs are provided in the distribution area cable than the number of feeder pairs branched to that particular distribution area. The location of the SAI is designed to minimize the length of feeder cable and the length and size of the distribution cables required to meet demands for growth and churn. At a pole or building near a group of customers, a properly sized number of distribution pairs is terminated in an apparatus called the "drop terminal" (typically a small box) where individual pairs *can be connected to a customer via a "drop wire." The drop wire is a small cable, usually two or four wires, that connects the drop terminal to the customer's premises. In a multi-unit dwelling the drops may be enclosed in a common "riser" cable that delivers a few pairs from the basement to each living unit.*

Q. Please describe the evolvement of the technology of the loop.

A. In recent years, the development of digital electronic systems and optical transmission has increasingly provided a new and more economic way to build loop facilities, utilizing what is known as "digital loop carrier" ("DLC") technology. DLC technology converts voice and other analog signals into a digital signal that can be combined or "multiplexed" with other such signals and sent over a shared "carrier" facility. The first DLC systems used copper pairs for transmission of the digital signal back to the wire center, but today DLC systems using optical fiber systems are the most efficient DLC technology. The cost of DLC technology initially made it economically efficient only for use on the longer subscriber loops. As the cost to deploy fiber fed electronic systems decreases, its use is more economical for applications with less access lines or fewer high speed digital service requirements and within shorter distances from the CO.

Q. Is this consistent with the technology that the Company has in its network today, and also used in its network model?

A. Yes. In a forward-looking network, the long-term objective is to work towards an all fiber-fed DLC network, reducing the copper cable length to the customer. However, copper cables continue to be the economically efficient design choice for many feeder loops nearer to the serving wire center.

Q. Describe the loop architecture utilized in your forward-looking network model.

A. In the forward looking network model, a combination of fiber-fed DLC and copper cables are utilized to provide feeder facilities. The use of copper feeder is limited to those loops typically closer to the central office, while fiber fed DLC is used beyond that point. This combined design strategy (copper and fiber) eliminates costly network elements required for longer loop copper designs (heavier gauge cables, load coils, repeaters). On longer loops, at the branch to a distribution area, fiber is placed to an electronic device called a remote terminal ("RT"). The RT terminates the optical system and provides the digital decoding/encoding and multiplexing functions that allow the many individual lines to be transmitted on the optical system. Each individual line or "channel" on the system has a port on the RT with a device (channel unit) that converts the information on a standard 3 kHz bandwidth, analog voice frequency line into a standard, 64 Kbs, digital DSO format. Each channel unit is connected by copper cable to a nearby distribution area cross-box, where the RT channels can be connected to the copper distribution cable pairs that run to customer locations.

Q. What do you mean by "DSO format"?

A. DSO (Digital Signal 0 Level) is a unit of digital signal that provides an information-carrying channel within a digital facility. In general, a DS0 channel provides sufficient digital signal to carry one standard voice grade signal with a 3kHz bandwidth. Higher capacity digital signals are referred to, for example, as "DS1s" and "DS3s" and are constructed by adding together (multiplexing) lower signals (a DS1 can contain 24 DSOs, a DS3 can contain 28 DS1s).

Q. Please continue your discussion of a modern, forward-looking loop plant architecture.

A. Thus, the typical modern loop facility is a hybrid. On longer loops the facility consists of the copper drop, feeder, and distribution cable from the customer location to the optical RT and the digital channel on the fiber optic system back to the wire center. Depending on density, the RT is located as close to the customer as possible, thus minimizing the length of the distribution cable and maximizing the substitution of fiber for copper. In very concentrated applications like high rise, multi-unit dwellings, it is economically efficient to install the optical RT in the basement or other common space in the building and completely eliminate the copper feeder cable. In other areas, some feeder and distribution cable is required to bring together enough customer lines to efficiently use the expensive RT facility. Nearer to the central office, an all-copper solution may still be economically more efficient than fiber-fed DLC.

Q. How do optical DLCs terminate at the wire center?

A. In the wire center, the optical DLC cable terminates on the wire center's fiber distribution frame ("FDF") and is connected from there, by fiber cabling, to a piece of equipment called the central office terminal ("COT"). The COT can provide an interface to local switching equipment or other transmission systems (for example, those systems providing interconnection to another carrier's network) either (a) in a standard, 24 DSO-line digital format (known as an "Integrated Digital Loop Carrier" [IDLC], or DS1 connection) or (b) as an individual analog channel (after decoding and demultiplexing) connected to copper wire interfaces (known as "Universal Digital Loop Carrier" [UDLC]). A "universal" interface can be connected to any type of voice frequency switch port or telecommunications equipment on the main distribution frame.

Q. Which of the two COT interfaces -- integrated or universal -- would be used in designing an efficient, forward-looking network?

A. Both would be used depending on the service that is ordered by the CLEC. For example when a CLEC orders an individual 2-wire analog loop, physically and technically this can only be handed-off (connected) to the CLEC using the universal interface.

Q. What types of services are provided over integrated DLC in a forward looking model?

A. Fiber-fed DLC switched services are provisioned using an integrated DLC in the forward looking model. Other services require a universal interface, such as individual 2-wire analog loops or data services like ISDN and DDS.

Q. Which of the two COT interfaces -- integrated or universal -- would be used in providing access to a (UNE) loop?

A: In order to access a 2-wire analog UNE loop, a physical point of interconnection is needed. For this reason, a universal DLC or UDLC interface is needed. Integrated DLC, IDLC, does not have a physical 2-wire connection in a central office. Therefore, a CLEC cannot connect to the 2-wire analog loop unless UDLC or copper cable is used.

Q. How does the loop transport facility of a modern forward-looking network compare with the loop facility analyzed in the Company's cost studies?

A. The two are fully consistent. First, with respect to feeder plant, as described above, the economic efficiency of optical DLC has reached a point where much of the feeder capacity can be efficiently created using these systems. Optical DLC is usually installed first in feeders serving distribution areas that are more distant from the wire center, since it is in such areas that optical DLC provides the greatest efficiencies. The copper feeder cable that is made spare (i.e., freed up) by the DLC installation is then cut and used to provide capacity to distribution areas closer to the wire center. Over time a greater and greater portion of the feeder will be moved to optical facilities.

Our forward-looking model assumes that feeder capacity is placed on the most efficient optical DLC currently available from suppliers. Copper feeder deployment is limited to areas where the economic advantages of fiber do not exist. This is the design that Verizon MA plans to employ for the foreseeable future.

Q. Is this the same network design presented in the Company's 1996 TELRIC study in the Consolidated Arbitrations?

A. No. The Company's 1996 TELRIC study was based on a loop construct consisting of 100 percent fiber in the feeder plant. In addition, the 1996 construct assumed that all unbundled two-wire loops could be served on an integrated digital loop carrier ("IDLC") interface.

Q. Why did Verizon MA change its cost study assumption for this filing?

A. The assumption of 100 percent IDLC adopted in the 1996 study reflected a network construct that, as described above, was not appropriate for provisioning unbundled loops. The Company now realizes that it was not necessary to base its 1996 cost estimates on an assumption of 100 percent IDLC.

In order to be consistent with the FCC's principles, a forward-looking TELRIC estimate should account for costs based on the forward-looking technology currently deployed *using the most efficient methods and practices developed by engineers for current, actual use in planned plant investment decisions and construction.*[(15)] *As described above, this TELRIC study is consistent with those principles and reflects the design that Verizon MA plans to deploy for the foreseeable future. The 1996 study based on 100 percent fiber was consistent with the Company's long term planning objectives, but did not reflect the forward-looking costs that Verizon MA would actually expect to incur over any reasonable planning period.*

Q. Is the Company's choice of technology for the distribution plant consistent with your network model?

A. Yes. As previously discussed, the efficiency of optical loop systems is determined chiefly by the density of the lines in the area served. This is because the electronics in the RT represent the majority of the cost. The smallest RT unit economically efficient with existing technology provides capacity for about 100 customer lines. In areas were the RT can be placed within 500 feet of about 100 customers, it is economically efficient to totally eliminate the copper feeder cable. This occurs, for the most part, only in dense urban areas and large multi-unit housing complexes. In all other areas, a limited length of copper feeder and distribution cable is required even in the forward-looking model to aggregate enough lines at the RT to make it efficient. The loop models described in the Company's testimony properly reflect the mixture of optical DLC, copper feeder and copper distribution cable required to efficiently address the density of the particular type of area covered by each model.

b) Utilization Factors for Local Loop Components

i) Distribution Cable

Q. What utilization factor was used for distribution cable in Verizon MA's studies?

A. A factor of 40 percent was used.

Q. How was this factor derived?

A. Distribution utilization is determined by two major factors: designing for long-term demand and construction breakage. Residential demand is the primary driver of utilization in the distribution plant. This study conservatively follows the long standing industry practice of allocating at least two distribution cable pairs per-zoned residential unit. Allocating pairs consistent with zoning provides for the long-term demand that could occur in an area if all the zoned land is developed and all potential customers use Verizon MA distribution facilities. The two-pairs per unit assumption accommodates the statistical peaks in per customer demand. If the ultimate demand level were attained, then the average distribution fill would be approximately 60 percent given the average residential demand of 1.2 lines per living unit. In any real network, the actual demand level is significantly less than the ultimate. Undeveloped land, vacancies, and the fact that all customers do not use the Verizon MA infrastructure contribute to reduce the actual demand. "Forward looking" estimates for these factors can be derived from experience and public information.

Even in the most mature demographic areas, a significant fraction of the land zoned for use is not currently in use. For the forward-looking model, the Company has made the very conservative estimate that on average 90 percent of the zoned units have been built, and hence the current maximum potential demand is 90 percent of the ultimate demand.

While new housing units are added at a steady rate, an important fraction of existing units are vacant at any point in time. Because distribution plant is by its nature dedicated on average to a small physical area, the distribution plant allocated within ultimate design to serve these vacant units must be spare. Business *vacancies also occur and contribute to the spare. We have assumed that 5 percent of the ultimate demand is not realized at any point in time because of vacancies.*

For a variety of reasons, some business and residential units, while occupied, do not obtain telephone service using the Verizon MA distribution network. Competition and service substitution have and will increasingly attract potential business and residence customers away from wireline local telephone service. Wireless alternatives and facilities-based competition have already begun to attract demand away from the local telephone network. The distribution plant allocated to these customer locations is left spare. For this analysis, we assume that 10 percent of the potential customers do not use Verizon MA distribution facilities. This is a highly conservative estimate since major competitors such as AT&T have publicly touted their objective of attracting 25 percent of the local access business onto their alternative networks within the next five years.

Combining these three factors, yields an estimate that only 75 percent of the zoned living units in an average Distribution Area will actually be generating Verizon MA demand in a forward-looking scenario. This means that the anticipated utilization of the available distribution pairs, which are sized to serve 100 percent of the units, is 1.2 times 75 percent divided by 2 or 45 percent. The actual utilization of distribution investment must be lower than this number because of construction breakage.

Construction breakage has a major impact on the utilization of distribution investment. Copper cable comes in fixed sizes: 25, 50, 100, 200, 300, 600 pairs, etc. As cables are branched down streets, the pairs required rarely fit the cable size perfectly and the next largest size cable that meets the demand must always be chosen. For example, if a street requires 60 pairs, a 100 pair cable must be run since the next smallest size, 50, does not satisfy the demand. This is an exaggerated but not unusual example. As the branch cables are combined back toward the SAI, some but not all of this unused capacity is eliminated. Cables are manufactured and spliced in units of 25 pairs called binder groups. In the example given above, only three binder groups, 75 pairs, would be spliced into the larger cable at the block branch point. This would eliminate 25 of the pairs unused in the 100 pair block cable but 15 pairs would remain unused in the larger cable. These pairs must remain spare all the way to the SAI but they are not included in the available inventory at the SAI. Thus, the distribution cable inventory recorded in the SAI is always less than the actual installed distribution cable capacity. There is also local breakage along the distribution cable.

Returning to the example above, the 100 pair cable is run down the whole street and passes many local drop terminals. At each one, two pairs are terminated for each living unit and are left spare in the remainder of the cable that runs down the street. When the last terminal is reached, most of the cable is left spare. In fact, at most, about 50 percent of the actual cable capacity will be used on branch cables down streets. Any size breakage reduces this number. Although at first blush it might seem that tapering could mitigate this reduced utilization, the reality of placing and splicing many short little segments of cable makes this an impractical alternative. There is also similar breakage along the larger cables that pass the local streets. For example, if the large cable is 300 pairs and 50 pairs must be dropped down a street, those 50 pairs must be left unused in the large cable as it continues, since a 250 pair cable is not available. How far the unused capacity continues in the cable depends on the requirements at the next branch point. The precise amount of unused capacity in a distribution area can only be determined by an exhaustive manual study of the cable layouts. A very conservative estimate is that on average 10 percent of the installed distribution cable investment is left unused because of construction breakage. This is equivalent to saying that for every nine pairs of available distribution capacity created, the equivalent investment of one pair is left unused.

Using the 10 percent breakage factor, the forward-looking utilization of distribution investment is estimated to be the 45 percent utilization of pairs available for assignment calculated above, multiplied by 90 percent or 40.5 percent. This analytically derived figure is consistent with the 40 percent used in this study.

ii) Feeder Cable

Q. What utilization rates were used for the feeder cable components in the cost studies?

A. For copper feeder cables, a 55.2 percent utilization rate was used. For fiber cables, a 60 percent utilization rate was used.

Q. Why are these utilization factors appropriate for use in Verizon MA's cost studies?

A. The outside plant network is not static; rather, it is a dynamic phenomenon. Service connections and disconnections occur during every working day. Also, additional feeder facilities are continually being constructed. On the granular level (i.e., individual distribution areas and feeder routes), the actual fill levels are changing with every service order. There will be some routes in which a relief job has just been completed. These routes will have significantly lower utilization levels. On a macroscopic level (i.e., the overall outside plant network), the overall fill level is relatively constant.

