Exhibit No. FJM-1T
Docket No. UT-023003

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of the Review of Unbundled Loop and Switching Rates; the Deaveraged Zone Rate Structure; and Unbundled Network Elements, Transport, and Termination	)))))	DOCKET NO. UT-023003

REPLY TESTIMONY OF FRANCIS J. MURPHY ON BEHALF OF VERIZON NORTHWEST INC.

[PUBLIC VERSION]

HM 5.3 CRITIQUE

April 26, 2004

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I. INTRODUCTION AND SUMMARY

A. QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND TITLE.

A. My name is Francis J. Murphy. My business address is 5 Cabot Place, Suite #3, Stoughton, Massachusetts 02072. I am the President of Network Engineering Consultants, Inc. ("NECI").

Q. PLEASE EXPLAIN THE BUSINESS EXPERTISE OF NECI.

A. NECI specializes in the fields of cost model analysis and development, and network engineering, planning and implementation. I specialize in service cost analysis of the telecommunications industry. Since founding NECI, I, along with members of my engineering team, have analyzed and evaluated telecommunications costing methodologies and models for unbundled network elements ("UNEs"), universal service fund ("USF") support, non-recurring costs, avoided costs, and collocation cost proceedings. I have also authored expert reports and provided expert testimony on network engineering and cost analyses filed in numerous state and federal dockets.

During the past eight years, I have analyzed extensively several versions of the HAI Model, including the various versions of HAI Model, Release 5.3 ("HM 5.3" or "Model").[1] I have also examined and commented upon numerous

[1] Unless otherwise specified, my analyses are based on the new version of HM 5.3 filed by AT&T Communications of the Pacific Northwest, Inc. ("AT&T") on April 9, 2004. Should AT&T or WorldCom,

versions of the Federal Communications Commission's ("FCC") universal service cost proxy model (the "Synthesis Model"),[2] the AT&T/MCI Modified Synthesis Model ("MSM"), the Hybrid Cost Proxy Model, and the Benchmark Cost Proxy Model. My analyses of these cost models involved a thorough examination and evaluation of each model's platform and inputs in federal USF, state USF, and state UNE proceedings.

Q. PLEASE DISCUSS YOUR BUSINESS EXPERIENCE AND EDUCATION.

A. I have worked in the telecommunications industry for approximately 34 years. Prior to founding NECI, I worked for Financial Strategies Group on behalf of its client, Pacific Bell, in the California Public Utility Commission's "OANAD" proceeding, analyzing Pacific Bell's avoided cost studies and the Hatfield (or "HAI") Model Version 2.2.2. Earlier in my career, I worked in the telecommunications industry at NYNEX for over 25 years. While at NYNEX, I held various positions in the network operations, marketing, access services, and cost analysis divisions.

I received a Bachelor of Arts degree in Business Management from Boston College in 1986. I have also attended numerous technical, management, and service cost-related courses, including service cost development and separations and settlement courses sponsored by Bellcore (now "Telcordia

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Inc. (d/b/a "MCI") file yet another version, or change their cost model in any way, I will likely need to supplement my Reply Testimony to address any new issues raised.

[2] *Tenth Report and Order*, In re Federal-State Join Board on Universal Service, In re Forward-Looking Cost Mechanism for High Cost Support for Non-Rural LECs, 14 FCC Rcd 20156 (1999) ("Tenth Report and Order"); *Fifth Report and Order*, In re Federal-State Joint Board on Universal Service, In re Forward-

Communications Inc.”). My academic credentials and professional experience are set forth in more detail in Exhibit FJM-2 to my Reply Testimony.

I have spent approximately 18 years in a variety of network operations positions. I have managed work forces that have implemented the engineered designs of virtually every aspect of an incumbent local exchange carrier’s (“ILEC”) network, including the installation, maintenance, and rearrangement of all manner of loop facilities, interoffice facilities (“IOF”), circuit equipment, switch and power facilities, as well as the installation and maintenance of all types of finished services provided to both retail and wholesale customers. Through this experience, I gained expertise with many different types, quantities, and configurations of network components that are required to provide quality telecommunications services. I also learned when to accept, and when to reject, various engineering designs that address more granular aspects of the network, such as the loop, IOF, switch, power, and traffic requirements.

At NECI, I have assembled and lead a team of experienced telecommunications engineers and cost analysts who specialize in the more granular aspects of telecommunications networks. These engineers and analysts have provided network design and planning guidance to a variety of NECI clients and have been a valuable resource in analyzing the more detailed aspects of the many cost models, including HM 5.3, that I have examined and critiqued over the past eight years.

Looking Cost Mechanism for High Cost Support for Non-Rural LECs, 13 FCC Rcd 21323 (1998) (“Fifth Report and Order”).

Q. ON WHOSE BEHALF ARE YOU PRESENTING TESTIMONY IN THIS PROCEEDING?

A. I am presenting testimony in this proceeding on behalf of Verizon Northwest Inc. ("Verizon NW").

Q. HAVE YOU PRESENTED TESTIMONY TO THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION ("COMMISSION") PREVIOUSLY?

A. Yes. On April 25, 1997, I submitted Direct Testimony on behalf of Verizon NW (then d.b.a. GTE Northwest Incorporated) regarding the Hatfield Model, Version 3.1,[3] which included an "Engineering Critique of the Hatfield Model 3.1," that I authored with T. Guarino and J. Schaaf. In that same proceeding, I submitted a Declaration requesting the production of AT&T's internally-used Transport Incremental Cost Model ("TICM").[4] I later submitted Supplemental UNE Testimony, which addressed the many engineering and operational flaws in the Hatfield Model, Version 3.1, as well as the problems associated with AT&T/MCI's reliance on the so-called "Fassett Papers."[5]

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[3] Before the Washington Utilities and Transportation Commission, Docket Nos. UT-960369, -370 & -371, *Rebuttal Testimony of Francis J. Murphy on behalf of GTE NW* (April 25, 1997).

[4] Before the Washington Utilities and Transportation Commission, Docket Nos. UT-960369, -370 & -371, *Declaration of David Tucek and Frank Murphy in Support of GTE NW's Motion to Reconsider the Denial* (May 12, 1997).

[5] Before the Washington Utilities and Transportation Commission, Docket Nos. UT-960369, -370 & -371, *Supplemental Direct Testimony of Francis J. Murphy on behalf of GTE NW* (June 13, 1997). The "Fassett Papers" contain a survey (and its results) of various telecommunications contractors that AT&T/MCI witness Mr. Dean Fassett conducted years ago as a member of the HAI Model's engineering team in an attempt to validate a variety of inputs to the HAI Model. The Commission rejected this survey in the previous UNE docket. Before the Washington Utilities and Transportation Commission, Docket Nos. 960369-, -370, -371, *Eighth Supplemental Order Interim Order Establishing Costs for Determining Prices in Phase II; and Notice of Prehearing Conference* (April 16, 1998) at ¶ 93 ("1998 Eighth Supp. Order"). ("The Commission agrees with GTE that the method used by AT&T to collect data from vendors was

I have also submitted Response Testimony on behalf of Verizon NW (then d.b.a. GTE Northwest Incorporated) on August 3, 1998 in the Commission's USF proceeding, in which I addressed the many engineering and operational flaws in the Hatfield Model, Version 5.0a.[6] My testimony included "An Analysis of the HAI Model Release 5.0a," which I authored with G. Duncan, T. Tardiff, K. Model, C. Dippon, J. Kim, R. Cellupica and T. Guarino. In that same proceeding, I submitted Rebuttal Testimony on August 24, 1998,[7] and Supplemental Testimony on September 11, 1998.[8]

B. PURPOSE OF THIS REPLY TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR REPLY TESTIMONY?

A. My Reply Testimony responds to various aspects of the Direct Testimony of Mr. John C. Donovan (dated June 26, 2003), the Supplemental Direct Testimony of Dr. Robert A. Mercer (dated January 23, 2004, as amended on April 9, 2004), and the Direct Testimony of Dr. Mark T. Bryant (dated June 26, 2003), all of which were filed on behalf of AT&T Communications of the Pacific Northwest Inc.

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flawed . . . The AT&T questionnaire did not define the terms used in the questionnaire."); *Id.* at ¶ 95 ("Even if the terms had been defined in the questionnaire, the collection of data should have been done in a manner consistent with the way in which the information was to be used in the Hatfield Model."); *Id.* at ¶ 96 ("We find that the outside plant data collected from the vendors by the Hatfield engineering team do not provide sufficient validation for the opinion of these experts.").

[6] Before The Washington Utilities and Transportation Commission, Docket No. UT-980311(a), *Response Testimony of Francis J. Murphy* (Aug. 3, 1998).