Looking at the network as an overall entity, Verizon tends to add pairs to the network at approximately the same rate that they are being used. This is not coincidence; rather, it is by design to ensure that a balance is maintained between cost and service demands. Therefore, the utilization factors used in Verizon MA's cost studies, which are based on an examination of actual fill levels, represent a true and stable picture of the overall forward-looking network fill.

iii) RT Electronics

Q. What utilization factor is appropriate for the RT electronics component of the loop.

A. A utilization factor of 80 percent was used for plug-ins at the Remote Terminal. Unlike other components of the loop plant, which can take a number of months to design, order, and install, the installation interval for plug-ins is shorter. However, if Verizon MA runs out of a particular type of plug-in needed to meet a service order, at a particular RT location, then a technician must be dispatched to install each plug-in. Consequently, plug-ins are usually installed in a remote terminal to accommodate a projected demand and estimated churn. This amount of spare plug-ins minimizes the number of times that technicians must be dispatched for each individual service request, therefore reducing the cost to provide individual service requests. This practice strikes a balance between the cost of individual dispatches and the cost to provide spare plug-ins in advance of their need. Just as with cable, at any point in time, there will be remote terminals that have just received additional spare plug-ins; there will be remote terminals that are in need of additional plug-ins because they will soon exhaust the spare plug-ins; and there will be remote terminals at various levels between these two points.

c) Determining Loop Investments: In General

Q. What investments are included in the loop cost studies?

A. Loop investments include:

- *Copper feeder, sub-feeder, and distribution cable.*

- *Fiber optic feeder cable.*

- *Remote terminal equipment.*

- *Cross-boxes (SAIs/FDIs) and distribution terminals.*

- *Central office DLC termination electronics.*

* *DSX-1s and (where utilized in connection with universal interfaces) MDFs.*

* *NIDs.*[(16)] *(For DS1 loops, a NID with additional functionality, sometimes referred to as a "smart jack," is required at the end user premises to support the isolation and testing and troubles reported by a CLEC to Verizon MA. The DS1 NID is activated remotely by a digital code that is sent during installation and maintenance activities. The code activates a loopback relay that breaks the DS1 circuit to the end user and closes a path between the network transmit and receive pair. The NID allows the tester to confirm the integrity and performance of the DS1 loop without having to dispatch a technician to the site, and represents the most efficient means currently available for carrying out this testing function.)*

* *Loop "structure" (i.e., poles, conduits, and other supporting facilities).*

Q. How were the forward-looking investments determined for these assets?

A. Material prices for electronic equipment and cables reflect the latest negotiated contract prices Verizon MA has with the manufacturers of the circuit equipment and cable facilities, including applicable vendor discounts. Fiber cable, copper cable, SAI, service wire, distribution terminals, poles, and installation and engineering costs were obtained from the ECRIS system.

Q. What is ECRIS?

A. ECRIS is a system used by the Company's OSP engineers to automate the costing, scheduling, and tracking of OSP work. ECRIS permits engineers to build complex OSP jobs from elemental work operations. ECRIS calculates the cost of performing a work operation ("WKOP"), based on specific information about the WKOP provided by the user. Using ECRIS, the Company determines the WKOPs for placing and splicing cables of various types, sizes, and lengths throughout the state. The total costs of these work operations were divided by the lengths of cable placed to obtain the installed costs per foot used by the loop cost model. A similar methodology was used for cross-boxes, terminals, and poles. In this way, installed unit costs were developed by region of the state and density zone.

Q. Were investment loadings applied to the loop investments?

A. In general, no. Investment data derived from ECRIS already incorporate the costs of engineering and installation. And, loops neither utilize central office power nor are housed in central office buildings, so the power and L&B factors are irrelevant. The only exception to this is certain COT and RT investments, to which L&B and power factors were applied.

Q. How was investment in loop structure addressed in the cost studies?

A. Structure investment (i.e., the investment in poles, conduit, and other structure support facilities) was assigned directly to the loop, along with the investment in loop cable and electronics, in accordance with ¶ 682 of the Local Competition Order.[(17)]

Q. In view of the fact that cables used for the loop and interoffice transport elements may be supported by the same structure, what measures were taken to prevent double-recovery of structure investment?

A. Structure costs were computed on a per-pair foot or per-strand foot basis and the resulting factors were multiplied by the number of pair/strand-feet of cable. This approach appropriately allocates total structure cost to the loop and transport elements based on the number of pair-feet of cable supported for each element.

Q. What measures were taken to prevent over-recovery of the cost of structure that is shared by Verizon MA and other utilities?

A. In determining structure investment, the Company's study took account of the fact that some poles are jointly owned with other utility companies. Only that portion of the structure investment owned by Verizon MA was considered in the study. Moreover, any revenues received by Verizon MA for pole attachments and conduit rentals were offset against the ACFs for pole and conduit maintenance.

d) The Feeder Route Analysis

Q. How did the Company determine the characteristics of forward-looking loops for purposes of its cost studies?

A. The Company utilized the Loop Cost Analysis Model ("LCAM") to develop the investments and costs associated with the local loop, which is discussed below. However, LCAM derives its loop plant characteristics from a survey of feeder route data conducted by Verizon MA's engineers.

Q. Were all Massachusetts COs included in the engineering survey?

A. No. All COs with 25,000 or more assigned lines were included in the engineering survey. COs with fewer than 25,000 assigned lines were divided into 2 groups. Group 1 consists of COs with 5,000 - 24,999 assigned lines. Group 2 consists of COs with fewer than 5,000 assigned lines. From each group, a random sample of COs was selected for inclusion in the engineering survey.

Q. How many COs were sampled in each of the groups?

A. From Group 1, a random sample of 50 COs was selected from a universe of 139 COs. From Group 2, a random sample of 23 COs was selected from a universe of 67.

Q. Are these samples statistically valid?

A. Yes. The samples were taken in accordance with standard statistical practice. The samples are quite large relative to their universes. The Group 1 and 2 samples represent 36 percent and 34 percent of their universes, respectively.

Q. How do the Group 1 and Group 2 COs relate to the four density zones?

A. The Group 1 and Group 2 COs are distributed throughout the Urban, Suburban, and Rural density zones.

Q. Were forward-looking loop costs developed for all COs included in the engineering survey?

A. Yes. LCAM developed forward-looking loop costs for all surveyed COs.

Q. How were the loop costs for the COs used to develop loop costs for the density zones?

A. For each of the four density zones, the forward-looking link cost is calculated as a working access line weighted average of the CO link costs.

e) LCAM

Q. Please describe LCAM.

A. LCAM is a client-server system using Visual Basic and Oracle Structured Query Language ("SQL"). It has been designed to calculate costs at the wire center basis. The system has three modules: Plant Characteristics, Electronics and Loop Study.

The ***Plant Characteristics*** *module is derived from a recently conducted engineering survey for Massachusetts. Physical characteristics of the Outside Plant Network were obtained from the respective engineering groups for each geographic area. These areas are identified as Carrier Serving Areas ("CSAs"). A mechanized report of actual assigned circuits in each CSA was obtained from Loop Engineering Assignment Data ("LEAD"). The Plant Characteristics module computes the feeder, sub-feeder and distribution length, structure and size for each CSA. The investment per pair foot is derived from the cable sizes and investment data derived from ECRIS. These results are weighted by working lines in the selected services, and are summarized by wire center. The* ***Electronics*** *module analyzes the total working lines by Distribution Area ("DA") or CSA to identify the appropriate size and investment for DLC. From these details, a weighted average investment is determined for each wire center. The* ***Loop Study*** *module reads the summarized results of the Plant Characteristics and Electronics studies and various other factors. These values are used to compute loop costs for the available architectures and weight them to produce a composite loop cost. Loop costs were developed using forward looking economic assumptions appropriate for the loop network. Consistent with forward-looking engineering estimates, the loops reflect copper or fiber optic feeder cable copper or fiber distribution cable, DLC and other electronic equipment. TELRIC ACFs developed in VCost are applied to all investments developed in the Loop Study. The annual costs are divided by twelve to produce monthly costs.*

2. DSL-Compatible Loops

Q. What are xDSL technologies?

A. The term "xDSL" describes a family of transmission technologies that use specialized electronics at the customer's premises and at a telephone company's central office (or other company facility)[(18)] *to transmit high-speed data signals over copper cables. Thus, xDSL does not refer to any particular service, but to a family of technologies that can be used to provision a wide variety of services.*

The two current xDSL technologies are, by definition, copper-based; that is, they can be utilized only over copper cables.[(19)] *The fact that these technologies utilize copper loops enables telephone companies to extend the economic life of their embedded copper loop plant by using that plant to provision high-speed digital services. xDSL is, therefore, an interim technology -- one that will eventually be displaced by fiber-based transmission technologies. It is, moreover, a technology that is based on and largely justified by the use of embedded plant. Verizon MA is not deploying copper loops on a forward-looking basis exclusively to support xDSL transmission technologies or the advanced digital services that those technologies can support.*[(20)]

Q. What xDSL transmission technologies are relevant to the DSL services in this filing?

A The two xDSL technologies that are relevant are Asymmetrical Digital Subscriber Line ("ADSL") and High Bit-Rate Digital Subscriber Line ("HDSL"). ADSL utilizes a twisted-pair copper loop. The technology is "asymmetrical" in the sense that it can support a signal of up to 640 Kbps from the customer to the telephone company, but a signal of much higher bandwidth -- 6 Mbps or more -- from the telephone company to the customer.[(21)] *The higher bandwidth in the telephone-company-to-customer direction permits rapid downloading of information from Internet Web servers or other databases. Moreover, using ADSL technology, data signals can be combined with a conventional voice-grade POTS signal and transmitted over a single facility.*

Q. What services can be provisioned using ADSL technology?

A. ADSL technology is used to provision voice-and-data service designed primarily to offer customers high-speed Internet access together with voice-grade POTS service. Various CLECs offer their own, competitive services based on ADSL technology.

Q. What is HDSL?

A. HDSL technology comes in two varieties, one of which utilizes a two-wire copper loop and the other of which utilizes a four-wire copper loop. The two-wire version supports symmetrical transmission at speeds of up to 784 Kbps; the four-wire version supports speeds of up to 1.5 Mbps. Four-wire HDSL technology can thus be used to provision DS-1 circuits.

Q. What are DSL compatible loops?

A. DSL compatible loops are simply two- or four-wire copper loops that will support the transmission of ADSL or HDSL signals. They extend from the customer's premises to an interconnection point between Verizon MA and the CLEC, located at a collocation arrangement in Verizon MA's central office. Verizon MA does not provide the xDSL terminating electronics at either end of the transmission path. Those are provided by the CLEC, its customer, or a third party.

Q. What is the forward-looking technology for DSL-compatible loops?

A. ADSL transmission technology can only be utilized over copper cables. The FCC confirmed this fact in its UNE Remand Order.[22] Thus, it simply does not make sense to talk about end-to-end DSL transmission over loops served by DLC systems and equipped with fiber feeders. The "most efficient technology currently available" for DSL transmission consists of copper cables. What CLECs have clearly requested from Verizon MA, and what Verizon MA provides, are copper transmission paths to which the CLECs can attach their own DSL electronics, provided by their own vendors and adapted to the services that they intend to offer. These electronics would not function properly over DLC systems.

Q. What rate is Verizon MA proposing to charge for ADSL compatible loops?

A. Verizon MA is proposing to charge the same monthly recurring rates for ADSL compatible loops that it charges for the two-wire analog loop. This reflects the fact that the loops used by CLECs for provisioning DSL services will in most cases be identical (except for the need for conditioning) to the majority of the unbundled loops actually provided to CLECs as two-wire analog loops. Costs and charges associated with conditioning are addressed in Mr. Meacham's testimony.

Q. Are any additional recurring costs associated with the provision of xDSL-compatible loops?

A. Incremental investments and associated monthly costs have been identified for wideband test access capability on ADSL-compatible loops. These costs are addressed later in the Line Sharing section of the testimony.

3. Mechanized Loop Qualification

a) The Qualification Process

Q. Please provide an overview of the loop qualification process.

A. The primary means by which CLECs can obtain loop qualification information is by submitting queries to Verizon MA's automated loop qualification database (the "Database"). This Database supports both Verizon MA's retail service and the provision of unbundled ADSL/HDSL-compatible loops to CLECs.

Since the Database is still in the process of being built on a central-office-by-central-office basis, in some cases a loop on which a CLEC wishes to offer an xDSL-based service may not yet be included in the Database. Alternatively, if the Database shows that the loop does not qualify, the CLEC may wish to determine why it is not qualified (e.g., the presence of load coils, the presence of DLC equipment, or excessive loop length). (The particular information that a CLEC may need to qualify a loop for its own services depends on the nature of those services, and in particular on the technical characteristics of the terminating electronics that the CLEC chooses to use.) In such case, additional information can be provided through a Manual Loop Qualification process. Further information that may be of interest to CLECs offering specialized services, such as cable gauges and the location of load coils, is available through the Engineering Query process.

A CLEC that is offering services comparable to Verizon MA's retail services should be able to get all of the qualification information it needs from the Database (provided that the Database has been created for the central office in question). The Manual Loop Qualification and Engineering Query processes recognize the fact that CLECs may wish to offer services with more stringent technical requirements than DSL. Costs associated with these manual processes are contained in the study presented by Mr. Meacham.

Q. What charges are proposed for the mechanized qualification function?

A. A recurring Mechanized Loop Qualification charge, applicable to all loops used to offer xDSL-based services, is proposed to recover a pro rata share of the costs incurred in the creation and maintenance of the Database.

Q. What information can a CLEC obtain from the Database and how is it obtained?

A. A CLEC can submit a query to the Database through Verizon MA's standard Operations Support System wholesale interfaces. The query may identify the loop in question by telephone number or address. The principal loop qualification information that is available from the Database and that would be of interest to CLECs is the total metallic loop length (including bridged taps), as determined by an MLT test.[(23)] *The Database will also indicate, however, whether the loop is qualified for the offering of DSL service. (A loop is deemed qualified for DSL if the total loop length, including bridged tap, is less than 15,000 feet, if the loop is not served by DLC, and if T1 is absent from the loop's binder group.*[(24)]*)*

It should be noted that although the Database is accessed by entering a particular telephone number or address, the loop qualification information is generated and stored on a terminal-by-terminal basis. The information returned from the Database indicates whether qualified loops are available within the terminal serving the specific location in question.

Q. How is the Database being created?

A. The creation of the Database for a particular terminal involves MLT testing of a sample of the loops in that terminal. The testing is carried out on an automated, bulk-testing basis that greatly reduces the time and cost per test. The loop-length information obtained from the MLT test is then associated in the database with the telephone number and address of each of the loops served by that terminal.[(25)]

On an ongoing basis, the Database will be updated to reflect any changes in loop qualification information resulting from modifications or rearrangements to loop facilities (e.g., the upgrading of a particular loop from copper to DLC).

Q. How many offices are currently included in the Database?

A. In Verizon MA, 83 percent of central offices, representing 96 percent of the Network Access Lines where CLECs are ready to purchase xDSL, i.e., where CLECs are collocated currently, are in the database.

Priority is being given to offices based on Verizon MA's proposed roll-out of retail DSL service, the presence of CLEC collocation, and specific CLEC forecasts for the offering of their own xDSL-based services.

Q. Why doesn't the Database include all information that might be of interest to CLECs intending to offer ADSL/HDSL-based services, and that currently must be obtained through the Manual Loop Qualification or Engineering Query processes?