[7] Before the Washington Utilities and Transportation Commission, Docket No. UT-980311(a), *Rebuttal Testimony of Francis J. Murphy* (Aug. 24, 1998).

[8] Before the Washington Utilities and Transportation Commission, Docket No. UT-980311(a), *Supplemental Testimony of Francis J. Murphy* (Sept. 11, 1998).

("AT&T") and WorldCom, Inc. ("MCI") (collectively, "AT&T/MCI").[9] I will demonstrate why the cost model sponsored by AT&T/MCI ("HM 5.3" or "Model") is not appropriate for calculating Verizon NW's forward-looking costs of providing UNEs in Washington. I will show that HM 5.3 does not possess many of the key attributes that AT&T/MCI's consultants claim a cost model should possess and I will demonstrate how HM 5.3 fails to comply with the FCC's TELRIC principles[10] and the Commission's cost modeling criteria. I will also show that AT&T/MCI have failed to correct a number of Model shortcomings previously identified by the Commission.[11] In addition, I will explain why those portions of the pre-filed testimony of Mr. Thomas L. Spinks (dated June 26, 2003, February 9, 2004, and April 2, 2004, respectively) relating to the use of HM 5.3, will, in most cases, be plagued with the same or similar flaws as the current version of HM 5.3.

Dr. Timothy Tardiff and Messrs. Christian Dippon, Willett Richter, Thomas Mazziotti and Harold West III are also filing Reply Testimony criticizing various aspects of HM 5.3. Dr. Tardiff addresses HM 5.3's significant economic and modeling flaws. Mr. Dippon addresses the problems associated with the processes used by AT&T/MCI to produce HM 5.3's cluster input database. Mr.

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[9] Mr. Donovan's testimony was also filed on behalf of XO Washington, Inc.

[10] 47 C.F.R. § 51.505 (stating that the forward-looking economic cost of an element equals the sum of: (1) the total element long-run incremental cost of the element; and (2) a reasonable allocation of forward-looking common costs).

[11] Before the Washington Utilities and Transportation Commission, Docket No. UT-980311(a), *Seventh Supplemental Order* (Aug. 26, 1996) ("Seventh Supplemental Order"); 1998 Eighth Supp. Order; Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Thirteenth Supplemental Order* (Sept. 8, 2003) ("Thirteenth Supplemental Order"); Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Fourteenth Supplemental Order* (Oct. 14, 2003) ("Fourteenth Supplemental Order"); Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Eighteenth Supplemental Order* (Dec. 5, 2003) ("Eighteenth Supplemental Order").

Richter demonstrates how the engineering practices used in HM 5.3 differ from the manner in which an engineer would design a forward-looking network in Washington. Finally, Mr. Richter, Mr. Mazziotti and Mr. West refute HM 5.3's assumption that switching investments are not traffic sensitive. In some instances, Dr. Tardiff and Messrs. Dippon, Richter, Mazziotti, West and I discuss similar aspects of HM 5.3, with my Reply Testimony focusing on HM 5.3's engineering and operational flaws.

Q. HOW IS YOUR REPLY TESTIMONY STRUCTURED?

A. My Reply Testimony is structured as follows. The remainder of this section outlines the key cost drivers in HM 5.3, and discusses the many ways in which HM 5.3 does not conform to the Commission's and the FCC's cost modeling criteria. Section II discusses the numerous engineering guidelines and network design parameters that HM 5.3 ignores when designing the modeled outside plant ("OSP") network. Section III explains the manner in which HM 5.3's loop design errors have caused much of the Model's feeder plant to be erroneously characterized as distribution plant. Section IV explains why the Model's sharing assumptions are incorrect and unrealistic. Section V explains how demand is repeatedly misused throughout the Model, including HM 5.3's erroneous modeling of high-capacity loops. Section VI identifies those instances in which the unsubstantiated opinions of AT&T/MCI's consultants have been used as a substitute for verifiable, and readily obtainable, data, and explains how HM 5.3's cost results have been impacted. Section VII explains why HM 5.3's switching costs are unrealistic and not forward-looking. And, finally, Section VIII presents my conclusions and recommendations to the Commission.

Q. PLEASE LIST THE EXHIBITS TO YOUR TESTIMONY.

A. The following exhibits are appended to my testimony:

- Exhibit FJM-2: Academic Credentials and Professional Experience
- Exhibit FJM-3: List of HM 5.3's Unsubstantiated So-Called Expert Opinions and Assumptions

C. KEY NETWORK COST DRIVERS

Q. PLEASE DESCRIBE THE MANNER IN WHICH AN OUTSIDE PLANT ENGINEER WOULD DESIGN AN EFFICIENT TELECOMMUNICATIONS NETWORK.

A. An efficient, functioning telecommunications network must allow each customer to connect to every other customer. At a minimum, the network must make sure that each existing customer location is connected to a central office, and that each central office is connected to the other central offices throughout the network. Every real-world, efficient network must account for more than just the existing customers; it must ensure that there is sufficient capacity for anticipated new customer locations and peaks in demand, among other things. These considerations all impact the costs of the loop, switch, and IOF network components, as well as their associated UNEs.

Q. PLEASE DESCRIBE THE BASIC DESIGN OF A REAL-WORLD LOOP NETWORK.

A. The loop network connects the customer's telephone, Private Branch Exchange ("PBX"),[12] facsimile machine, modem and/or private line equipment locations to the wire (or switching) center that serves them.[13] The loop network consists of, among other things, fiber optic and copper cables, the splices that join the individual fibers or wires together, the electronic equipment that manipulates particular calls and lines for transmission and capacity purposes, the terminals that connect the cables to the building wiring, and the poles, conduits, manholes and other structure that carry or support the cables.

The loop network is divided into feeder and distribution networks, each of which has been characterized as a sub-loop element in the past (i.e., feeder sub-loop and distribution sub-loop elements). These networks aggregate demand from the customer locations back to the wire center that serves them. They

[12] PBXs are privately-owned switches located on the premises of medium- to large-size businesses.
[13] In defining the loop UNE, the FCC not only specified the physical nature of the loop, but also defined the loop in terms of its capability to deliver particular types of services. Specifically, the FCC defined the loop as: "a transmission facility between a distribution frame, or its equivalent, in an incumbent LEC central office, and the network interface device (loop demarcation point) at the customer premises. This definition includes, for example, two-wire and four-wire analog voice-grade loops, and two-wire and four-wire loops that are conditioned to transmit the digital signals needed to provide services such as ISDN, ADSL, HDSL and DS-1 level signals." *See* First Report and Order, *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, 11 FCC Rcd 15499 (1996) at ¶ 380 ("First Report and Order"). The phrase "network interface device" has been replaced with "loop demarcation point." *See* In the Matter of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket Nos. 96-98, *Third Report and Order and Fourth Further Notice of Proposed Rulemaking*, FCC 99-238 (rel. Nov. 5, 1999) at ¶ 167, n.301.

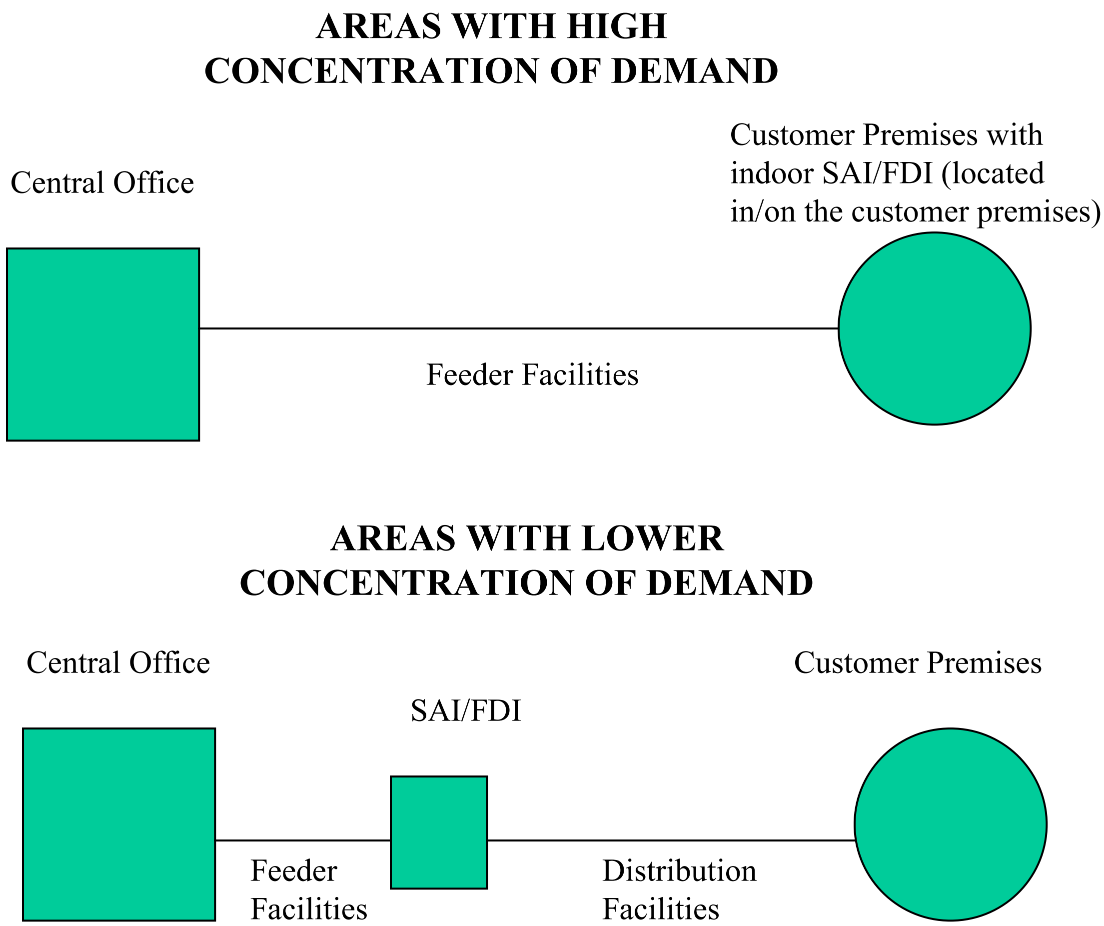
resemble a tree, with the branches representing the distribution network and the trunk representing the feeder network.

As shown on the following diagram, there are two basic loop network configurations. The first consists of a loop that travels from the central office to the customer premises, where an indoor serving area interface ("SAI")[14] -- i.e., the demarcation point between the feeder and distribution networks -- is located. In this configuration, the entire loop network consists of feeder facilities (i.e., the distribution facilities are privately-owned riser cable).

The second loop network configuration has the SAI located somewhere between the customer premises and the central office. In this configuration, the feeder facilities constitute that portion of the loop between the central office and the SAI, whereas the distribution facilities constitute that portion of the loop between the SAI and the customer premises.

[14] The term SAI is synonymous with feeder/distribution interface ("FDI"). At times, an indoor SAI is more appropriately called an "indoor terminal" depending on the quantity of services being terminated in the building. Indoor terminals can be present in either of the two basic loop configurations depicted in Diagrams 1 and 2 below. HM 5.3 does not model any "indoor terminals." For purposes of this discussion, I will refer to both indoor terminals and indoor SAIs as "indoor SAIs."

Diagram 1



Q. WHAT DRIVES THE COSTS OF THE LOOP?

A. Loop costs are driven principally by the location of the customers to be served, the number of customer lines, the location where the feeder meets the distribution, and the assumed design and mix of plant structure (which should be driven by terrain, natural boundaries, demand, etc.) in each segment of the OSP. Because the loop UNEs constitute the largest segment of the OSP portion of the network, they are the most costly to provision. One of the most significant cost components of the loop UNEs is the structure (e.g., poles, conduits, manholes, etc.).

Q. PLEASE DESCRIBE THE "ALL-FIBER" PORTION OF A REAL-WORLD LOOP NETWORK.

A. The "all-fiber" portion of a real-world loop network is an all-fiber construct that is typically built over the copper loop network used to provision plain-old-telephone service ("POTS"). This all-fiber network is generally used to provision high-capacity (i.e., DS-3 and OC-N) services.

Q. DOES HM 5.3 MODEL AN ALL-FIBER NETWORK?

A. Yes; but it does not do so correctly. As discussed more fully herein, HM 5.3's all-fiber network exaggerates demand (and the subsequent cost reductions associated with structure sharing), employs faulty network design parameters, and, as a result, inappropriately reduces the costs of loop UNEs. In addition, with respect to the understated UNE costs it does estimate, the Model discards the vast majority of the costs attributed to the all-fiber network based on an erroneous assumption that certain UNEs included in HM 5.3's so-called "Hi-Cap" category are not being priced in the instant proceeding. These errors ultimately lead to the inappropriate elimination of millions of dollars of investment.

Q. PLEASE DESCRIBE A REAL-WORLD INTEROFFICE NETWORK.

A. The interoffice network connects a wire center (or local switch) with other wire centers, local switches, tandem switches, and other carriers' networks (e.g., inter-exchange carriers ("IXCs"), wireless service providers and competitive local exchange carriers ("CLECs")). The interoffice network consists of the fiber optic cables and splices that join the individual fibers together, the optics and electronics that convert and amplify the electrical and optical signals, and the poles, conduits, manholes and other structure that carry or support the interoffice cables. Generally, all switched and private line traffic originating at a wire center location is connected to the interoffice network via electrical digital signals. The interoffice equipment at the wire center converts the electrical digital signals to optical signals for transport over the fiber optic cables linking the various wire centers.[15] The signals are then converted back to electrical digital signals at the terminating wire center. The fiber optic cables connecting the wire centers are arranged in a Synchronous Optical Network ("SONET")[16] ring design, which essentially provides an on and off ramp (i.e., nodes) for traffic at the wire centers located along the ring. This SONET ring topology provides a great deal of network redundancy to protect against fiber or equipment failures.

Q. WHAT ERRORS HAVE YOU IDENTIFIED WITH THE MANNER IN WHICH HM 5.3 ATTEMPTS TO MODEL AN INTEROFFICE NETWORK?

A. Contrary to a real-world network, HM 5.3 does not account for the demand placed on Verizon NW's IOF and switches by other carriers' networks (such as

[15] The exception to this requirement to convert from an electrical to an optical signal at the wire center is when high-capacity optical services are provided directly to customer locations. I refer to these as OC-N services and discuss them in more detail later.
[16] SONET stands for "synchronous optical network" which is the North American optical interoffice network standard utilized by all major carriers in the United States. The European counterpart is Synchronous Digital Hierarchy or SDH. SDH and SONET equipment are not compatible.

wireless service providers and CLECs). Usage demand from one customer location to another customer location, or from one customer location to another carrier's network throughout (and beyond) the LATA -- whether they are dedicated or switched facilities -- drive the design and sizing of the interoffice network. As with the loop network, HM 5.3 does not identify or use the correct customer demand needed to build and cost an interoffice network, and thereby misstates the costs associated therewith.

Q. PLEASE DESCRIBE A REAL-WORLD SWITCHING NETWORK.

A. The local switching portion of the network is located at the wire center and housed in the central office building. The wire center serves as the physical hub for the loop plant, while the local switch serves as the equipment hub at the wire center for the POTS lines, PBX trunks, Centrex lines, coin lines, etc. All of these are collectively referred to as switched lines. The local switch must direct and transmit all the switched calls from and to each customer location,[17] as well as terminate the switched loop plant and switched trunk plant.

Non-switched lines, on the other hand, connect to the wire center at the central office, but do not utilize the local switching equipment. Rather, these non-switched lines typically require significant amounts of frame terminations and circuit equipment within the switch-room at the wire center, and are generally connected to the IOF without going through the switch.

[17] There is an exception that applies to PBXs. These privately-owned switches are often connected directly to the networks of IXCs, CLECs and other private networks (i.e., other PBXs) via high-capacity

Q. WHAT ERRORS HAVE YOU IDENTIFIED WITH THE MANNER IN WHICH HM 5.3 ATTEMPTS TO MODEL A SWITCHING NETWORK?

A. HM 5.3 attempts to develop switching network costs using illogical and inconsistent inputs and assumptions. For example, the Model's switch investments are derived from a 1998 study, but then are assumed to be equipped with optical SONET interfacing capabilities, which would have been extremely rare in 1998.

D. HM 5.3 DOES NOT CONFORM TO THE COMMISSION'S AND FCC'S UNE COST MODELING CRITERIA

Q. DOES HM 5.3 CONFORM TO THE COMMISSION'S AND THE FCC'S COST MODEL CRITERIA?

A. No. The Commission and FCC have mandated that UNE cost models must comply with the following criteria: (1) the total demand for each element must be taken into account;[18] (2) forward-looking technologies must be modeled;[19] (3) discriminatory practices must be avoided;[20] (4) cost models must be open and

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services. Neither HM 5.3, nor any ILEC, has any way of knowing how many PBX trunkside connections are made to switches other than the ILECs own switches.