A. Obtaining information on cable gauges, load coil locations, etc., for all of Verizon MA's loops -- and using it to populate a greatly expanded database -- would require a massive and highly expensive effort. Paper records ("cable plats") would have to be reviewed for literally millions of loops. This would greatly expand the cost of the Database for all carriers, including those whose chosen technologies do not require such detailed information. In contrast, under Verizon MA's less extravagant approach, unnecessary costs are not incurred to review cable plats for loops that may never be used to offer xDSL-based services. Moreover, under Verizon MA's approach, the costs of paper-record-review would be imposed in a cost-causative manner only on those CLECs whose services require the additional information.

Q. What charges are associated with the Database?

A. Verizon MA has proposed a Mechanized Loop Qualification Charge. This is a recurring charge, imposed on all ADSL-capable loops ordered by CLECs. (The associated cost is also identified as a cost of all loops used to provide Infospeed DSL service, and is covered by the retail rate for such service.)[26]

The Mechanized Loop Qualification Charge would not be imposed on loops served by central offices that are not included in the Database at the time of the CLEC request. It also would not be imposed on CLECs that choose not to consult the Database prior to ordering an ADSL/HDSL-compatible loop or DDL.

Q. What activities are involved in Database maintenance?

A. The activities involved in Database maintenance are related to program changes, loading and extracting data, and the updating of the records in the database performed by engineers in the Facilities Management Center ("FMC"). In general, these activities will be conducted on an ongoing basis as a consequence of changes in facilities, growth in loop plant, and CLEC requests for additional information not originally included in the Database.

This expense is in no way related to the computer-operations, software-development, and database management type expenses assigned for recovery through ACFs under such USOA Accounts as 6724 (Information Management).

b) Methodology for Mechanized Loop Qualification

Q. What was the basis for setting the Mechanized Loop Qualification charge?

A. The Mechanized Loop Qualification Charge was based on the costs of creating and maintaining the Database.

Q. How was that cost determined?

A. The Database creation costs are essentially the costs of performing MLT tests for a sample of loops in each terminal in the offices included in the database. Testing costs are determined by multiplying the average testing time per loop[27] *by the relevant labor rate. This generates a per-loop cost. The total testing cost is then determined for the five-year period that will be required to qualify all of Verizon MA's loops, and is reduced to a net present value ("NPV") basis. This total cost is then divided by the forecasted* *number of wholesale and retail ADSL loops that Verizon MA will be providing or using, also computed over a five year period and reduced to an NPV basis. The result is an average testing cost per loop utilized for ADSL/HDSL transmission. This cost was amortized over a 30-month period (representing an average "service life" for a customer's use of a retail ADSL-based service) to arrive at a monthly recurring cost.*

Another component of the Mechanized Loop Testing Charge is the Database maintenance cost. The cost was developed by identifying the cost (labor rate times activity time duration), of program development and refinements, loading and extracting data, and other ongoing maintenance activities. Next, the cumulative number of lines qualified over the planning period, by year, was multiplied by the cost previously developed. Again, the forecasted number of subscribers requesting ADSL over the five-year planning period were also brought back, on a NPV basis, to the current year to match these expenses. The total Database maintenance expense was then divided by the total forecasted number of ADSL subscribers and converted to a monthly expense.

4. Line Sharing

a) Background: Description of Line Sharing and Proposed Serving Arrangements

Q. What is line sharing?

A. Line sharing generally describes the ability of a competitive LEC to provide xDSL based service over the same physical loop facility as is used by the incumbent LEC for the provision of a retail voice grade service. As part of this arrangement, voice traffic is transported in the 0-4 KHz frequency range; data traffic is transported in the available spectrum above 4 KHz. This frequency separation is accomplished through the use of central office based "splitters" with low-pass and high-pass filters to combine the separate voice and data services onto a single loop facility. Splitters or filters are also required at the customer location to separate these services for delivery to the appropriate CPE (i.e., telephone set for voice services and personal computer for data services). The FCC has addressed line sharing requirements in some detail in a recent order (the "FCC Order").[28]

b) Costs of Line Sharing

i) Background

Q. What costs did the FCC conclude that the incumbent LEC could potentially incur in providing access to Line Sharing?

A. The FCC Order addresses five types of direct costs that an incumbent LEC could potentially incur to provide access to line sharing: (1) local loops; (2) OSS; (3) cross-connects; (4) splitters; and (5) line conditioning.

Q. What costs for the local loop does the FCC Order address?

A. The FCC Order concludes that the states may permit LECs to charge CLECs for access to shared local loops no more than the amount of loop costs allocated by the LEC to its interstate rates for retail ADSL-based service.

Q. Does Verizon MA propose to allocate any loop costs to the rates that it will charge for line sharing?

A. No.

Q. What costs for Operational Support Systems ("OSS") does the FCC Order address?

A. The FCC Order concludes that the incumbent LECs should recover in their line sharing charges reasonable incremental costs of OSS modifications that are caused by the obligation to provide line sharing.

Q. What costs associated with cross-connects does the FCC Order address?

A. The FCC Order finds that where the splitter is located "within the incumbent LEC's MDF," the cost for installing cross-connects for xDSL services would, in general, be the same as the costs incurred for cross-connecting loops to the CLEC's collocation facilities.

Q. What costs associated with the splitter does the FCC Order address?

A. The FCC Order concludes that if the incumbent LEC purchases for CLEC use the same splitter that it uses itself for its own xDSL service, states may require that the incumbent assess the CLEC the same "amount that it itself pays for a delivered splitter." It further concludes that the CLEC can purchase its own splitter and transfer it to the incumbent LEC. In addition, the state may allow the LEC to charge to recover the cost of installing the splitters.

Q. What costs associated with conditioning does the FCC Order address?

A. The FCC Order concludes that the states may require that the conditioning charges for shared lines not exceed the charges the LECs are permitted to recover for similar conditioning of stand-alone loops for xDSL-based services.

ii) Splitter Costs

Q. What costs has Verizon MA identified for line sharing associated with the splitter?

A. The Company's cost studies assume the placement of the splitter on a relay rack located in the Company's own space in the central office or installed in a CLEC collocation arrangement. There are four cost components for a splitter mounted in Verizon MA space: (1) installation costs if Verizon MA installs the splitter on behalf of the CLEC; (2) the recurring network maintenance, marketing, and support costs for the splitters; (3) collocation-related costs for the splitter equipment support element; and (4) the nonrecurring cross-connect costs. Collocation related splitter costs are described in Ms. Clark's testimony. Mr. Meacham's study determines the nonrecurring central office wiring costs.

Q. What different provisioning scenarios did Verizon MA assume in developing splitter costs?

A. The Company assumed two different scenarios for the splitter installation costs to capture the different manners in which the splitter could be located, installed, maintained, and supported. These options are: (1) Option C, where the CLEC purchases the splitter and Verizon MA installs it in its own space and maintains and supports it; and (2) Option A, where the CLEC purchases and installs the splitter in its collocation cage. These are the options contained in Verizon MA's interconnection tariff, D.T.E. - Mass. - No. 17, which the Department examined in D.T.E. 98-57, Phase III.

Q. Please describe Option C (CLEC purchased, Verizon MA installed, maintained and supported) and how the costs were developed.

A. In this scenario, the CLEC purchases the splitter and transfers the asset to Verizon MA for a nominal amount. Verizon MA installs the splitter and takes responsibility for the network maintenance, administration and support of the splitter once installed.

The cost study calculates the installation cost for the splitter common equipment shelf and the full complement of 24 cards containing four splitter circuits (i.e., 96-line capacity) by multiplying the material cost by the EF&I factor. This installation cost will be recovered up-front in a non-recurring rate element.

In addition to the installation costs, the Company developed a recurring cost element to recover the operating expenses for network maintenance, administration and other support. Verizon MA identified the total installed investment for the splitter as if it actually purchased and installed the splitter, and then it applied the appropriate ACFs to develop the annual network maintenance, administration, and support recurring cost. These costs appropriately do not include any capital-related costs.

Q. Please describe Option A (CLEC purchased, CLEC installed in collocation cage.

A. In this scenario, the CLEC purchases and installs the splitter in its collocation cage. Verizon MA is responsible only for the network administration and other support of the line sharing equipment and its integration into the Company's network. Therefore, Verizon MA excluded maintenance, repair, and testing costs from the recurring cost and recovers only the cost incurred for administration and other support. Also, in compliance with the Department's directives in D.T.E. 98-57, Phase III (page 122), the ACFs have been applied only to the splitter material investment and not to the installation expense.

iii) Testing

Q. Is Verizon MA implementing a testing capability for shared lines?

A. Yes. Verizon MA is implementing a Wideband Test System that will allow the Company to minimize its forward-looking costs for trouble shooting on shared loops. Without this enhanced capability, Verizon MA (and CLECs) will incur increased costs and dispatches as the volume of this type of service arrangement increases.

Q. Please explain the Wideband Test System Charge.

A. In accordance with the Department's earlier directives,[(29)] Wideband Testing is provided on an optional basis for the testing of xDSL capable loops. The wideband testing charge recovers the cost Verizon MA incurs when working with the CLECs to test a data service using the new Hekimian testing system. The Hekimian system provides remote testing and spectrum testing capabilities. The Hekimian wideband testing equipment provides the following information: POTS supervision, central office Noise, Loop Noise, Dial Tone, Loop Wiring, ADSL Signal, and ATU-R Detection. This information will be provided to CLECs upon request.

iv) Line Sharing OSS Costs

Q. What OSS costs are associated with Line Sharing?

A. The OSS costs include the amortization of one-time expenses in connection with the required Telcordia-provided OSS software for line sharing (and its associated installation and testing).

Q. How does Verizon MA propose to recover these costs?

A. Verizon proposes a per-line recurring rate that will be charged to each Line Sharing line ordered by a CLEC. Some of the Telcordia-provided software also supports subloop unbundling applications, as described below. The subloop-related software expenses have been removed prior to developing the per-line OSS rate for Line Sharing.

5. DS3-And-Above High Capacity Loops

Q. Please describe the DS-3 and Above high capacity loops.

A. DS-3 and Above high capacity loops (also referred to as "Entrance Facilities") are digital local access services that connect a customer's premises to a Verizon MA central office at the DS3, STS-1, OC3, and OC12 signaling rates. This section of the testimony will address the STS-1, DS3, OC3, and OC12 high capacity loops only.

Q. Please describe the network architecture assumed in each of the Company's High Capacity loop cost studies.

A. The High Capacity loop cost study is premised on the use of Synchronous Optical Network ("SONET") transport equipment. The equipment configuration is the most efficient technology currently available for provisioning high capacity local access service.

Q. To what extent do the facilities used for high capacity loops duplicate those used for the two-wire or four-wire loops?

A. Because of the unique nature of this service and the type of customer it serves, the loop transport facilities involved must be dedicated point-to-point facilities, provided on a completely overlay basis to the more general local access infrastructure. There is no opportunity for network resource sharing other than the fact that the fiber strands supporting this service and supporting the local access services addressed in the loop construct are contained in the same large fiber feeder cable from the central office to the customer location, typically a large high-rise commercial building or a major business campus.

The more prevalent local access services (voice grade loops and DS1 loops) to a large customer location of this kind are most efficiently served by the DLC and fiber optic architecture described previously. The RT delivering the individual voice grade or DS1 loops is located in common space and serves either the entire location or many floors with multiple end-user customers. The construct used for this local loop architecture by Verizon MA is not capable of delivering high-capacity channel services.

Furthermore, high-capacity channel services are delivered directly on fiber to the individual customer premises within a larger location (building or campus). The most efficient fiber architecture for such a service is to provide a direct fiber extension from the feeder cable serving the location up to the customer premises where the high-capacity channel service terminates. This is because the cabling requirements of this service make it economically and technically inefficient to deliver the service optically to the common RT location, terminate the optical system in common equipment, and extend electronically from there to the actual interface to the customer application (usually, a high speed, private data network). Fiber cable packaging and splicing technology mandate that the minimum size of this cable be 12 fiber strands. A customer-dedicated OC-3 or OC-12 SONET transport system is used on this dedicated fiber cable to deliver the actual high capacity channel service.

Q. What investments were included in the High Capacity Loop cost studies?

A. The investments include:

- *Central office electronic equipment, such as a FLM150 multiplexer ("Mux"), digital cross connect frames, and fiber termination frames;*

- *Equipment installed at the customer's premises, such as a protective cabinet housing the FLM150 Mux, power equipment, cross connect panels, and fiber termination frames; and*

- *Fiber cable and associated "structure" investment. The study assumed 100 percent fiber cable between the central office and the customer's premises.*

Q. How were the relevant investments determined?

A. Material prices for electronic equipment and cables reflect the latest negotiated contract prices provided to Verizon MA by the manufacturers. Circuit equipment investment loading factors were multiplied by the material prices to arrive at a total investment. Fiber cable installation and engineering costs were obtained from ECRIS as described in the two-wire and four-wire loop section of this testimony.

Q. How was the structure investment determined?

A. Structure investment was determined using the same methodology as previously describe in the two-wire and four-wire loop section of this testimony.

Q. What recurring cost components were identified for the DS3, STS-1, OC3, and OC12 High Capacity Loops?

A. Two recurring cost components were identified: a non-mileage-sensitive component attributable to terminating electronics at the central office and at the customer's premises, and a mileage-sensitive component attributable to fiber-optic cable and the associated structure.

Q. Is Verizon MA's cost study for High Capacity loops geographically deaveraged?

A. The DS1 loop, which is equivalent to the four-wire digital loop, has been geographically deaveraged as described earlier. Since the typical customer of the higher capacity loops is generally a large business customer, with the vast majority being located in the business sections of a major city type environment, DS3, STS-1, OC3, and OC12 have not been geographically deaveraged. However, the High Capacity loop costs have been calculated on a fixed and per-quarter-mile basis to address the difference in costs by customer loop length.

6. House and Riser

a) In General

Q. What is House and Riser?

A. House and Riser refers to cabling within a multi-story building that provides access to the network side of end-users' network interfaces from a point of interconnection within the building (e.g., in the basement).

Q. Is House and Riser a network element?

A. Yes. House and Riser cable is essentially loop distribution cable. Thus, House and Riser is a component of the unbundled loop, or a "subloop."

Q. What House and Riser costs has the Company developed for this filing?

A. The Company has developed the following costs:

- *One-time costs associated with Building Set-up.*

- *Recurring costs associated with both Vertical and Horizontal House and Riser investments;*

Q. Please describe Verizon MA's House and Riser service.

A. House and Riser consists of a metallic pair of house and riser cable in a multistory building. House and Riser investment includes the riser cable itself, the terminations, and the labor associated with the termination of the pair at a location close to the entrance cable (usually the basement) and at a location on (or close to) the customer's floor.