[18] 1998 Eighth Supp. Order at ¶ 38 ("the cost estimates should be based upon the cost of satisfying the total demand for elements"); First Report and Order at ¶ 682 ("We conclude that, under a TELRIC methodology, incumbent LECs' prices for interconnection and unbundled network elements shall recover the forward-looking costs directly attributable to the specified element, as well as a reasonable allocation of forward-looking common costs. Per-unit costs shall be derived from total costs … the per-unit costs associated with a particular element must be derived by dividing the total cost associated with the element by a reasonable projection of the *actual total usage* of the element.") (emphasis added); 47 C.F.R. § 541.505(a)-(b).

[19] 1998 Eighth Supp. Order at ¶ 10 ("the use of best available technology with the limits of existing network facilities"); 47 C.F.R. § 51.505(b)(1) ("the use of the most efficient telecommunications technology currently available").

[20] 47 C.F.R. § 51.311(a) ("The quality of an unbundled network element, as well as the quality of the access to the unbundled network element, that an incumbent LEC provides to a requesting telecommunications carrier shall be the same for all telecommunications carriers requesting access to that network element."); 47 C.F.R § 51.313(a) ("The terms and conditions pursuant to which an incumbent

transparent;[21] (5) cost models must capture the salient cost characteristics of the network;[22] (6) inputs must be realistic, accurate estimates of the actual costs that would be incurred;[23] and (7) the public welfare must be maximized.[24] As I explain below, HM 5.3 ignores these unambiguous criteria, and thus fails to meet even the most fundamental cost modeling requirements.

Q. PLEASE EXPLAIN WHY HM 5.3 FAILS TO MEET THE COMMISSION'S AND FCC'S DEMAND CRITERIA.

A. An accurate measure of demand is one of the single most important determinants of accurate UNE cost estimates. The FCC's TELRIC principles, as well as those of the Commission, require that all demand be taken as a given.[25] The Commission also mandates that Verizon NW furnish service on demand.[26]

LEC provides access to unbundled network elements shall be offered equally to all requesting telecommunications carriers.").

[21] 1998 Eighth Supp. Order at ¶ 183, n.23 ("A transparent model offers the opportunity to observe how calculations are being made, even if the analyst would not change the algorithms. By open, we mean the model would be readily and easily susceptible to modification of the program algorithms."); Thirteenth Supplemental Order at ¶ 17 ("The Commission has repeatedly stressed that it wants the parties' cost models to be transparent and readily capable of verification.").

[22] 1998 Eighth Supp. Order at ¶ 14 ("The evaluation of any model involves two important steps. First, do the algorithms (formulas) adequately capture the salient cost characteristics of the network?…[W]e consider, among other factors, the degree to which each model's cost algorithms accurately estimate the economic impact of the primary cost drivers.").

[23] 1998 Eighth Supp. Order at ¶ 27 ("In judging the soundness of the cost inputs, we believe that US West has proposed a useful standard: the inputs 'must be *realistic, accurate estimates* of all of the *actual* costs a provider would incur if it built out a network using the least cost, forward-looking technology.'") (emphasis added).

[24] 1998 Eighth Supp. Order at ¶ 12 ("Economic efficiency dictates that the cost floor be established in a manner which maximizes society's welfare…that the rates be just and reasonable. Setting economically efficient prices will provide the right competitive signal to competitive local exchange carriers (CLECs). Most importantly, it will help them in making their decision either to construct their own network or to lease facilities from the incumbent local exchange carrier (ILEC).")

[25] 47 C.F.R. § 541.505(a)-(b); 1998 Eighth Supp. Order at ¶ 38 ("We agree . . . that the cost estimates should be based upon the cost of satisfying the total demand for elements rather than some lesser level of incremental demand.").

[26] Revised Code of Washington ("RCW") 80.36.090 (Service to be furnished on demand) ("Every telecommunications company shall, upon reasonable notice, furnish to all persons and corporations who

HM 5.3 fails to account for the total demand on Verizon NW's network, and does not model a network that would ensure that service could be provided upon request. Specifically, the Model ignores the cost-efficient engineering guidelines for designing the distribution network based on ultimate demand and data regarding the actual orders for facilities by Verizon NW's Washington customers, relying instead on inappropriate expedients that underestimate the demand to be handled by the modeled network.[27] Unable to accurately calculate network demand, HM 5.3 cannot ensure that all housing units will have access to service when it is requested. This failure to account accurately for total network demand is a modeling defect that permeates HM 5.3 and produces significantly understated UNE cost estimates and distortions between the cost of elements in urban versus rural areas.

Q. PLEASE EXPLAIN WHY HM 5.3 FAILS TO MEET THE FCC'S AND COMMISSION'S FORWARD-LOOKING NETWORK DESIGN CRITERIA.

A. The Commission's and the FCC's cost modeling criteria require that the technology assumed by a model be known and proven, be clearly identified and in use, at least partially, today, and include *all* cost components required to provision the telecommunications services at issue.[28] HM 5.3 fails to adhere to these forward-looking design criteria. For example, HM 5.3 assumes that loop

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may apply therefor [sic] and be reasonably entitled thereto suitable and proper facilities and connections for telephonic communication and furnish telephone service as demanded.").

[27] HM 5.3 does not always employ these expedients consistently when designing each network component (e.g., loop, IOF, and switch). At times demand data is ignored, at other times, demand data is lost or assumed to exist at locations where it should not exist, and at still other times, demand data is used to calculate network costs that are assumed not to be at issue in this proceeding.

facilities provisioned on fiber fed Digital Loop Carrier ("DLC") will use 100 percent GR-303 Integrated Digital Loop Carrier ("IDLC"). However, the FCC has rejected this approach, stating "we are not persuaded, based on the record before us, that a correct application of TELRIC would require 100 percent use of such technology for that purpose."[29]

Q. PLEASE EXPLAIN WHY HM 5.3'S NETWORK DESIGN FAILS TO RECOGNIZE THE OPERATING REALITIES IN VERIZON NW'S SERVING AREA IN WASHINGTON.

A. As Mr. Dippon explains in his Reply Testimony, HM 5.3 does not account for existing or planned cable routes, and ignores the significant additional right-of-way, easement and other costs that would necessarily be incurred when building a forward-looking network along different routes.[30] HM 5.3 ignores natural and manmade barriers, and disregards widely-accepted engineering standards when determining plant mix. HM 5.3 essentially assumes a pre-defined mix of structure types (i.e., aerial, buried or underground) without any consideration of the number and size of cables on a route or the number of other users that will share the same structure. For example, the Model fails to assume buried or underground construction when modeling cables larger than 2,700-3,000 pairs, and thus ignores completely the fact that such cables would *never* be placed on

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[28] 47 C.F.R. § 51.505; 1998 Eighth Supp. Order at ¶ 38 ("The models . . . were designed to estimate the total element long-run incremental cost (TELRIC). We agree that this is the correct costing standard.").
[29] In the Matter of Joint Application by BellSouth Corporation, BellSouth Telecommunications, Inc., and BellSouth Long Distance, Inc. for Provision of In-Region, InterLATA Services In Georgia and Louisiana, CC Docket No. 02-35, *Memorandum Opinion and Order*, FCC 02-147 (rel. May 15, 2002) at ¶ 50.

poles.[31] Other instances in which HM 5.3's hypothetical network design fails to recognize the operating realities in Verizon NW's Washington serving area include placing more aerial cables than a pole line could realistically support, accounting for multiple sheaths in a buried trench, and upsizing trenches and conduit counts for sharing with other users.

HM 5.3's network design stands in stark contrast to Verizon NW's VzLoop cost study, which appropriately recognizes natural and manmade barriers and reflects the reality that existing rights-of-way and easements typically run along the streets where customers are located, and thus will often dictate route lengths and structure types (i.e., aerial, buried, or underground) to be used when modeling the forward-looking network.[32]

Q. PLEASE EXPLAIN WHY HM 5.3 VIOLATES THE FCC'S NON-DISCRIMINATION PRINCIPLE.

A. The FCC's non-discrimination principle requires that Verizon NW provide UNEs that reflect the same service levels in terms of timeliness, quality of service, and

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[30] Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Reply Testimony of Christian M. Dippon on behalf of Verizon Northwest Inc.* (April 27, 2004), *passim* ("Dippon Reply Testimony").

[31] Mr. Donovan cites data request responses from the Verizon-California UNE proceeding, which provided contracts from vendors with prices for various cable sizes. The largest aerial cable size provided by a vendor is a BKTA 2700-pair cable. For larger-sized cables, Mr. Donovan used the prices provided by vendors for underground cables. *See* Before the Utilities Commission of the State of California, Docket I.93-04-003/R. 93-04-002, *Declaration of John C. Donovan In Support of Opening Comments of Joint Commentors* (Nov. 3, 2003) at Exhibit JCD-7.1.