Q. Describe the House and Riser construct used in the Company's cost study.

A. The construct used for House and Riser is described in the diagram provided with the cost study workpapers. It reflects the forward-looking design established by the Company's engineering staff. It is a design that would be implemented in any new, high-rise building. The design is efficient because it uses a 300 pair riser cable, which reduces the installed cost per pair. This size cable also facilitates terminations in groups of 50 pairs to meet the requirements of the different floors in a building requiring house and riser access.

b) Building Set-up Costs

Q. Please describe the Building Set-up cost study.

A. The Building Set-up cost study was developed as a nonrecurring cost and reflects the investments in a backboard and a fifty-pair terminal block.

Q. How did Verizon MA determine the material and installation prices for House and Riser Building Setup?

A. The current vendor material prices and their installation prices, which reflect the latest vendor discounts realized by the Company, were the basis of the input prices to the cost study. Material prices for the metallic cable, terminals, and installation and engineering costs were obtained from ECRIS.

Q. Were the House and Riser Cable Service Building Setup and 50 Pair Terminal charges deaveraged?

A. Yes. All House and Riser elements were deaveraged by density zone. Although the forward-looking design for this element construct is not unique by density zone, installation costs do vary by density zone.

c) Vertical House and Riser Recurring Costs

Q. Please describe how the investments for vertical House and Riser were developed.

A. The vertical House and Riser investments were developed on a fixed and variable basis. The fixed investment, which was developed on a per pair basis, includes six 50-pair terminals located close to the entrance cable, 30 feet of 300-pair metallic horizontal intra-building cable, and a 50-pair terminal with 20 feet of 50-pair stub cable located on (or close to) the customer's floor. The variable investments, which were developed on a per-pair, per-floor basis, include ten feet of 300-pair metallic intra-building cable. All investments include installation and engineering.

Q. How did Verizon MA determine the material and installation prices for vertical House and Riser.

A. Material, installation, and engineering costs were identified in the same manner as the House and Riser Building Set-up element, from ECRIS..

Q. How did Verizon MA calculate the per-unit investment of the House and Riser element?

A. Per-unit investments were calculated by dividing the total investments by a utilization factor of 40 percent. This corresponds to the utilization factor used in the loop study for distribution cable.

Q. How were the House and Riser investments converted to monthly costs?

A. The investments associated with the House and Riser element were converted to a monthly cost through the application of the ACFs associated with the Intra-building account (Account No. 2426).

d) Horizontal House and Riser Recurring Costs

Q. Please describe how the costs for horizontal House and Riser were developed.

A. House and Riser Horizontal investment, which was developed on a per pair basis, includes one hundred fifty (150) feet of three-hundred pair metallic horizontal intra-building cable, and a fifty pair terminal with twenty (20) feet of fifty pair stub cable located on (or close to) the customer's floor. Investments were converted to monthly costs in the same manner as Vertical House and Riser.

7. The Distribution Subloop

Q. What is Verizon MA's Unbundled Subloop Arrangement ("USLA")?

A. The USLA provides access to Verizon MA's metallic distribution pairs/facilities at the FDI. USLA provides a two- or four-wire transmission channel between a CLEC-provided Outside Plant Interconnection Cabinet ("COPIC") and the NID or Rate Demarcation Point at the end user location. Both recurring and nonrecurring charges apply to USLA. The nonrecurring charges are discussed in the testimony of Mr. Meacham.

Q. What are the recurring charges associated with USLA?

A. USLA recurring charges will recover the distribution facilities costs associated with two- and four-wire subloops as well as the OSS implementation costs. The distribution facilities costs are based on the costs of the two and four-wire loop discussed earlier. The OSS implementation costs include the amortization of one-time expenses in connection with the required Telcordia-provided OSS software for subloop unbundling (and its associated installation and testing).

8. Unbundled Feeder Subloop

Q. Please describe Verizon MA's Feeder Subloop Element.

A. A feeder subloop provides a dedicated DS1 or DS3 two-point transmission path over a feeder facility in Verizon MA's network between a Verizon MA central office and a Collocation at the Remote Terminal ("CRTEE") arrangement. As with unbundled distribution subloops, both nonrecurring and recurring charges will apply to this arrangement.

Q. What are the recurring charges?

A. Unbundled feeder subloop recurring charges will recover the feeder facilities costs associated with the subloops as well as the OSS implementation costs. The OSS implementation costs include the amortization of one-time expenses in connection with the required Telcordia-provided OSS software for subloop unbundling (and its associated installation and testing).

9. Dark Fiber

Q. What is Dark Fiber?

A. Dark Fiber consists of a continuous fiber optic strand within an existing in-place fiber optic sheath, that is owned by Verizon MA but is not connected to electronic equipment needed to power the line in order to transmit information. (Since information is transmitted on fiber optic cable in the form of light pulses, a fiber without the necessary electronics is appropriately described as "dark.") A CLEC that requests access to Dark Fiber is responsible for the establishment of any fiber optic transmission equipment or intermediate repeaters needed to utilize the fiber to transmit information.

Q. Please describe what is meant by "continuous" fiber optic strand?

A. The term continuous fiber optic strand refers to a fiber optic strand that does not require any additional splicing and construction work in order to build and rearrange the fibers to provide continuity between the CLEC's A and Z locations for the dark fiber circuit.

Q. Please describe the Dark Fiber Cost Study.

A. The Dark Fiber Cost Study determines the cost for offering spare, unlit, continuous fiber optic cable without any attending electronics or photonics. Verizon MA has developed costs for Interoffice ("IOF") and Loop Dark Fiber. In addition, costs have also been developed for Channel Termination Dark Fiber which can be ordered from a CLEC POP to the Verizon MA End Office that serves the specific POP.

For Loop Dark Fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile, a monthly fixed serving wire center cost, and a monthly customer premise cost (if appropriate). For IOF Dark Fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile and a monthly fixed cost per serving wire center. For Channel Termination Dark Fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile, a monthly fixed POP FDF cost, and a monthly fixed cost per serving wire center. Nonrecurring costs are also developed for each of the Dark Fiber elements and are addressed in Mr. Meacham's study.

Q. How were the Loop Dark Fiber costs developed?

A. For the monthly fixed cost per serving wire center, FDF investments, utilization, and installation factors were extracted from the Interoffice Transport TELRIC study. For the monthly fixed customer premise cost, the Company used vendor prices for a mix of FDF and associated equipment typically placed at customer premises for its own use. For the monthly variable fiber costs per tenth of a mile, the installed fiber and associated support structure investments were extracted from the Loop TELRIC Study. In each case, the appropriate loadings and ACFs were applied to develop the monthly cost.

Q. How were the IOF Dark Fiber costs developed?

A. For the monthly fixed cost per serving wire center, FDF investments, utilization, and installation factors were extracted from the Interoffice Transport TELRIC study. For the monthly variable fiber costs per tenth of a mile, the installed fiber and associated support structure investments were extracted from the Interoffice Transport TELRIC Study. The appropriate loadings and ACFs were then applied to produce the monthly costs.

Q. How were the Channel Termination Dark Fiber costs developed?

A. For the monthly fixed cost per serving wire center, FDF investments and utilization levels were extracted from the Interoffice transport TELRIC study. Monthly costs were developed through the application of loadings and ACFs.

10. NIDS

Q. What is the NID network element.

A. FCC Rule 319(b) describes and incumbent LECs NID unbundling obligations as follows:

(b) Network Interface Device. An incumbent LEC shall provide nondiscriminatory access, in accordance with § 51.311 and section 251(c)(3) of the Act, to the network interface device on an unbundled basis to any requesting telecommunications carrier for the provision of a telecommunications service. The network interface device network element is defined as any means of interconnection of end-user customer premises wiring to the incumbent LEC's distribution plant, such as a cross connect device used for that purpose. An incumbent LEC shall permit a requesting telecommunications carrier to connect its own loop facilities to on-premises wiring through the incumbent LEC's network interface device, or at any other technically feasible point.

As noted previously, the NID has two aspects: it may be a component of the loop, and it is a network element subject to unbundling in its own right. Loop costs were addressed in the preceding section of this testimony (and included NID investment). Here we consider the costs associated with unbundled access to the NID. Such access would be required where a CLEC wishes to connect its own loop to a Verizon MA NID. Also included in this filing are charges associated with the Shared NID. The Shared NID charge recovers the cost incurred when a CLEC shares one or more line terminations in a NID where Verizon MA has existing service and spare capacity.

Two categories of costs are involved: the recurring cost of the investment in the NID itself, and a non-recurring NID connection charge. The NRC is addressed in Mr. Meacham's NRC study.

Q. Please describe the cost methodology used in developing the recurring costs of two-wire and four-wire NIDs, DS1 NIDs, and Shared NIDS.

A. The cost methodology used in developing the recurring NID costs is consistent with the methodology used to develop the NID component of the loop cost. For a Shared NID, the cost reflects the material and labor associated with 1/6 of a fully equipped (6 line) NID.

VIII. local switching

A. Element Description

Q. What is the definition of the local circuit switching network element?

A. FCC Rule 319(c)(1)(A) defines local circuit switching capability as:

(i) Line-side facilities, which include, but are not limited to, the connection between a loop termination at a main distribution frame and a switch line card;

(ii) Trunk-side facilities, which include, but are not limited to, the connection between trunk termination at a trunk-side cross-connect panel and a switch trunk card; and

(iii) All features, functions and capabilities of the switch, which include, but are not limited to:

(1) The basic switching function of connecting lines to lines, lines to trunks, trunks to lines, and trunks to trunks, as well as the same basic capabilities made available to the incumbent LEC's customers, such as a telephone number, white page listing and dial tone, and

(2) All other features that the switch is capable of providing, including but not limited to, customer calling, customer local area signaling service features, and Centrex, as well as any technically feasible customized routing functions provided by the switch.

Rule 319(c) also creates an exception to the unbundling requirement for local switching, applicable "when the requesting telecommunications carrier serves end-users with four or more voice grade (DS0) equivalents or lines, provided that the incumbent LEC provides nondiscriminatory access to combinations of unbundled loops and transport (also known as the 'Enhanced Extended Link') throughout Density Zone 1, and the incumbent LEC's local circuit switches are located in (i) The top 50 Metropolitan Statistical

Areas . . ., and (ii) In Density Zone 1 . . .." ("Density Zone 1" was defined by the FCC for carrier access purposes and is unrelated to the loop rate zones discussed elsewhere in this testimony.) This exception may apply to certain of Verizon MA's switches.

Q. What local switching rate elements is Verizon MA proposing?

A. The Local Switching element addressed in the Company's cost study consists of the following components:

- *Line ports (analog, digital, and coin);*
- *Trunk ports (digital);*
- *Local Switch Usage (terminating and originating); and*
- *Reciprocal Compensation Usage (terminating).*

Q. Does the Local Switching element contain any switch features?

A. Yes. Features that can be provisioned through the switch processor and that do not require any specific, unique hardware are included in the Local Switching element. A list of the features that were included in the proposed usage rate can be found in the Local Switching cost study, Part C.

Q. Can a carrier purchase a feature that requires specific, unique hardware, and that is therefore not included in the Local Switching Usage element?

A. Yes. The most commonly used features that have specific, unique hardware requirements can be purchased from Verizon MA as "port additives." A list of those features can be found in the Local Switching cost study, Part C.

B. Technology Assumptions

Q. Please describe the forward-looking end office switch construct.

A. The forward-looking end office switch construct is based on digital switching with an access line split of 57.13:42.87 mix of 5ESS and DMS-100 technologies, respectively. The lines are assumed to be provisioned on DLC and cooper, with 25 percent on integrated DLC GR-303 peripherals, at a 3:1 line concentration at the RT consistent with the loop forward-looking construct; and 75 percent on analog line ports (copper cable pairs and universal DLC). All trunking is designed as clear channel capability trunking on the vendor's latest available trunk peripherals.

Q. What is the reason for the mix of the two switch vendor technologies?

A. The use of two suppliers ensures a degree of strategic diversity in the sources of supply of an important network asset. Moreover, the mix of 5ESS and DMS-100 technologies represents Verizon MA's forward-looking construct for local switching technologies to serve Massachusetts. This mix is consistent with Verizon MA's deployment of each switching technology.

Q. What locations are assumed for switches in Verizon MA's study?

A. Consistent with the FCC's TELRIC regulations, the study assumes current wire center (and, therefore, switch host/remote) locations.

C. Costing Approach

1. Materials Investments

a) In General

Q. How were material investments developed for the switching study?

A. The material investments for the switch were developed using the Switching System Cost Information System ("SCIS") model developed by Telecordia (formerly known as Bellcore). SCIS is a computer system that determines the basic material investments of switches. It includes basic switch investments and the processor related investments associated with features that do not require any specific, unique hardware. It also allocates traffic efficiently between host and remote switches.

Q. How did Verizon MA utilize SCIS in its study?

A. SCIS/Model Office ("SCIS/MO") lets the user "build" (i.e., specify) a model office, which is representative of a typical office in the network. It then determines for that model office the basic switching investments. Existing office parameters, adjusted to make them forward-looking, were provided by Verizon MA's engineering organization for each existing switch in Massachusetts, and were used to create SCIS model offices for both DMS-100 and 5ESS technology. SCIS then calculated, by switch technology type, unit and total switch material investments for both of the two technologies.

Q. What inputs were used for the SCIS runs?

A. Inputs were derived from Verizon MA's existing switches, then adjusted to make them forward-looking. For each switch, 25 percent of the lines were designed on GR-303 peripherals; all remaining lines were designed on the latest available analog line peripherals; and all trunks were designed on the latest available trunk peripherals. In addition, the current number of lines and trunks per switch were adjusted based on the Verizon MA's access line growth forecast, and the averages CCS per line and trunk were adjusted based on current CCS growth trends.

Q. What version of SCIS was used for Verizon MA's study?

A. The latest available version of SCIS/MO - Version 2.8 - was used.

Q. How does SCIS take account of vendor prices for switching equipment?

A. Vendor list prices are built into each version of SCIS. The vendor discounts offered to particular companies are inputs supplied by the user when SCIS is run.

2. Discount

Q. What components are included in Local Switching investment and how were they determined?

A. The discounted material investments for Local Switching and their total investments were broken into three components: Line Terminations (or Ports), Trunk Terminations (or Ports), and Usage. These were determined from the SCIS output reports for each technology. The discounted material investments for each technology were then melded together using the forward-looking ratio of switching technology mix. These investments were then adjusted by the appropriate forward-looking utilization factors.

a) Switch Discounts in the Vendor Contracts

Q. Please describe the switching vendors' discount structure in the currently effective contracts under which 5ESS and DMS-100 switching equipment is provided to Verizon.