[32] *See* Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Reply Testimony of Willett G. Richter on behalf of Verizon Northwest Inc.- Outside Plant Design* (April 20, 2004) at Section II, pp.2-12 ("Richter Reply Testimony").

service reliability that Verizon NW provides to itself.[33] The engineering standards and network design principles employed by HM 5.3 completely ignore this fundamental costing requirement. For example, HM 5.3 fails to account for the total demand to be served by a given area -- a modeling flaw that would lead to service disruption and extended delays in the real world because, in order to meet daily service order requirements, Verizon NW frequently would need to build new, or rearrange existing, facilities, and undertake expensive loop qualification tasks. This is not how Verizon NW, or any other local exchange carrier, actually operates -- facilities are typically built to serve the ultimate demand in an area. In such a case, when a customer requests service, the facilities need only be assigned; there are no disruptions or delays because the facilities are already installed. By modeling an inferior quality network, the Model systematically understates the costs of the UNEs Verizon NW must provision.

Q. PLEASE EXPLAIN WHY HM 5.3 FAILS TO MEET THE COMMISSION'S CRITERIA FOR "OPENNESS" OF COST MODELS.

A. When it established the UNE cost modeling criteria, the Commission stated that the cost models must be transparent and open:

> A transparent model offers the opportunity to observe how calculations are being made, even if the analyst would not change

[33] 47 C.F.R. § 51.311(a) ("The quality of an unbundled network element, as well as the quality of the access to the unbundled network element, that an incumbent LEC provides to a requesting telecommunications carrier shall be the same for all telecommunications carriers requesting access to that network element."); 47 C.F.R § 51.313(a) ("The terms and conditions pursuant to which an incumbent LEC provides access to unbundled network elements shall be offered equally to all requesting telecommunications carriers.").

> the algorithms. By open, we mean the model would be readily and easily susceptible to modification of the program algorithms.[34]

As I discuss in the next section, many key cost drivers are buried in HM 5.3's preprocessing platform and algorithms -- they certainly are not "easily susceptible to modification," and explanations of how to modify key assumptions are not provided. I have also identified at least one key cost driver (i.e., the modeling criteria for designing an indoor SAI) that Verizon NW has been denied the ability to modify because of AT&T/MCI's refusal to produce the clustering algorithm's source code.[35]

E. SUMMARY OF MODEL FLAWS

Q. BRIEFLY SUMMARIZE THE MODEL FLAWS IDENTIFIED IN YOUR REPLY TESTIMONY.

A. HM 5.3, and the associated documentation provided by AT&T/MCI, present a distorted picture of the forward-looking costs of providing UNEs. Among the modeling flaws I have identified are:

- Key cost drivers in the Model cannot be changed or require significant and burdensome changes in the Model platform;
- Appropriate engineering standards in sizing and designing elements are frequently ignored;

[34] 1998 Eighth Supp. Order at ¶ 183, n.23. Importantly, the Commission also stated that it would "require a transparent, rational, stable, consistent, and understandable approach that will continue to be viable and applicable in determining costs for the services in the foreseeable future…to allow parties to proceedings involving cost issues to have the ability to understand assumptions used, to review and analyze the effect of inputs and outputs, and to modify and model different inputs and assumptions." 1998 Eighth Supp. Order at ¶ 24, n.11.
[35] Dippon Reply Testimony at Section II.

- Loop design errors contained in the Model result in feeder plant being characterized as distribution plant;
- Sharing assumptions are unrealistic;
- Demand is misused throughout the Model;
- Unsubstantiated expert opinion is used as a substitute for verifiable data and estimates; and
- Switching costs are unrealistic.

These, and a myriad of other flaws, are discussed more fully herein, as well as in the Reply Testimony of Dr. Tardiff and Messrs. Dippon, Richter, and West.

Q. WHAT DO YOU MEAN KEY COST DRIVERS IN THE MODEL CANNOT BE CHANGED?

A. Many of HM 5.3's key cost drivers and inappropriate engineering assumptions are buried in the Model's platform and algorithms, thereby making it impossible to correct many of the design flaws and/or run sensitivities to quantify the impacts of HM 5.3's errors. In particular, numerous loop design errors plague the distribution and feeder portions of the network because of the oversized clusters and the cluster parameters that are predefined by the TNS Telecoms ("TNS") preprocessed data. For example, the locations and quantities of the all-feeder network described above is predetermined by TNS's preprocessing of the cluster database, thereby preventing the user from correcting any errors associated with that aspect of the modeled network and quantifying any problems identified.[36]

[36] Before the California Public Utilities Commission, Docket Nos. I. 93-04-002/R.93-04-003, *Verizon California Workshop* (Jan. 15, 2004) ("Verizon California Workshop") at p. 3641 (Dr. Mercer stating, "That again would require a step to be taken by TNS.").

Similarly, demand errors associated with the high-capacity all-fiber loops are also predetermined by TNS's preprocessing, and thus are incapable of being corrected within the Model of record.

I have also found numerous instances in which HM 5.3 is not working as described or fails to design a network consistent with appropriate engineering design principles. Many of these errors cannot be quantified or readily corrected absent major reprogramming of the Model and/or the preprocessing. For example:

- Feeder facility costs are developed using distribution investment assumptions and inputs;
- There are not enough indoor SAIs in buildings housing medium to large businesses or concentrations of residential customers;
- Unnecessary fiber facilities are modeled in both distribution and feeder routes; and
- Far more fiber strands are modeled than are required to reach the premises served by the all-fiber network.

As discussed in more detail below, a number of the aforementioned errors appear designed to force as much investment as possible into the all-fiber loops, thereby overstating the investment in HM 5.3's all-fiber loops and artificially increasing the OSP structure costs that AT&T/MCI throw away as "irrelevant" to the instant proceeding.

Q. PLEASE SUMMARIZE YOUR FINDINGS REGARDING THOSE AREAS WHERE THE APPROPRIATE ENGINEERING STANDARDS IN SIZING AND

DESIGNING ELEMENTS HAVE BEEN IGNORED.

A. It is telling that in a recent California UNE Workshop both Mr. Donovan and Dr. Mercer conceded that an engineer would not design a network in the manner modeled by HM 5.3.[37] Yet in this proceeding, Mr. Donovan claims, albeit incorrectly, that "HM 5.3 applies standard engineering guidelines, current equipment capabilities and prices to reasonably estimate loop costs."[38] He also asserts, again in error, that "HM 5.3 models the network similar to the way an incumbent local exchange carrier ('ILEC') outside plant engineer, such as those at Qwest or Verizon, would do."[39] In fact, the Model ignores standard engineering practices from the beginning of the network design process, disregarding for example streets and street corners, which would require a splice point and possibly a manhole.[40] In addition, the Model:

- Completely skips the Distribution Area ("DA") planning and design steps;
- Violates the Serving Area Concept ("SAC") SAI sizing rules;
- Ignores DA sizing guidelines;
- Designs non-standard Carrier Serving Area ("CSA") configurations;
- Violates transmission design rules for loops;

[37] *See* Verizon California Workshop at pp. 3623-24.
[38] Before the Washington Utilities and Transportation Commission, Docket UT-023003, *Direct Testimony of John C. Donovan on behalf of AT&T Communications of the Pacific Northwest, Inc. and WorldCom, Inc. and XO Washington, Inc.* (June 26, 2003) at p. 4 ("Donovan Direct Testimony").
[39] Donovan Direct Testimony at p. 5.
[40] Therefore, Mr. Donovan's claim that "HM 5.3 models the network similar to the way an incumbent local exchange carrier ('ILEC') outside plant engineer … would do" is at odds with Dr. Mercer's acknowledgment that the network modeled by HM 5.3 is "certainly not what the engineer is doing who's got to put in a real street, real corner." *See* Donovan Direct Testimony at p. 5; Verizon California Workshop at pp. 3623-24.

- Fails to provide the network components needed to unbundle DLC loops; and

- Designs excessively long copper loops that would require load coils.[41]

A more detailed explanation of HM 5.3's failure to account for appropriate engineering standards in sizing and designing elements is included in Section II.

Q. PLEASE SUMMARIZE YOUR FINDINGS REGARDING THE LOOP DESIGN ERRORS THAT RESULT IN FEEDER PLANT BEING CHARACTERIZED AS DISTRIBUTION PLANT.