A. The contracts that Verizon has with its switch vendors are very complex and have various discount levels for different types of equipment. For example, there are different levels of growth discounts on peripherals that provide GR303 interfaces, versus peripherals that provide analog interfaces. In addition, depending on the type of material, Nortel's contract has a two-tier discount level, one for new (or replacement) switches, and another for additions (or growth) to existing switches. To further add to the complicated discount structures, the contracts also specify "Verizon" prices for specific types of equipment, without directly specifying a "discount". It is important to note that for both vendors' contracts, there is no longer one single discount specified that is applicable for new (or "replacement") switches and another single discount specified for all types of "growth" equipment. Both vendors have a multitude of discounts offered, which depend on both types of equipment purchased, and volumes.

Q. At one point in time, didn't both vendors have a two-tier discount structure, that is, one for new or "replacement" switches, and another for "growth" purchases?

A. Yes. The original NYNEX Megabid contracts with both Lucent and Nortel had such a two-tier discount structure. The current contract with Lucent no longer has a two-tier discount structure. And the current Nortel contract new or "replacement" discount is very close to its growth discounts.

Q. Please explain what is meant by a two-tier discount structure versus a one-tier discount structure.

A. The Megabid contracts were originally negotiated with Verizon's switching vendors (Nortel and Lucent) in 1993 during a period when Verizon - North (the former NYNEX) was replacing its analog switches. In order to accommodate the replacement program, both vendors negotiated a two-tier discount structure in their contracts. One discount applied to growth additions, the other, a steeper discount, applied to new switch purchases. The reality is that as we move into the future the vendors will no longer offer a two-tier discount structure such as they did in Megabid. Lucent has already revised its two-tier discount structure specified in Megabid and replaced it with a one-tier discount structure.

Q. What factors would tend to favor phasing out of two-tier discounts?

A. The Company and its vendors know that Verizon will upgrade and grow its existing digital switches in the future, not replace them. Such a structure provides Verizon with a competitive pricing structure on the types of switching purchases it will most likely actually make in the future.

Q. Please outline the existing switch contracts that Verizon has in place with Nortel and Lucent.

A. As previously mentioned, the former NYNEX originally signed Megabid contracts with both vendors back in 1993 that are applicable until 2003. However, since 1993 there have numerous amendments to both contracts, in addition to separately negotiated smaller contracts.

The former Bell Atlantic (prior to the NYNEX merger) and the former GTE (prior to the Bell Atlantic merger) also had contracts in place with each vendor. For Nortel, Verizon signed three agreements in December 2000 which specify specific prices for which Verizon - North (formerly NYNEX), Verizon - South (formerly Bell Atlantic), and Verizon - West (formerly GTE) will pay for switching equipment through 2003. The net prices and estimated purchase quantities of equipment are listed in Attachment "C" in each of the agreements. Attachment "C" in both the Verizon - North and Verizon - South agreements are the same.

For Lucent, amendments were signed to the contracts covering Verizon - North and Verizon - South in January 2000 that specified the same changes to the discount levels in both contracts. An additional amendment to the Verizon - South contract was signed in September 2000 which added the Verizon - West (former GTE) to that contract.

b) Appropriate Switch Discount for TELRIC Switching Studies

Q. What is the appropriate vendor material discount to use in the switching cost studies?

A. The appropriate material discount to use is the discount that Verizon can actually receive when deploying switching equipment in the foreseeable future.

Q. Why is the use of a discount that is based on the actual discount Verizon can actually receive appropriate for TELRIC studies?

A. The actual discount that Verizon will receive when purchasing the latest available digital switching technology in the future is appropriate for determining TELRIC switching costs for the following reasons:

1. In the Consolidated Arbitrations, the Department consistently approved cost studies that incorporated the latest technology being deployed in Verizon MA's network, with material prices based on the latest negotiated Verizon MA-vendor contracts for that material. In effect, the Department found that the appropriate material price to use in a TELRIC cost study is the material price Verizon MA will actual pay, incrementally, in the foreseeable future, under current vendor contracts, for the particular equipment being costed. For example, the IOF Transport costs that were approved by the Department in Phase 4 of the Consolidated Arbitrations were based on the incremental cost Verizon incurs to purchase SONET equipment. Verizon MA does not believe that the Department should treat the switching material prices in a different manner than any other material prices associated with any other type of UNE being studied.

2. The forward-looking switching technology which represents the basis of the switching costs presented here will be deployed by the Company in the future, incrementally, at the discount rates Verizon actually receives. The forward-looking switch construct used to develop the costs is made up of the latest available processors, trunk peripherals, and line peripherals. This construct does not represent the mixture of switching equipment components Verizon has currently deployed in its network. It represents the mixture of switching equipment components Verizon is purchasing incrementally to upgrade and expand its switching network, on a forward-looking basis. The discount that Verizon will receive when purchasing this equipment, as specified by the current contract Verizon has with the suppliers of this equipment, is not a "replacement" (or new switch) discount that would only apply to purchases of entire switches. Since Verizon has already fully deployed digital switches in its network, using the "replacement" discount would be totally inappropriate and inconsistent with the TELRIC methodology as previously determined by the Department for all other unbundled elements. This is also supported by a very recent decision of the United States District Court for the Northern District of New York, in which the court concluded that forward-looking costs determinations "must be based on the incremental costs that an incumbent local service provider actually incurs or will incur".[(30)]

3. On a forward-looking basis, Verizon has no plans to "replace" its existing end office digital switches with new end office digital switches.

Q. Please explain why the contractual new-switch discounted prices should not be used to develop Verizon's TELRIC switch costs?

A. The concept that switch prices should be based on the cost of switching under the scenario that all of the switches could be replaced at the exact same moment in time is not reasonable. Verizon's switching cost studies are based on a "hypothetical network" based on a forward-looking technological configuration that Verizon MA may never actually achieve (i.e., 25 percent GR-303). Nevertheless, the cost of that hypothetical configuration must be anchored to some form of reality. And the reality of any technological advancement is a gradual, well-planned evolution that takes place over a period of time. And that is exactly how the evolution of digital switching has occurred. Even if one were attempting to capture only the first time costs, using the Megabid "new switch" discounts, applied against today's switching material investments, would not come close to estimating switching investments necessary to rebuild Verizon's entire switch network.

Q. Is it realistic to assume that the price for a one-time replacement of all of Verizon's switches would be lower than the prices that it currently pays?

A. No. In the Consolidated Arbitrations, the Department concluded that "it is speculative to assume what the manufacturers' discounts would be if a TELRIC network were being constructed today"[(31)]*. This is also clearly illustrated by the Ford - Bridgestone/Firestone tire recall, in which it was necessary to accomplish what could be thought of as a "scorched node" instant replacement of 6.5 million tires. In an attempt to speed up the replacement, Bridgestone/Firestone even commissioned its competitors, including Goodyear, Michelin, and Uniroyal, to manufacture replacement tires. Even with four of the world's biggest tire manufactures maximizing production, and a possible life and death situation, the entire recall is estimated to take until the Spring of 2001. Does anyone really believe that the recall is going to cost Bridgestone/Firestone incrementally less per tire than it would to manufacture the replacement tires under normal circumstances? To the contrary it has been estimated that it will cost an additional $60/tire to airlift them from Japan, and there will be an additional premium of $350 million, to accelerate the completion of the recall by the end of this year, instead of sometime in 2001. The bottom line is that its vendors would not be able to offer steep discounted prices if the Company were to competitively bid the hypothetical scenario of replacing all of its switches at one point in time. More likely, the vendors costs would be substantially higher in order to meet the demand requirements of such a massive undertaking.*

Q. But wouldn't the Megabid replacement discounts represent close to what Verizon might realize if it were going to replace its entire switch network?

A. No. The Megabid contracts covered the purchase of 3.46 million lines, or only approximately 31 percent of Verizon - North's (the former NYNEX region) access lines purchased after 1993. Yet Verizon - North started its digital switch deployment back in 1985. Therefore, approximately 69 percent of Verizon - North's access lines were not purchased with the steep Megabid discounts. Megabid replacement discounts were a one-time event and should not be used as the basis for determining TELRIC switching costs. The actual discount Verizon will actually receive going forward is the proper TELRIC discount to use in its switching costs studies.

Q. Are the estimates of materials investment that are based on the discounts that Verizon will actually receive conservative?

A. Yes. As explained in more detail below, over time Verizon continues to upgrade the different component parts of Verizon's digital switches. Regulatory mandates and vendor enhancements continually drive network additions and modifications. The forward-looking material investments presented here do not capture future switch-related costs Verizon will have to incur to meet such regulatory requirements.

Q. Is it appropriate to apply a discount that Verizon will actually incur in the future to the getting started equipment, or first cost of the switch, since this portion of the switch is allegedly purchased with the initial installation at the new switch discount?

A. Using a discount Verizon MA will actually incur against all switch investment provides a reasonable estimate of the forward-looking investment associated with its UNE switching costs. The switching network is by no means stagnant. Verizon has and will continue to replace the majority of the switch's components, and it will be at the discount level it actually receives for those replacements.

Q. Can you give examples of the scope and costs of these upgrades?

A. Yes. Verizon's history has shown that over time virtually every component of the DMS-100 and 5ESS switch has needed to be expanded or changed out; even the latest vintages of equipment will become obsolete. The trunk and line terminations grow linearly with demand. The common equipment reaches exhaust or obsolescence and must be upgraded or replaced.

The vendors continue to upgrade and enhance the basic building blocks of the switches. Verizon incorporates these changes into its network for various reasons including:

- *Manufacturer discontinued products -- Vendors upgrade equipment and discontinue support to the vintage predecessor equipment. Verizon is required to upgrade the hardware to keep within the guidelines of the vendor's support policy.*

- *Regulatory requirements for features -- Regulatory requirements often necessitate the addition of software and memory as well as changes in hardware designs to provide for the mandates of the regulatory bodies. Some regulatory requirements include CALEA, Local Number Portability and Interchangeable NPAs.*

- *Increased demand for new software intensive features and services demanded by the public require changes in the basic building block components of the switch including memory upgrades, new software releases, faster processors and larger pipes connecting peripherals.*

The following is a summary of the infrastructure upgrades required to upgrade the common equipment in Massachusetts from July 1999 through April 2001.

Infrastructure Upgrades

Verizon Massachusetts, 7/99 to 4/01

Planning $	Description of Upgrade
$74,881	Lucent CM1-CM2
406,124	Umbilical Relief
131,722	NPA Code Splits
5,596,501	Lucent 3B20-3B21
430,440	Lucent SMP23 Upgrades
1,122,077	Lucent 5E12
9,039,924	Lucent 5E13
10,843,311	Lucent 5E14

1,238,354	5E11 thru 5E13 Software
10,087,716	Lucent Remote Replacement
96,306	Specific Software/Hardware for CALEA
550,000	CM2 Bay Expansions
900,102	DMS-10 Generic 501
729,674	DMS-10 Replacement
913,940	Nortel NA010
411,257	Nortel NA011
2,832,807	Nortel NA012
39,600	Nortel NA014
421,669	Supernode Upgrades
954,041	Nortel Remote Replacement
1,383,643	ENET Upgrades
2,165,685	Nortel AIN Platform Features Option 1
$50,369,774	**Total Infrastructure Upgrades**

In addition, Lucent and Nortel have provided information on their required gating hardware upgrades for their respective switch platforms.

Q. Can you give some example of the various types of switching equipment purchased with the initial switch that most people believed would never be expanded or replaced over time?

A. Yes. The following are examples where Verizon has grown, or replaced equipment that most people believe never need to be expanded or replaced in the switch:

- ***Administrative Module (5ESS) -- Hardware upgrades (memory) to the Administrative Module (AM) have been required with every Software Release. There have been multiple offices where the AM -- model 3B20 processor needed replacement with a 3B21 model for load relief. Specifically, Greendale, Amherst, Concord and Middleboro are examples of Massachusetts offices where the model 3B20 processor was replaced with a 3B21. With the 5E14 generic release, the 3B20 to 3B21 processor replacement is required in all offices to provide capacity for increased memory requirements. With 5E13, the Administrative Services Module was introduced which is an architectural improvement over the AM.***

- ***The Communications Module (CM) has evolved from CM-1 to CM-2. The CM-2 is required with 5E14. Additional pairs of CM-2 bays are required when the peripheral equipment added exceeds the capacity of the current CM-2 bays. Framingham and Milford are examples where additional CM-2 bays were required.***

- ***Recorded Announcement System (5ESS) -- The 13A analog broadcast announcement units were manufacturer discontinued in 1995. The replacement 16A digital announcer provides for an increase in announcement capability utilizing digital trunk access. Announcement units were changed out in Quincy, Hingham and Great Barrington.***

- ***Maintenance and Test equipment (5ESS) -- New test sets have been required to test new services. The Operations, Administration and Maintenance software was enhanced with 5E7.***

• ***Quad Link Packet Switch (5ESS) -- This was an enhancement to the CM-2 architecture that was introduced in 5E9.2. The Quad Link Packet Switch (QLPS) is being installed when the first Switch Module (SM) 2000 is added to the office. Verizon is continuing to incur expense associated with provisioning the QLPS in conjunction with growing SM2000 in the network.***

• ***Gateway Processor (5ESS) -- The Gateway Processor interfaces with the AM and classic SMs. It also interfaces with the QLPS for SM-2000 communications. Verizon is currently adding Gateway Processors in conjunction with the QLPS when the first SM-2000 is added to an office.***

• ***Core Cabinet with Message Switch (DMS-100) -- The gating hardware for the Message Switch was 7MB minimum for generic NA003. With NA004, the minimum requirement increased to 16MB. With generic NA007 and NA008, message switch memory was increased to 24 MB. Offices require NA007 for Local Number Portability and NA008 for year 2000 compliance.***

• ***Computing Module (DMS-100) -- Supernode (SN) 50 was required to load NA006. Effective with NA007, NT40 is no longer supported and SN60 processors are required with increased memory requirements of 96M cards. Upgrade of the memory cards from 24M to 96M requires a minimum of four 96M cards per side for a total of eight 96M cards per Computing Module. This requirement has increased to five cards per side or ten 96M card per Computing Module with generic NA0010.***

• ***System Load Module (DMS-100) -- With NA003, System Load Module (SLM) II were required for SN offices and SLM1A were required with SNSE offices. With NA006, SNSE offices required 9X44AD SLM III. Effective with NA008, SLM IIIs are required for all SN offices of greater than 95K lines. Effective with NA010, SLMIII are required in all offices.***

• *The* ***Nortel processor*** *evolution will migrate from SN70 to XA Core. With the XA-Core upgrade, the existing processor, memory and system load modules of the DMS supernode will be replaced.*

• ***Input/Output Equipment (DMS-100)*** *-- The Input/Output controller was manufactured discontinued on 2/28/00. The replacement hardware is the Integrated Services Module (ISM). Verizon was required to upgrade to the ISM in various locations as additional input/output ports have been needed for additional SMDI, SMDR and voice messaging links.*

• ***Maintenance and Test Equipment (DMS-100)*** *-- The Line Test Unit (LTU) has been replaced by the Metallic Test Unit (MTU) to provide increased capacity. Nortel documentation states that this feature is in the process of evolution with enhancements to be provided in the near future.*

c) Methodology for Determining Appropriate Discount

Q. Given the complexity of the switch contracts, please describe the methodology that is appropriate to determine the switch discount that the Company will actually receive when deploying switching equipment?