A. There are several loop design errors that result in HM 5.3 significantly understating the investment in feeder plant. These include:

- Feeder plant is characterized as distribution plant;

- The number of indoor SAIs is understated;

- Clusters are oversized;

- Structure is incorrectly allocated to high-capacity services;

- SAIs are sized incorrectly;

- Feeder sharing with both distribution plant and IOF, as well as sharing with other utilities, is inaccurately estimated; and

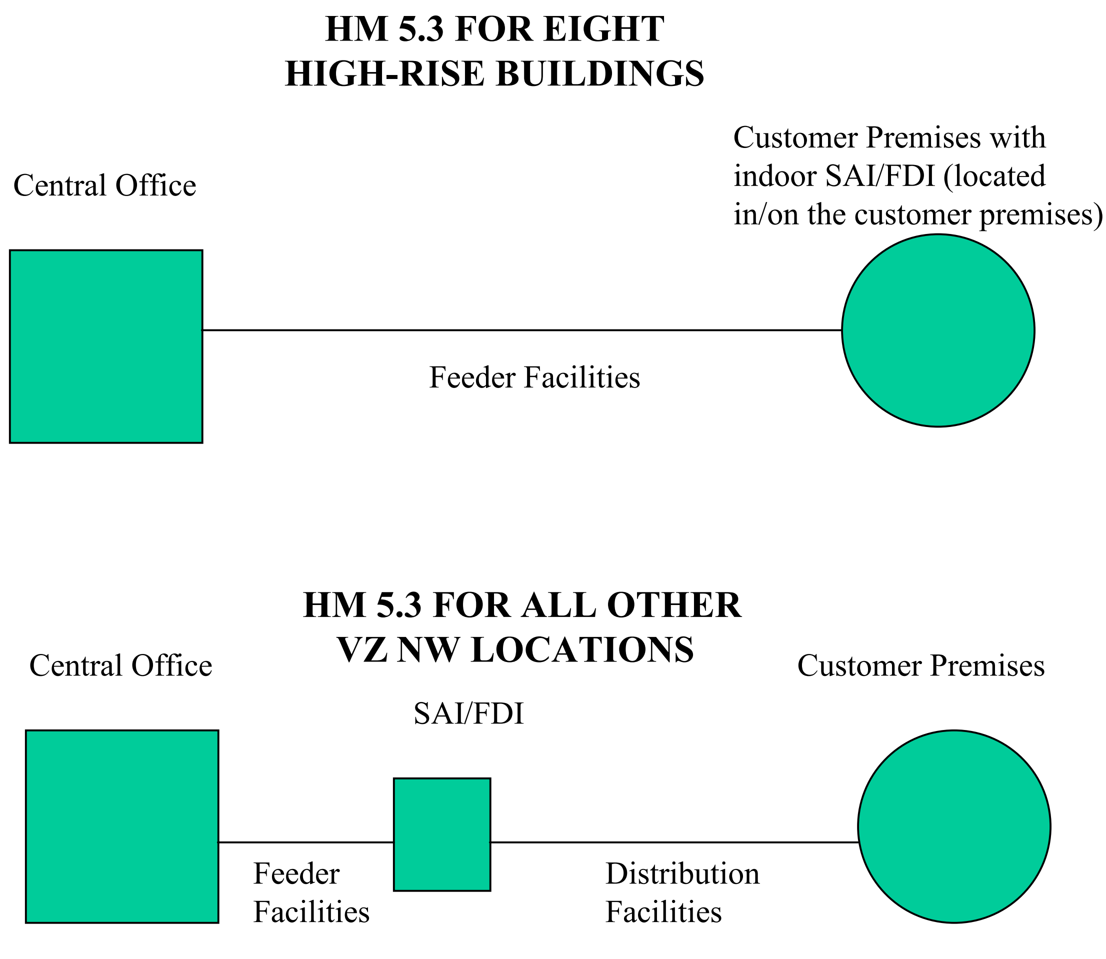
- DS-1 costs are erroneously assigned to POTS.

These loop design errors cause the Model to reduce substantially the lengths and costs of the feeder plant. This can be illustrated by HM 5.3's treatment of

[41] In the Matter of the Federal-State Joint Board on Universal Service, CC Docket No. 96-45, *Report and Order*, FCC 97-157 (rel. May 8, 1997) at ¶ 250 ("The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. For example, loading coils should not be used because they impede the provision of advanced services.").

indoor SAIs. The top of Diagram 2 below shows the real-world routing of outside plant facilities to medium and large businesses (or buildings with concentrations of residential customers) with indoor SAIs. The bottom of Diagram 2 below shows HM 5.3's erroneous assumption that indoor SAIs will rarely be placed.

Diagram 2



HM 5.3 avoids virtually all indoor SAI situations, placing only *eight* of them in Verizon NW's entire Washington serving area. This occurs because, to trigger an indoor SAI, HM 5.3 requires that a cluster consist of less than 0.0004 square miles. TNS creates such clusters for any single location with over 536 lines.[42] In addition, only four of the eight indoor-SAI locations modeled by HM 5.3 are served by fiber to the premises with an indoor DLC, an essential and important aspect of a forward-looking network design. Since HM 5.3 fails to model virtually all locations that should have been modeled with indoor SAIs, it avoids modeling the most expensive, but essential, underground structure. Instead of modeling the appropriate feeder structure in these instances, it models distribution structure, which is generally characterized by buried and aerial plant. As the foregoing demonstrates, the network designed by HM 5.3 is anything but forward-looking.[43]

Importantly, when designing HM 5.3's feeder-only network (and hence the instances in which indoor SAIs should be placed), HM 5.3 treats all high-capacity

[42] Before the Washington Utilities and Transportation Commission, Docket UT-023003, *Supplemental Direct Testimony of Dr. Robert A. Mercer on behalf of AT&T Communications of the Pacific Northwest, Inc.* (Jan. 23, 2003) at Exhibit RAM-4 (HAI Model Release 5.3 ("Model Description")) at p. 34 ("Mercer Supplemental Direct Testimony") ("Main clusters with total areas less than 0.0004 square miles (100 feet per side) are assumed to consist of high-rise buildings and accorded special treatment appropriate for such buildings. Clusters with such small areas are created by TNS during the PointCode process when there are more than 536 lines located at a single address.").

[43] *See* Before the California Public Utilities Commission, Application Nos. 01-02-024, etc., *Declaration of Robert A. Mercer in Support of Joint Applicants' Rebuttal Comments* (March 12, 2003) at pp. 100-02 ("SBC Mercer Rebuttal Decl.") ("TNS . . . cannot determine whether such common addresses are located in a high-rise building served by a single serving area interface or in, say, a strip mall or building complex that happens to share an address but where each customer receives individual service.") Dr. Mercer concludes that "the model *overestimates* the amount of distribution cable required, and thereby overestimates the cost of serving these customers." SBC Mercer Rebuttal Decl. at p. 102 (emphasis in original).

services the same as POTS loops.[44] That is, even though a DS-1 service contains 24 times more capacity than a POTS loop, and a DS-3 service contains 672 times more capacity than a POTS loop, both are treated just like POTS (i.e., as one line) when line densities and high-rise situations are determined. The same is true for OC-N services, which contain multiple DS-3 capacities.[45] As a result, HM 5.3 significantly understates the number of buildings with feeder-only design, and thus underestimates the number of instances in which an indoor SAI should be placed. I recently performed a similar analysis of HM 5.3 in California and found that the Model produced a similarly small number of indoor SAIs.[46]

By comparison, the FCC's Synthesis Model assumes that an indoor SAI is placed when a single location has 25 voice-grade equivalent lines.[47] And Verizon NW's VzLoop identifies all of the approximately 8,000 existing indoor SAIs in Verizon NW's network, and properly includes each one in the modeled network.[48]

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[44] Before the California Public Utilities Commission, Docket I. 93-004-03/R. 93-004-02, *Response of AT&T Communications of California, Inc. and WorldCom, Inc. ("MCI") to Verizon California's Second Set of Data Requests* (Dec. 10, 2003) at Response No. 2-1.

[45] The N in OC-N is equal to the number of multiplexed DS-3s that can be carried on the fiber medium. For example, an OC-3 multiplexer carriers the equivalent of three DS-3s, and an OC-12 multiplexer carries the equivalent of twelve DS-3s.

[46] *See* Before the California Public Utilities Commission, Docket 1.01-02-024 et al., *Reply Declaration of Francis J. Murphy on behalf of SBC California* (Feb. 7, 2003) at p. 30 ("Joint Applicants completely miss this dynamic when attempting to identify high-rise buildings (and the employees therein), core (downtown) areas, or even just 'density' zones. HM 5.3 would treat the large business in the aforementioned examples exactly the same as it would treat an 800 square foot barbershop with one POTS line.").

[47] Tenth Report and Order at ¶ 268.

[48] Verizon NW's cost study also uses a 160 lines per single location "trigger" that will place not only an indoor SAI, but also an indoor RT. As a result, VzLoop models DLC fiber directly to the building. Both of theses features of VzLoop reflect real-world, forward-looking, network design principles.

Q. HOW DOES HM 5.3'S MISCHARACTERIZATION OF FEEDER PLANT AS DISTRIBUTION PLANT AFFECT COSTS?

A. By shifting the OSP facilities and costs from feeder into distribution (via oversized clusters and erroneous modeling assumptions), HM 5.3 significantly reduces the costs of the loop in general, and the feeder portion in particular. This is so because many of HM 5.3's input values and assumptions for distribution plant are considerably less costly than feeder plant. For example, there is relatively more underground plant in the feeder network. In addition, HM 5.3 erroneously assumes that there are no manholes associated with underground distribution plant, but does assume (again incorrectly) that underground feeder plant requires the placement of manholes.[49] The loop design errors that result in feeder plant being characterized as distribution plant are discussed in greater detail in Section III.

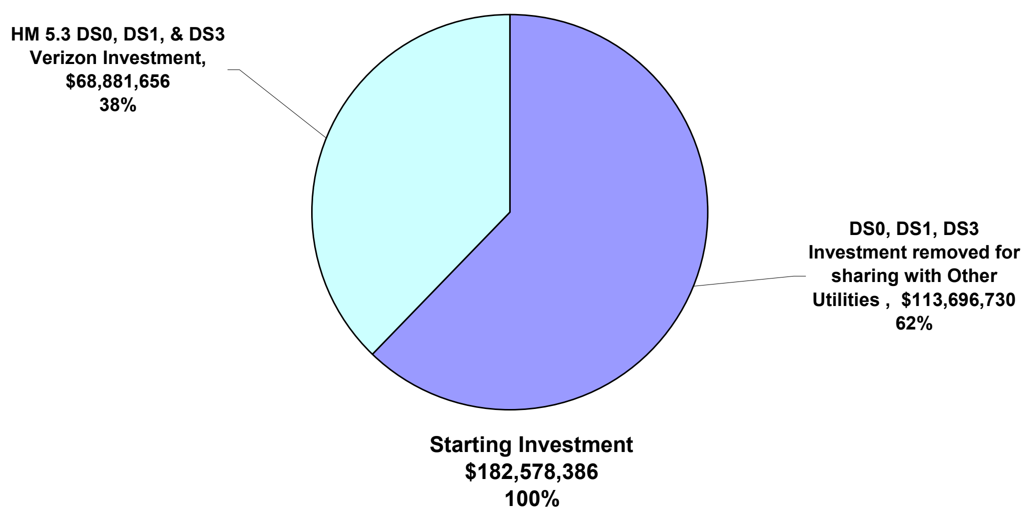
Q. PLEASE SUMMARIZE YOUR FINDINGS REGARDING THE USE OF UNREALISTIC SHARING ASSUMPTIONS.

A. Various versions of the HAI Model have accounted, albeit erroneously, for several types of OSP structure sharing including: (1) sharing between an ILEC and other utilities, (2) sharing between an ILEC's distribution and feeder facilities, and (3) sharing between an ILEC's feeder and interoffice facilities. In HM 5.3, AT&T/MCI use this reasonable concept to obtain unreasonable results. As Chart 1 below demonstrates, the starting distribution structure investment in HM 5.3 is

$182,578,386. Large portions of this investment are assumed to be shared with other carriers, and are thus removed entirely from the costs to be considered in this proceeding. Specifically, $113,696,730 (62 percent of the original distribution structure investment) is removed because of sharing with other utilities. This leaves only $68,881,656 of distribution structure investment (*only 38 percent of the total*) that is assigned to Verizon NW distribution facilities.

CHART 1[50]

Verizon NW
HM 5.3 Distribution Structure Investment

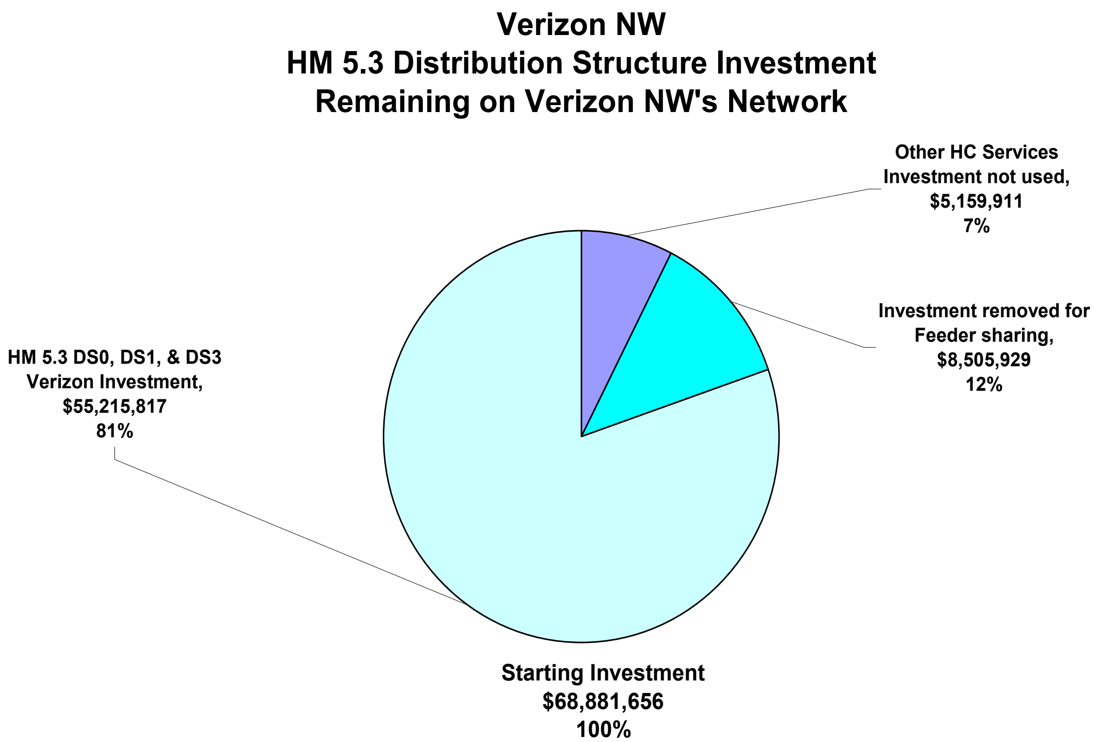


[49] HM 5.3's failure to place manholes in underground distribution is also a serious engineering design error.

Chart 2 below shows how the remaining distribution structure investment of $68,881,656 is further reduced based on the unsubstantiated opinions of the HM 5.3 model developers regarding the assignment of structure investments and the so-called sharing of this structure between segments of outside plant. An additional $8,505,929 (12 percent of the remaining distribution structure investment) is removed due to sharing with feeder facilities, and $5,159,911 (over 7 percent of the remaining total) is removed to account for high-capacity investment that is "not at issue in this proceeding."[51] This leaves a mere $55.2 million in distribution structure investment -- 30 percent of the original amount. While the Model sponsors refer to the removed investments as "shared," the investment dollars computed in HM 5.3, and identified in these charts, are not shifted from one part of the network to the other -- they are removed entirely, and thus are never captured in any of the calculations used to develop AT&T/MCI's proposed UNE prices.

[50] HM 5.3 determines the DS-0, DS-1 and DS-3 structure investment separately. These investments are summed together in Charts 1 through 4 of my Reply Testimony.
[51] Mercer Supplemental Direct Testimony at RAM-4 (Model Description), p. 31.

CHART 2



The results are similar with respect to feeder structure investment. A detailed explanation of, and pie charts illustrating, the problems associated with feeder structure sharing are included in Section IV.

Q. PLEASE SUMMARIZE YOUR FINDINGS REGARDING HM 5.3's MISUSE OF DEMAND.

A. Among the problems associated with HM 5.3's misuse of demand are: [52]

- Inflated amounts of high-capacity fibers in the loop to achieve lower unit costs;
- Guessing at IOF demand;
- Ignoring wireless and CLEC switched trunks for developing both tandem switching and IOF investments, but then dividing the understated investment by demand associated with CLEC and wireless traffic;
- Counting the high-capacity demand in the loop, while simultaneously ignoring the high-capacity demand in the IOF; and
- Claiming to include in-state private lines, but failing to include the required network design or equipment.

In almost every instance, HM 5.3's use of incorrect demand inputs produces artificially low UNE cost estimates. A detailed explanation of the problems associated with HM 5.3's misuse of demand is included in Section V below.

Q. PLEASE SUMMARIZE YOUR FINDINGS REGARDING HM 5.3's RELIANCE ON EXPERT OPINION.

A. The vast majority of the default inputs that have a significant impact on costs are supported by nothing more than the unverifiable subjective opinions and judgments of AT&T/MCI's consultants and members of the HAI Model's development team. While many of these opinions and judgments have been criticized repeatedly by Verizon, and rejected by both the FCC and many state

[52] Mr. Dippon discusses an additional and very significant misuse of demand relative to the inappropriate modeling (understating) of Verizon NW's customer locations. Dippon Reply Testimony at Section III B.

regulatory commissions (including the Commission),[53] AT&T/MCI steadfastly refuse to modify them or address the criticisms raised, even when the empirical data necessary to produce accurate results are readily available.