A. The best method to determine the switching discount Verizon will receive in the foreseeable future is to examine the overall actual discount experienced by the Company for recent purchases of switching equipment under the current contracts. Some of the reasons why this is the most appropriate methodology to determine the forward-looking switch discount are:

1) It is the overall discount Verizon actually receives (and will continue to receive) when purchasing switching equipment under its current contracts;

2) It is based on the mix of equipment that Verizon is actually deploying in its network, including all types of switching equipment such as processors, trunks, lines, and peripherals.

3) It captures all "credits" offered within the contracts;

4) It is determined from the actual material prices Verizon paid for switching equipment, not someone's interpretation of Verizon's complex contracts or hypothetical model; and

5) It is determined exclusively from vendor supplied data concerning their list prices and discount prices of switching equipment (hardware) sold to Verizon.

Q. Please describe how this was accomplished.

A. Verizon asked each of its switching vendors to provide detailed information of all switching equipment (hardware) purchases Verizon made during the past year (2000), including actual quantities, list prices, as well as the prices Verizon paid for the equipment. From this information, the Company calculated an overall effective discount it actually received during the timeframe the actual purchases were made, by comparing the total list price of all purchases made versus the actual total price paid.

Q. What is meant by "list prices"?

A. For the purposes of this study, "list prices" refers to the undiscounted published list prices offered by each vendor to the general public as their prices for the equipment. Since these are the prices that are built into SCIS, care must be taken to ensure that the starting point for the determination of the discount used for the Company's switching studies must be the "list prices".

Q. Please describe the Lucent actual purchase data and how it was used to determine the Lucent forward-looking switch discount.

A. Lucent provided the Company with its equipment purchases[(32)] for the entire year 2000 for Verizon - East's states[(33)]. The overall effective discount the Company received during this timeframe was developed by summarizing these purchases. The discount shown on Line 1 of Proprietary Exhibit Part C-P1 is the Lucent discount the Company used to develop its switching costs.

Q. Please describe the Nortel purchasing data and how they were used to determine the Nortel forward-looking switch discount.

A. Nortel provided the Company with its equipment purchases for the entire year 2000, for Verizon. The overall effective discount the Company received during this timeframe was developed by summarizing these purchases. However, since Verizon signed new agreements in December 2000, the Company did not use the discount based on purchases to develop its switching costs, because it does not capture the latest material prices available to Verizon by Nortel. As previously described, the Nortel contracts signed in December 2000 included an Attachment "C" that depicts the equipment prices the Verizon will pay for equipment purchased under the contract, along with estimated quantities of this equipment. Under a separate cover, Nortel also provided the Company with Attachment "C" depicting the resulting discount level of each of the equipment listed. The overall estimated discount was developed by summarizing the purchases shown in Attachment "C". The Company believes this discount represents an appropriate estimate of the forward-looking discount Verizon - East will actually incur under the latest contracts with Nortel. This is the Nortel discount the Company used to develop its switching costs, which are shown on Line 2 on Proprietary Exhibit Part C-P1.

Q. How were the equipment quantities shown in Attachment "C" determined?

A. The types of equipment and quantities shown in Attachment "C" were determined by the Company's switch planners, and represents their best estimate as to what the Company will be purchasing over the next three years from Nortel.

Q. How does the calculated discount developed from the Nortel contract used in the Company's cost studies compare to the discount developed from the Verizon's actual Nortel purchases for the year 2000?

A. The discount developed from the latest Nortel contract is greater than the discount developed from Verizon's actual Nortel purchases in the year 2000.

Q. Are the forward-looking discounts appropriate for both end office and tandem switches?

A. Yes. Since the actual purchases included both tandem and end office switching equipment, the discounts are appropriate for both.

3. Utilization

Q. How is utilization accounted for in the switching studies?

A. Consistent with the definition used through out these studies, working as a percent of total installed capacity, switching utilization is accounted for by each type of equipment investment (digital line ports, analog line ports, and digital trunk ports). Utilization was not applied against usage investment.

Q. How was the forward-looking utilization for digital trunk ports determined?

A. Trunks are added using building blocks of digital DS1 interfaces (24 voice grade trunks per DS1). Therefore, the utilization factor for DS1 trunks is determined by the need to maintain a minimum 5 percent administrative spare capacity, and the rate of consumption of spare growth capacity. A switch trunk addition is engineered and ordered to complete when 95 percent of the DS1 trunk capacity is forecasted to be working. The typical trunk addition provides for approximately 10 percent added capacity. It is reasonable to expect the average trunk utilization over the entire universe of switches to be evenly distributed between those that have just had an addition and those just under 95% utilization. This yields an average trunk DS1 utilization of 90 percent for the forward looking design.

Q. How was the forward-looking utilization for digital line ports determined?

A. The same utilization for Digital Loop Carrier lines at the RT was used for the switch digital line ports.

Q. How was the forward-looking utilization for analog line ports determined?

A. The utilization of analog lines is set at 93 percent.

Q. Does the SCIS model allow for administrative fill in its cost calculation?

A. Yes. SCIS has an input to allow for administrative spare for trunks and lines. In Verizon MA's study, the administrative spare capacity fills used are: digital trunk ports - 95 percent; digital line ports - 93 percent; and analog line ports - 95 percent.

Q. Does SCIS allow for breakage in its cost calculation?

A. Yes. SCIS adds one half of the cost of a line (or trunk) unit peripheral when it calculates the total cost of lines (and trunks).

Q. Did Verizon MA adjust the overall utilizations described above to account for SCIS treatment of administrative fill and breakage?

A. Yes. The utilizations for digital trunk ports, digital line ports, and analog line ports were adjusted for SCIS administrative fills and breakage for each office.

4. Switch Ports

Q. How were material investments converted to the port material investments?

A. Unit material investments for the Line and Trunk port components were obtained directly from the SCIS model office outputs, then adjusted as described above. Unit material investments were developed for analog line, digital line, Basic Rate ISDN ("ISDN BRI"), and coin line ports, and for digital and Primary Rate ISDN ("ISDN - PRI") trunk ports. The material investment associated with the Trunk Port was expressed on a per-port (Dedicated) basis and an all hours of the day ("AHD")[34] per-minute-of-use ("MOU") (Common) basis.

Q. Why was the Trunk Port cost calculated on both a per-port basis and an AHD-MOU basis?

A. The Trunk Port was calculated on a per-trunk basis for those carriers who wish to purchase dedicated trunk ports. The Trunk Port was calculated on an AHD-MOU basis for those carriers who simply purchase switching on a per-minute basis (i.e., through the UNE Platform).

Q. How were the material investments associated with trunk ports converted to a per-MOU basis?

A. The MOU trunk port cost was derived by dividing the trunk port investment by the designed busy-hour minutes of use capacity of the trunk port. The busy-hour investment was then converted to an AHD investment by the application of the annual-to-busy-hour ratio.

Q. How were the investments associated with coin ports developed?

A. Incremental investments associated with coin ports was determined from SCIS.

5. Usage

Q. How were material investments converted to Local Switch Usage material investment?

A. Total material investment for the Line and Trunk Port components from the SCIS model office outputs was subtracted from the total SCIS investment to arrive at a total switch usage investment. This investment (usage) represents all switch investment, without the Trunk Port and Line Port investments, and includes features.

Q. How was the material investment associated with usage converted to a MOU basis?

A. The usage investment was divided by the busy hour total switch MOU capacity (at the planning cycle midpoint) to arrive at a busy hour MOU investment for Usage.

Q. How was the total investment per busy hour MOU converted to a cost per AHD MOU?

A. The total investment per busy hour MOU was converted to a total cost per busy hour MOU by the application of annual cost factors and investment related loadings as previously described in this testimony. This total was converted to an AHD MOU cost by the application of the busy hour to AHD conversion factor.

Q. Are the Local Switching Usage originating and terminating MOU costs that Verizon MA is proposing applicable to both intra- and inter-switch calls?

A. Yes. The entire capacity of MOU (originating minutes plus terminating minutes) was use to develop the per-MOU costs of Local Switch Usage. The costs associated with a terminating MOU is the same cost for a terminating MOU for any call type (intra-switch or inter-switch). Likewise, the cost associated with an originating MOU is the same cost for originating MOU for any type of call (intra-switch or inter-switch).

Q. Is Verizon MA proposing to charge the originating usage rate for all originating minutes, and the terminating usage rate for all terminating minutes?

A. Yes. Verizon MA separated its total switching usage costs into terminating and originating costs.

Q. Please explain non-conversation time ("NCT") and how it relates to usage costs.

A. Conversation time is the actual time (in MOU) that switch resources are being used during the conversation part of each call. Non-conversation time represents the time that switch resources are being used other than during the actual conversation time. For example, NCT includes the time required for dialing the call, ringing, and call set-up. It also includes the time associated with calls that are not completed (that is, the called party does not answer). Since non-conversation times are not measured by the switches billing recordings, and thus cannot be billed, NCT must be added to the conversation minutes (MOU's) to account for these times.

Q. Please explain how RTU was included in Local Switching Usage?

A. The right-to-use factor was applied against the total in-place MOU busy hour investment to arrive at a right-to-use cost per busy hour MOU. This cost was then added to the switch busy hour MOU usage cost to arrive at a total busy hour MOU cost for local switch usage.

a) Reciprocal Compensation Usage (Terminating)

Q. Please explain why the Company is filing a separate usage (terminating) cost for Reciprocal Compensation.

A. Section 251 (b)(5) of the Act states that all Local Exchange Carriers have "the duty to establish reciprocal compensation arrangements for the transport and termination of telecommunications." Reciprocal compensation arrangements include the mutual and reciprocal recovery of costs through cash payments or other non-cash transactions such as bill-and-keep arrangements. Additionally, incumbent local exchange carriers are obligated to provide interconnection "on rates, terms, and conditions that are just, reasonable, and nondiscriminatory."[(35)] In Section 252(d)(2)(A), the Act specifies that a state Commission can not consider the terms and conditions to be just and reasonable unless -,

i. Such terms and conditions provide for the mutual and reciprocal recovery by each carrier of costs associated with the transport and termination on each carrier's network, facilities of calls that originate on the network facilities of the other carrier; and

ii. Such terms and conditions determine such costs on the basis of a reasonable approximation of the additional costs of terminating such calls.

Therefore, the Company has appropriately filed costs associated with the additional costs of terminating such calls..

Q. Please explain how the Reciprocal Compensation usage cost was developed.

A. The additional costs associated with basic usage type calls (no-features) were determined in the same manner as previously described for Local Switch Usage, however the getting started[(36)] investments identified by SCIS, and RTUs were excluded.

6. Port Additives

Q. How were the investments associated with the "port additives" developed?

A. The incremental hardware investments associated with optional features was determined by running each feature through SCIS/IN. SCIS/IN is the module of SCIS that calculates incremental investments associated with specific features of the switch. When Telcordia releases a new version of SCIS/MO, it also releases a new version of SCIS/IN to run in conjunction with it. Verizon MA used Version 2.8 of SCIS/IN in conjunction with SCIS/MO Version 2.8.

Q. How were the material investments described above converted to in-place investments?

A. The material investments were converted to total in-place investments by the use of loading factors for power, EF&I, and L&B as previously described.

7. Deaveraging

Q. Should Local Switching rates be deaveraged?

A. No. Differences in local switching rates between zones could lead to asymmetric inter-zone usage rates. Calls originating from point A and terminating at point B might wind up being rated differently than calls originating from point B and terminating at point A. This is an undesirable result and proposes statewide local usage rates to guard against this possibility.

D. Tandem Switching

1. Element Description

Q. What is the tandem switching element?

A. Tandem switching is defined as follows in FCC Rule 319(c)(2).

Local Tandem Switching Capability. The tandem switching capability network element is defined as:

(A) Trunk-connect facilities, which include, but are not limited to, the connection between trunk termination at a cross connect panel and switch trunk card;

(B) The basic switch trunk function of connecting trunks to trunks; and

(C) The functions that are centralized in tandem switches (as distinguished from separate end office switches), including but not limited, to call recording, the routing of calls to operator services, and signaling conversion features.

Q. Please define the tandem switching element used in Verizon MA's forward-looking incremental cost study.

A. The tandem switching element used in the Company's cost study consists of trunk ports (digital) and usage. Trunk ports are either dedicated or common. Common trunk ports are recovered on a per minute-of-use basis.

2. Technology Assumptions

Q. Please describe the forward-looking tandem switch construct.

A. The forward-looking tandem switch construct is based on the latest available tandem digital switching with a mix of 5ESS (82.90

percent) and DMS-200 (17.10 percent) technologies based on the number of trunks, placed at current tandem locations.

Q. Please describe in detail how the construct was designed.

A. Existing office parameters, adjusted to make them forward-looking, were provided by Verizon MA's engineering organization for each existing tandem switch in Massachusetts, and were used to create SCIS model offices for both DMS-200 and 5ESS technology. SCIS then calculated, by switch technology type, unit and total switch material investments for both technologies.

Q. Please describe how the tandems were adjusted to make them forward-looking.

A. Tandem switches were adjusted In the same manner as previously described for Local Switching.

3. General Costing Approach

Q. Please describe the cost methodology used in developing the Tandem Switching element.

A. The cost methodology used in developing the Tandem switching costs is consistent with the cost methodology described above for local switching.

Q. Did the Company deaverage the Tandem Switching element by zone?

A. No. Since tandem switching will provide delivery of calls between two (or more) density zones, it would not be meaningful to develop deaveraged tandem switching costs.

Q. How were the material investments for the tandem developed?

A. The material investments for the tandem were developed using SCIS, in the same manner described for Local Switching. However the feature module of SCIS was not required because trunk features are provided solely by software and the processor.

Q. Please explain how RTU was included in Tandem Switching?

A. RTU was included in Tandem Switching in the same manner as previously described for Local Switching.

E. TOPS Switches

Q. What is a "TOPS" switch?

A. A TOPS ("Telephone Operator Position System") switch is the switch type utilized for routing Operator Services calls in Verizon MA's network. A TOPS switch is a type of tandem switch.

Q. What cost elements has the Company identified for access to TOPS switches?

A. The Company has identified the investment and associated cost for a DS1 level trunk termination. The cost associated with the trunk termination has been developed on a per trunk basis for dedicated trunks, as well as a per MOU for common trunks.

Q. Please define the TOPS trunk port element used in Verizon MA's study.

A. The TOPS trunk port element used in the Company's cost study consists of digital DS1 trunk ports. Trunk ports can be either dedicated or common. Costs of common trunk ports are recovered on a per minute of use basis; costs of dedicated trunk ports are recovered on a monthly recurring basis.

Q. Please describe the forward-looking TOPS switch construct.

A. The forward-looking TOPS switch construct is based on the latest available TOPS digital switching, which is DMS-200 technology , placed at current TOPS locations.

Q. Please describe in detail how the construct was designed.

A. The forward-looking DMS-200 TOPS switches were developed by reviewing all of Verizon MA's TOPS switches in Massachusetts, and adjusting them to make them forward-looking in the same manner previously described for Local Switching. The forward-looking offices were then used as the basis for determining the investments associated with the TOPS Switching element.

Q. Please describe the cost methodology used to develop the TOPS trunk port cost.

A. The cost methodology used to develop the TOPS port cost is consistent with the cost methodology described for the Local Switching trunk port cost above.

Q. Did the Company deaverage the TOPS trunk port element by zone?

A. No. Like tandems, TOPS will provide delivery of calls between two (or more) density zones. It is thus not meaningful to develop deaveraged TOPS trunk port costs.

Q. How were the material investments for the TOPS developed?

A. The material investments for the TOPS were developed using SCIS, in the same manner described for Local Switching. However the feature module of SCIS was not required because trunk features are provided solely by software and the processor.

Q. Please explain how RTU was included in TOPS Switching?

A. RTU was included in TOPS Switching in the same manner as previously described for Local Switching.

IX. interoffice transport

Q. Please describe the Interoffice Transport (or "IOF"[(37)]) element.

A. The element is defined as follows in FCC Rule 319(d).

Interoffice Transmission Facilities. An incumbent LEC shall provide nondiscriminatory access, in accordance with § 51.311 and section 251(c)(3) of the Act, to interoffice transmission facilities on an unbundled basis to any requesting telecommunications carrier for the provision of a telecommunications service.

(1) Interoffice transmission facility network elements include:

(A) Dedicated transport, defined as incumbent LEC transmission facilities, including all technically feasible capacity-related services including, but not limited to, DS1, DS3 and OCn levels, dedicated to a particular customer or carrier, that provide telecommunications between wire centers owned by incumbent LECs or requesting telecommunications carriers, or between switches owned by incumbent LECs or requesting telecommunications carriers;

(B) Dark fiber transport, defined as incumbent LEC optical transmission facilities without attached multiplexing, aggregation or other electronics;

(C) Shared transport, defined as transmission facilities shared by more than one carrier, including the incumbent LEC, between end office switches, between end office switches and tandem switches, and between tandem switches, in the incumbent LEC network.

A. Dedicated Transport

1. Element Description

Q. Please define the Dedicated Interoffice Transport element used in Verizon MA's forward-looking incremental cost study.

A. The Dedicated IOF element is defined as IOF transmission facilities dedicated to a particular customer. Dedicated IOF is offered between Verizon MA owned wire centers at the following signaling levels: DS0, DS1, DS3, STS-1, OC-3, OC-12, and OC-48. Monthly costs have been developed on a "fixed" basis and a "per mile" basis for each signaling level facility.

Q. In general, what are the fixed (non-mileage-sensitive) costs of dedicated transport?

A. The fixed investments are those investments identified at the originating and terminating Verizon MA wire centers, which include electronic equipment such as SONET add/drop multiplexers, digital cross connect systems ("DCS"), and fiber terminations.

Q. In general, what are the per-mile costs of dedicated transport?

A. The variable investments are those investments which vary with the length of the facility and contain interoffice fiber cables, structure, and any electronics at intermediate Verizon MA serving wire centers.

2. Technology Assumptions

Q. Please describe the forward-looking IOF construct used as the basis for developing the costs associated with Dedicated IOF Transport.

A. Verizon MA is using SONET fiber optic transport rings for growth applications in the interoffice network. The IOF Transport cost studies have been based on facility models, which are schematics representing equipment routing and configurations using this construct. The facility models were created to serve signal levels (DS0, DS1, DS3, STS-1, OC-3, OC-12, and OC-48) throughout the Verizon MA IOF network.

The model also identifies three types of SONET ring arrangements, based on the complexity (high, medium, and low) of the IOF configuration being served.

3. Utilization

Q. How is utilization accounted for in the transport study?

A. Consistent with the definition used throughout these studies, utilization is accounted for as a percent of total installed capacity. Interoffice transport elements (DS0, DS1, DS3, etc) must pass through one or more levels of multiplexing to be carried by the backbone transport network. As is the case with all network capacity, the interoffice facility multiplexing equipment, including electronic digital cross connect machines, cannot be operated at 100 percent of capacity. A reasonable utilization level must be estimated for these elements. The factors of rapid interoffice facility growth, churn, equipment breakage, and administrative spare must all be reflected in the utilization level. The combined impact of these factors yields an estimated forward looking fill of 75 percent. This 75 percent utilization factor is applied in the study at each multiplexing level in the IOF model.

4. Costing Approach

Q. Describe how the investments for Dedicated IOF Transport were developed.

A. IOF investments were developed on a fixed and variable basis. The fixed investments, which were identified at the originating and terminating Verizon MA serving wire centers, include electronic equipment such as SONET Add/Drop Multiplexers, digital cross connect frames, and fiber termination frames. The variable investments, which were developed on a per-mile basis, are those that vary with the length of the facility and contain the interoffice fiber cable, structure, and any electronics necessary at intermediate Verizon MA serving wire centers.

Q. Were structure investments included in the IOF study?

A. Yes. Outside plant interoffice structure investments were determined using the same methodology as previously described to determine loop structure investments.

Q. On what basis were the material and installation prices determined for IOF?

A. Material prices for electronic equipment and cables reflect the latest negotiated contract prices Verizon MA has with the manufacturers of the circuit equipment and interoffice cable facilities. Circuit equipment investment loading factors were multiplied by the material prices to arrive at a total investment. Fiber cable installation and engineering costs were obtained from ECRIS.

Q. Did the Company's cost study deaverage the Dedicated IOF Transport investments by density zones?

A. No. Neither the "fixed or "variable" cost components are density sensitive. Since an unbundled Dedicated IOF Transport facility can originate and terminate in different density zones (as well as pass through different central office nodes along the SONET rings), it is not appropriate to deaverage the dedicated transport costs.

B. Common Transport

Q. Please define the Common Interoffice Transport element used in Verizon MA's forward-looking incremental cost study.

A. The Common IOF element is defined as IOF transmission facilities shared by more than one customer or carrier. Common IOF is offered between Verizon MA owned wire centers on an MOU basis.

Q. Please describe how the MOU cost was developed for the Common IOF Transport element.

A. The MOU cost for Common IOF Transport was developed by dividing the Dedicated Transport investments by the capacity of annual minutes of usage that could be transported by those investments. This is a reasonable approach because Common Transport uses the same physical interoffice facilities as Dedicated Transport.

X. signaling systems and call-related databases

Q. Please describe the signaling system and call-related databases element.

A. The element is described in FCC Rule 319(e) as follows:

Signaling Networks and Call-Related Databases. An incumbent LEC shall provide nondiscriminatory access, in accordance with § 51.311 and section 251(c)(3) of the Act, to signaling networks, call-related databases, and service management systems on an unbundled basis to any requesting telecommunications carrier for the provision of a telecommunications service.

(1) Signaling Networks: Signaling networks include, but are not limited to, signaling links and signaling transfer points.

(A) When a requesting telecommunications carrier purchases unbundled switching capability from an incumbent LEC, the incumbent LEC shall provide access from that switch in the same manner in which it obtains such access itself.

(B) An incumbent LEC shall provide a requesting telecommunications carrier with its own switching facilities access to the incumbent LEC's signaling network for each of the requesting telecommunications carrier's switches. This connection shall be made in the same manner as an incumbent LEC connects one of its own switches to a signaling transfer point.

(2) Call-Related Databases: Call-related databases are defined as databases, other than operations support systems, that are used in signaling networks for billing and collection, or the transmission, routing, or other provision of a telecommunications service.

(A) For purposes of switch query and database response through a signaling network, an incumbent LEC shall provide access to its call-related databases, including but not limited to, the Calling Name Database, 911 Database, E91l Database, Line Information Database, Toll Free Calling Database, Advanced Intelligent Network Databases, and downstream number portability databases by means of physical access at the signaling transfer point linked to the unbundled databases.

(B) Notwithstanding the incumbent LEC's general duty to unbundle call-related databases, an incumbent LEC shall not be required to unbundle the services created in the AIN platform and architecture that qualify for proprietary treatment.

(C) An incumbent LEC shall allow a requesting telecommunications carrier that has purchased an incumbent LEC's local switching capability to use the incumbent LEC's service control point element in the same manner, and via the same signaling links, as the incumbent LEC itself.

(D) An incumbent LEC shall allow a requesting telecommunications carrier that has deployed its own switch, and has linked that switch to an incumbent LEC's signaling system, to gain access to the incumbent

LEC's service control point in a manner that allows the requesting carrier to provide any call-related database-supported services to customers served by the requesting telecommunications carrier's switch.

(E) An incumbent LEC shall provide a requesting telecommunications carrier with access to call-related databases in a manner that complies with section 222 of the Act.

(3) Service Management Systems:

(A) A service management system is defined as a computer database or system not part of the public switched network that, among other things:

(1) Interconnects to the service control point and sends to that service control point the information and call processing instructions needed for a network switch to process and complete a telephone call; and

(2) Provides telecommunications carriers with the capability of entering and storing data regarding the processing and completing of a telephone call.

(B) An incumbent LEC shall provide a requesting telecommunications carrier with the information necessary to enter correctly, or format for entry, the information relevant for input into the incumbent LEC's service management system.

(C) An incumbent LEC shall provide a requesting telecommunications carrier the same access to design, create, test, and deploy Advanced Intelligent Network-based services at the service management system, through a service creation environment, that the incumbent LEC provides to itself.

(D) An incumbent LEC shall provide a requesting telecommunications carrier access to service management systems in a manner that complies with section 222 of the Act.

A. Scope

Q. What is the scope of the studies presented here by Verizon MA concerning this element?

A. As explained above, the studies of this element that are presented here are limited to the signaling network elements, including STP Port and Signaling links, access to certain databases, and Service Management System.

B. Element Description

Q. Please define the signaling network elements used in Verizon MA's forward-looking incremental cost study.

A. Modern telecommunications networks transmit signaling information over communication paths separate from those used to transmit the voice communication itself. Signaling information is switched at Signaling Transfer Points ("STPs"), and is carried between STPs and local and tandem switches over signaling links. Routing and other information used by the signaling network are stored in call-related databases known as Intelligent Service Control Points ("ISCPs"). The protocol used for signaling information is known as Signaling System 7 ("SS7"). A call-related database query is a switch query and database response through the signaling network, which provides access to Verizon MA's Line Information Database ("LIDB") and Toll Free Calling ("800") database by means of physical access at the STP.

C. STP Port and Signaling Link

Q. Please describe the forward-looking construct used to develop the costs associated with the STP port for A-link traffic.

A. A representative model STP was determined by reviewing the actual STP network, number of ports, and the number of SS7 links. A forward-looking representative switch, based on the latest available STP technology, was designed. The forward-looking model office was used as the basis for determining the investments associated with the STP port element.

Q. Please describe the cost methodology used in developing the STP port element and signaling link element.

A. The cost methodology used in developing the STP port cost is consistent with the cost methodology for switching described previously.

Q. Did the Company deaverage the STP port element?

A. No. Since the signaling network provides signaling for calls between two (or more) density zones, it would not be meaningful to develop deaveraged STP port costs.

Q. How were the material investments for the STP port developed?

A. The material investments for the STP were developed using Telcordia's Common Channel Signaling Cost Information System ("CCSCIS"), in the same manner as described for Local Switching for the SCIS. The latest negotiated vendor discount was applied to the material investment in CCSCIS.

Q. What version of CCSCIS was used for Verizon MA's study?

A. The latest available version from Telcordia, Version 5.0.4.

Q. Please describe how the investment for the signaling link investment was developed.

A. The investment of the Signaling Link element was developed by taking the investments and the associated costs previously developed for the Dedicated Transport "fixed" and "mileage" elements at the DS0 level. These costs reflect the costs associated with the DS0 level facility, which comprises the Signaling Link.

D. LIDB, 800, and AIN Database Query

Q. Please describe the forward-looking construct used to develop the costs associated with the LIDB, 800, and AIN Query.

A. A representative model Intelligent Signaling Control Point ("ISCP") for each database (800, LIDB, and AIN) was determined by reviewing the actual 800, LIDB, and AIN databases. A forward-looking representative ISCP for each database, based on the latest available ISCP technology was designed. The forward-looking model office was used as the basis for determining the investments associated with each database query.

Q. Please describe the cost methodology used in developing the 800, LIDB, and AIN query.

A. The cost methodology used in developing the 800, LIDB, and AIN query cost is consistent with the cost methodology described above.

Q. Did the Company deaverage the 800, LIDB, and AIN query by zone?

A. No. Since the signaling network will provide signaling of calls and data between two (or more) density zones, it would not be meaningful to develop deaveraged database queries.

Q. How were the material investments for the queries developed?

A. The material investments for the queries were developed using CCSCIS. The latest negotiated vendor discount was applied to the material investment in CCSCIS.

E. 800, LIDB, AIN, and Call Set-up Transport

Q. What technological assumptions underlie the 800, LIDB, AIN, and Call Set-Up Transport cost study?

A. The signaling technology is the same as described above.

Q. How did Verizon MA develop the SS7 Transport costs?

A. All SS7 message investments were obtained from CCSCIS and reflect the investment in SS7 links and STPs. The investments used in the study are a weighted average inclusive of all Massachusetts STPs and a weighted average of all A links, D links, and C links (up to the SCP for the particular service involved) for the entire state.

Q. Please describe the cost methodology used in developing the 800, LIDB, AIN, and Call Set-Up transport.

A. The cost methodology used in developing the 800, LIDB, AIN, and Call Set-Up transport cost is consistent with the cost methodology described above.

Q. Did the Company deaverage the 800, LIDB, AIN, and Call Set-Up transport by zone?

A. No. Since the signaling network will provide signaling of calls and data between two (or more) density zones, it would not be meaningful to develop deaveraged database queries.

F. AIN Service Management System and AIN Service Creation

Q What AIN cost studies are being presented here?

A. Cost studies are presented for AIN Service Creation, and AIN Record Provisioning. AIN Transport and query has been previously presented under SS7 Transport cost studies in this testimony.

Q. Please describe the AIN Service Creation model underlying Verizon MA's cost study.

A. Verizon MA's study is based on the assumption that carriers will access the Service Creation Environment ("SCE") through the same platform, ISCP SPACE™, that Verizon itself uses.

Q. Please describe the costs components for AIN Service Creation.

A. AIN Service Creation has the following cost components: Service Establishment; Service Creation Access Port; Service Creation Usage; Help Desk Support; Service Certification; and AIN ISCP Record Provisioning.

Q. Please describe Service Establishment and how the cost was developed.

A. Service Establishment cost reflects the labor required for the initial establishment and set-up of an AIN SCE account by Verizon MA's Project Management organization. This cost element is a non-recurring cost and is developed in the non-recurring cost model presented in the testimony of Mr. Meacham.

Q. Please describe Service Creation Access Port and how the cost was developed.

A. An AIN Service Creation Access Port gives the carrier access to the SCE through a dedicated access port. These costs include the costs associated with the access workstations, and related software right to use fees. The cost methodology is described in the study documentation workpapers.

Q. Please describe Service Creation Usage and how the cost was developed.

A. Service Creation Usage is the cost associated with providing a carrier with access to the SCE facility, in twenty-four hour increments. This costing methodology is also described in the work papers.

Q. Please describe Help Desk Support and how the cost was developed.

A. Help Desk Support provides a carrier with a dedicated SCE technician to assist the carrier with any problems encountered accessing the SCE. The cost is the hourly labor rate associated with the SCE technician that will provide this assistance multiplied by the time required by the carrier, to be billed in 15-minute increments.

Q. Please describe Service Certification and how the cost was developed.

A. Service Certification includes the cost of lab and field testing required to certify the carrier's service before it can be deployed in Verizon MA's ISCP. The testing ensures that the AIN service logic deployed in the ISCP can control network switches without creating unanticipated and harmful interactions with other network services and functions. Certification is required of all AIN services created by Verizon MA as well. It includes lab testing of the service logic, followed by actual field trials in the network.

The cost components of Service Certification consist of a weighted mix of labor rates for the job functions listed above as well as the labor rate associated with management of the project. This weighted labor rate multiplied by the time required to certify the particular AIN service would then be billed to the carrier in 15-minute increments.

Q. Please describe ISCP Record Provisioning and how the cost was developed.

A. ISCP Record Provisioning is the labor associated with the creation and/or modification of AIN ISCP Records. The cost is the product of the hourly labor rate of the technician who will be performing this job function and the time necessary to perform that function (dependent on the size and number of records), to be billed in 15-minute increments.

XI. element combinations

A. Regulatory Background

Q. Does Verizon MA provide elements in combined form?

A. Yes. Incumbents are required to provide certain combinations by FCC Rule 315. Verizon MA currently provides network element combinations as required by the FCC under D.T.E. - Mass. - No. 17.

B. Recurring Charges for Combinations: In General

Q. What is the recurring charge for an element combination.

A. In general, the recurring charges for element combinations are the sum of the recurring charges for the constituent elements. In some cases, however, additional charges apply, as discussed below.

C. The EEL Testing Charge

Q. What is the "EEL Testing Charge"?

A. The EEL Connection Charge is a charge proposed by Verizon MA to recover the costs associated with testing EEL arrangements. (EEL is a combination of loops with IOF, together with multiplexing where required.)

In the local loop studies being presented in this filing, subscriber trouble testing expense is excluded from the expense base on which the Company's ACFs are based. The exclusion of subscriber trouble testing expense reflects the assumption that in the forward-looking environment, the CLEC purchasing a loop will perform the subscriber trouble testing function itself.

Currently, a CLEC purchasing EEL is not able to perform the testing necessary to isolate troubles to the loop (i.e., "sectionalization"), since such testing would require the use of equipment in the central office serving that loop. Accordingly, Verizon MA is currently responsible for subscriber trouble testing for EEL arrangements, and it is appropriate to include the relevant expense in the EEL cost.

Q. How has the testing charge been determined?

A. An EEL Testing expense factor has been developed which when applied to the investment in the underlying loop component of the EEL arrangement yields the relevant bases of costs. Ordinarily these costs would be divided by twelve and multiplied by common overhead and gross revenue loading factors in order to develop the monthly costs for testing. However, in an earlier decision[(38)] *the Department ruled that EEL testing costs should be recovered as a per-transaction charge. The Company converted the monthly costs to transaction-based costs using the same methodology we followed when the compliance studies were filed in the earlier proceeding.*

Q. How was the EEL Testing factor developed?

A. The first step was to identify the overall level of Subscriber Trouble Testing incurred by Verizon MA in 1999. Next an adjustment was made to remove testing expenses that are for non-regulated portions of the network. In addition, the circuit investments and annual costs associated with the testing equipment needed to test the network have been identified previously in developing the UNE network ACFs. A pro rata portion of these costs are picked up with the same relationship as with the subscriber trouble testing expenses to be used in EELS. The resultant amounts are then combined and spread over the outside plant investment accounts to derive the basis of the forward - looking estimation of testing that will be required for EEL arrangements.

XII. Miscellaneous services

A. Daily Usage File

Q. Please explain the Daily Usage File ("DUF") service.

A. This service provides resellers and UNE purchasers with detailed usage information. It consists of the processing and transmission of call records.

Q. How were the processing costs for DUF developed?

A. Costs were developed for Recording Processing, Data Transmission, and Tape or Carriage. The costs include the computer processing usage time, computer termination maintenance, salary and wages of personnel handling the data transmission functions, software maintenance, and disk maintenance.

Q. In the Phase 4-O Order in the Consolidated Arbitrations[(39)], the Department rejected Verizon MA's DUF[(40)] costs. Please address the Department's criticisms in that proceeding.

A. The Department found that the Company was already being compensated for forward-looking computer-related costs in its UNE rates. Therefore, the Department ruled that allowing cost recovery through a separate rate element would result in a double recovery. In this filing, Verizon MA addresses any potential double recovery of OSS costs through an explicit adjustment to the ACFs as described above.

In the Consolidated Arbitrations, the Department also found that certain OSS-related investments were overstated. In this filing, the DUF study is based on more current data than that provided in the Consolidated Arbitrations.

B. Customized Routing

Q. Please describe the Customized Routing of OS/DA for resale.

A. Customized Routing, as the term is used in this testimony, provides a reseller with the ability to route local OS/DA calls from a resold line to an Alternative Operator Service Provider ("AOSP"), i.e., to an operator

service provider other than Verizon MA.

Q. What is the long-term view of how this service will be provided?

A. The long-term view for this service is to make use of Advanced Intelligent Network (AIN) technology. Using an AIN switch "trigger", Verizon's switch providing the CLEC's end user dial-tone, will launch a query to an SCP, which will provide the instructions on how to route the call, which trunk group to select specific to the originating line, traffic type of the specific call, and destination of the call.

Q. What assumptions were made with respect to other elements or services that the reseller must provide?

A. Customized Routing of OS/DA for Resale requires the reseller to purchase direct trunks in order for the routed calls to be directed to the designated trunk group, and transported to the AOSP that will handle OS/DA for the reseller. These trunk facilities must be either purchased from the Company, or otherwise provided for by the reseller.

Q. What costs are involved in this service?

A. There are two types of costs that are involved with this service: non-recurring establishment and SS7 costs (including AIN Transport and Query). The non-recurring costs are addressed Mr. Meacham's testimony.

Q. How were the recurring costs calculated in the study?

A. First, the average number of OS/DA calls per month for these calls for all lines were identified. Each one of these "re-routed" calls needs to launch an AIN query for routing instructions. The average number of OS/DA calls was multiplied by the cost for the Customized Routing AIN Query and AIN Transport to establish the SS7 costs per line per month.

Q. Does this conclude the Panel's testimony?

A. Yes.

1. [1] *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98, Third Report and Order and Fourth Further Notice of Proposed Rulemaking (rel. November 5, 1999).*

2.

[2] *47 C.F.R. § 51.319.*

3.

[3] *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98, First Report and Order 11 FCC Rcd 15,499 (rel. August 8, 1996), ¶ 675 (footnotes omitted).*

4.

[4] *Local Competition Order ¶ 692 (footnote omitted).*

5. [5] *47 C.F.R. § 51.505(b)(1) (emphasis supplied); see also Local Competition Order ¶ 685.*

6. [6] *See UNE Remand Order ¶¶ 468-73.*

7.

[7] *See Local Competition Order ¶ 694; 47 C.F.R. § 51.505(a).*

8. [8] *47 C.F.R. § 5.505(c)(1).*

9. [9] *See 47 C.F.R. § 51.505(c)(2)(B): "The sum of the allocation of forward-looking common costs for all elements and services shall equal the total forward-looking common costs, exclusive of retail costs, attributable to operating the incumbent LEC's total network, so as to provide all the elements and services offered."*

10. [10] *See Local Competition Order ¶ 678.*

11.

[11] *Local Competition Order ¶ 682.*

12. [12] *See LCO ¶ 682: "Per-unit costs shall be derived from total costs using reasonably accurate 'fill factors' . . .; that is, the per-unit costs associated with a particular element must be derived from dividing*

the total cost associated with the element by a reasonable projection of the actual total usage of the element." See also 47 C.F.R. § 51.511.

13. [13] D.P.U 96-73/74, 96-75, 96-80/81, 96-83, 94-94- Phase 4, Order Dated December 4, 1996 at 32.

14. [14] 47 C.F.R. § 51.507(f)

15.

[15] This principle is discussed in the Direct Testimony of William E. Taylor and also in Local Competition Order ¶¶ 683-685.

16. [16] Although the NID is available as a separate unbundled network element -- see below -- it is also a component of the loop element.

17.

[17] "Directly attributable forward-looking costs include the incremental costs of facilities and operations dedicated to that element. Such costs typically include investment costs and expenses related to primary plant used to provide that element."

18.

[18] In the case of ADSL, discussed below, the equipment at the customer premises is commonly referred to as an ADSL Terminal Unit -- Remote ("ATU-R"). The equipment at the other end of the circuit is commonly referred to as a Digital Subscriber Line Access Multiplexer ("DSLAM").

19.

[19] Certain other forms of xDSL technology, such as ISDN Digital Subscriber Line("IDSL"), are compatible with loops incorporating fiber-based DLC systems.

20. [20] While it is possible to utilize xDSL technologies on loops equipped with DLC technology, such applications involve the placement of DSLAMs at the remote terminal rather than at the central office. In such cases, however, the use of xDSL technology is limited to the (copper) distribution portion of the loop; the technology would not be used on the (fiber) feeder facilities between the terminal and the central office. Thus, even in such applications, the use of the technology would still be limited to copper cables.

21.

[21] The precise speed that is available in each direction depends upon the specifications of the terminating electronics that are used, as well as on the length and other characteristics of the loop.

22. [22] Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98, Third Report and Order and Further Notice of Proposed Rulemaking (rel. November 5, 1999) ¶ 204 n.390 ("xDSL cannot work over fiber, and it generally requires a 'clean' (i.e., conditioned) copper loop.").

23.

[23] An MLT test determines the effective length of a loop by measuring its capacitance. The process involves sending a voltage pulse from testing equipment located in an MLT test center, through a central office

switch port, and down the loop being tested. Only working loops, i.e., loops connected to a switch port and provided with dialtone, can be MLT-tested.

24. [24] A "binder group" is a bundle of pairs, typically twenty-five, that are adjacent to each other within a cable. Transmission of T1 signals can interfere with xDSL transmission in nearby pairs, and vice versa.

25.

[25] A preliminary step in the bulk testing process is generating a file listing the loops to be tested. Terminals that contain T1 in the binder group or that have less than a specified percentage of non-DLC loops are excluded from these files. Thus, loops in such terminals are not MLT-tested, and the terminals are simply recorded in the Database as non-qualified.

26.

[26] The charge is not based on the actual (i.e., historical) costs of creating and maintaining the Database, but rather on the estimated, forward-looking costs of the functions involved in Database creation and maintenance. Moreover, with respect to Database creation, only the costs associated with MLT testing are recovered in the charge. Any additional costs (for example, the costs associated with excluding from MLT test files loops equipped with DLC technology or loops located in binder groups with T1 facilities) are not recovered in the wholesale charge.

The development of the Mechanized Loop Qualification charge is discussed in detail later in this testimony.

27.

[27] The manner in which the cost-per-line (pair) tested was identified was based on the amount of time (e.g., 10 minutes) taken to conduct the testing of a number of terminals and the total count of pairs in those terminals (e.g., 1200 lines). The number of lines was then divided into the amount of time consumed (10 minutes) to come up with the cost-per-line or in this example, 0.0083 minutes per line (i.e., 10 minutes/1200 lines). The actual number of lines physically tested was in fact only a sample of the total number of lines across which the testing costs was spread. (For terminals with between 10 and 100 lines, 10 lines were tested. For terminals with more than 100 lines, 20 lines were tested.)

The estimated times reflect the time required for an MLT test when the test is performed on an automated, bulk basis, as was the case for the tests performed in connection with the creation of the Database. MLT tests that are individually conducted, upon special request, require significantly greater time, particularly for associated administrative tasks.

28.

[28] Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket Nos. 98-147 and 96-8, Third Report and Order in CC Docket No. 98-147 and Fourth Report and Order in CC Docket No. 96-98 (rel. December 9, 1999).

29. [29] D.T.E. 98-57-Phase III, Order Dated September 29, 2000 at 79.

30. [30] MCI Telecommunications Corp. v. New York Telephone Co., No. 97-CV-1600, slip op. At 25 (N.D.N.Y. March 7, 2001).

31.

[31] D.P.U 96-73/74, 96-75, 96-80/81, 96-83, 94-94- Phase 4, Order Dated December 4, 1996 at 37.

32. [32] Excluding 10% of the lowest dollar value orders.

33. [33] Excluding 3 months of New Hampshire data which was not available at the time of this filing.

34.

[34] "All Hours of the Day" means averaged over all time-of-day periods.

35.

[35] Telecommunications Act of 1996 at SEC. 251 (c)(2)(D)

36.

[36] "Getting started" investments represent the investments associated with switch processor and memory, and are not impacted by the additional reciprocal compensation usage.

37. [37] "IOF" stands for Interoffice Facilities.

38.

[38] D.T.E 98-57, Order Dated March 24, 2000 at 112.

39.

[39] D.T.E. 96-73/74, 96-75, 96-80/81, 96-83, 96-94 - Phase 4-O, Order On Motions For Reconsideration Of MCI WorldCom, Inc. And Motion For Reconsideration And Clarification Of Bell Atlantic-Massachusetts, January 10, 2000.

40. [40] In the Consolidated Arbitrations, DUF was known as Customer Usage Detail Service ("CUDS").