In the few instances in which AT&T/MCI's consultants have changed their opinions and judgments (either between different versions of the HAI Model, or between filings of the same model, i.e., HM 5.3, in different states), they fail to offer any verifiable support for their modifications. In many cases, these changes are used to offset cost increases caused by changes made elsewhere in the Model, and are neither supported nor necessitated by any proven technological change. Thus, Dr. Mercer fails to tell the entire story when he claims that "[e]ach release [of the HAI Model] has been subject to the 'refiner's fire,' and this has led to many changes in the Model's assumptions, algorithms, inputs, and operational aspects over the years."[54] In many instances, AT&T/MCI have simply refused to remedy known flaws identified by regulators and interested parties, or address the criticisms levied.[55] Specific examples of the conflicting use of inputs and assumptions provided by AT&T/MCI's consultants are included in Section VI.

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[53] *See e.g.*, 1998 Eighth Supp. Order, Tenth Report and Order at ¶¶ 102 and 247. *See also,* Before the Massachusetts Department of Telecommunications and Energy, D.T.E. 01-20, *Final Order* (July 11, 2002) at p. 59.
[54] Mercer Supplemental Direct Testimony at p. 32.
[55] Staff witness, Mr. Thomas L. Spinks also identifies issues with the HAI Model inputs in past proceedings, many of which have not been changed in this proceeding (e.g., methods used by Hatfield team to collect data erroneous user-adjustable input choices, and structure sharing assumptions)). Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Supplemental Direct Testimony of Thomas L. Spinks* (Jan. 26, 2004) at pp. 8-9 ("Spinks Supplemental Direct Testimony").

F. HM 5.3 PRODUCES UNREALISTIC AND UNRELIABLE RESULTS

Q. DO THE MODEL FLAWS YOU PREVIOUSLY IDENTIFIED CAUSE HM 5.3 TO PRODUCE UNREALISTIC AND UNRELIABLE RESULTS?

A. Yes. HM 5.3 is incapable of accurately estimating the forward-looking costs of an efficient telecommunications provider operating in the real world. Therefore HM 5.3 should not be used, or relied upon, by the Commission to calculate Verizon NW's forward-looking cost estimates of providing UNEs. Its numerous input flaws and modeling anomalies cause HM 5.3 to produce the following unrealistic and unreliable results:

- The Model builds outside plant to only eight indoor SAIs. By way of contrast, Verizon NW's cost model builds approximately 8,000 indoor SAIs in Verizon NW's network.

- Over 2,200 of the fiber loops modeled for the provision of high-capacity services (including the DS-1s that AT&T/MCI have inappropriately excluded because they are high-capacity services) lack the equipment necessary to connect those loops to the wire center**.**

- The Model designs 4,300 distribution fiber strands for high-capacity optical services, yet calculates a need for nearly 12,000 strands of fiber in the feeder network to carry the same services.

- The Model assumes away over $276 million of OSP structure based upon the unsupported opinions of AT&T/MCI's consultants regarding structure sharing opportunities.

- The Model incorrectly calculates over 6,800,000 route feet of feeder as though it was distribution and, as a result, understates structure investment, feeder costs, and loop costs.

- The Model designs only about 48,000 switched trunks for interexchange carriers ("IXCs"), and ignores completely wireless and CLEC demand for such trunks. As a result, HM 5.3 models about *****Begin Verizon NW Proprietary*** XXXXXXXXXX ***End Verizon**

NW Proprietary*** fewer switched trunks than the amount actually ordered by Verizon NW's interconnecting carriers (i.e., IXCs, CLECs and wireless carriers).

II. HM 5.3 DOES NOT ADHERE TO APPROPRIATE INDUSTRY ENGINEERING GUIDELINES WHEN DESIGNING THE OUTSIDE PLANT NETWORK

A. HM 5.3 IGNORES REAL-WORLD OPERATING CONSTRAINTS WHEN DESIGNING ITS HYPOTHETICAL NETWORK

Q. DOES HM 5.3 ADHERE TO APPROPRIATE ENGINEERING LOOP DESIGN STANDARDS IN MODELING THE DISTRIBUTION AND FEEDER LOOP NETWORK?

A. No. HM 5.3 is unable to estimate accurately the cost of a network designed according to established industry standards because it skips key steps in the loop network planning and design process, and relies on flawed assumptions and inaccurate input values to develop the costs for the network elements it "designs." As discussed more fully below, HM 5.3 relies on inaccurate approximations that fail to reflect the real-world operating constraints faced by Verizon NW and other telecommunications providers in Washington.[56]

Q. PLEASE DESCRIBE THE INDUSTRY ENGINEERING GUIDELINES THAT GOVERN THE DESIGN OF AN ILEC'S DISTRIBUTION AND FEEDER NETWORKS.

A. Ironically, the vast majority of the engineering guidelines used to design an ILEC's distribution and feeder networks were developed by AT&T. These guidelines state that OSP loop planning and design is a multi-task, multi-step process during which the OSP planner must obtain detailed information from a number of sources to identify the characteristics of the area to be served by each wire center.[57] The OSP planner begins by gathering wire center data, forming study assumptions, developing administrative route layouts, and requesting OSP growth forecasts. Armed with these data, the OSP planner sectionalizes the wire center into core areas and DAs. Ultimately, these areas are grouped into Carrier Serving Areas ("CSAs"). These combinations are then used to develop copper and fiber feeder route plans.

The beginning of this process, gathering wire center data, is critical since it provides some of the essential information upon which OSP network design is based, including:

(1) The proposed land usage plans and zoning maps for each area in the wire center;

(2) Tax maps to identify boundaries of each piece of property;

(3) Natural or man-made features such as bodies of water, power lines, large buildings;

(4) Master plans of utilities to identify where future population growth is expected;

(5) Transportation plans to identify where road improvement projects are expected and where new roads and highways will be located; and

(6) Economic development plans, if they exist, of local or state agencies.

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[56] *See* Richter Reply Testimony at Section II (pp. 2-12) for a further discussion on how the engineering practices used in HM 5.3 differ from the manner in which an engineer would design a forward-looking network in Washington.

[57] AT&T Practice Standard, Section 901-350-201, Outside Plant Engineering, Long Range Outside Planning, Issue 3 (Sept. 1983) at p. 1.

Q. HOW ARE THESE WIRE CENTER DATA USED?

A. The wire center data are then used to determine where the DAs will be located. In order to ensure that the distribution network can be economically and efficiently constructed and operated, the DAs must avoid natural obstacles (e.g., rivers, lakes, mountains, etc.) and must account for man-made boundaries (e.g., rights-of-way, roads and highways, parks, buildings, etc.).[58]

DAs also must be sized to meet ultimate demand (i.e., existing demand plus expected growth) in order to avoid the delay, expense, and public inconvenience associated with having to provide additional distribution plant to meet an increase in demand in the future. The public inconvenience is especially problematic in neighborhoods that are served by buried facilities located under existing lawns, sidewalks, driveways, roadways, etc.

In addition, the design of DAs should be optimized based on the number of living units in the area -- only then can the OSP engineer ensure that sufficient facilities are built to serve each customer location. As the AT&T engineering guidelines state:

> The number of living units in a DA generally ranges between 200 and 600. In dense areas (for instance, 12 units/acre) the DA should contain close to the upper limit (600) of living units to improve feeder efficiency and to economically minimize the number of interfaces. In relatively sparse areas (such as, somewhat less than one unit/acre) the DA should contain a number of units closer to the lower limit (200) to avoid wasting money building excessive lengths of

[58] AT&T Practice Standard, Section 901-350-201, Outside Plant Engineering, Long Range Outside Planning, Issue 3 (Sept. 1983) at p. 19. *See also,* AT&T Outside Plant Engineering Handbook, Exchange Network Design (Aug. 1994) at p. 3-9.

> distribution cables. Your job is to balance distribution cable costs and feeder interface efficiency to form optimally sized DAs.[59]

Q. DOES HM 5.3 ACCOUNT FOR ANY OF THESE FACTORS WHEN MODELING ITS OSP NETWORK?

A. No. HM 5.3 ignores these industry guidelines when designing its OSP network. First, the Model does not begin the network design process by modeling DAs, and thus cannot identify homogeneous, easily-administered, and reasonably-sized areas within which to group customers. As detailed in Mr. Dippon's Reply Testimony, HM 5.3 relies instead upon a faulty clustering process that fails to account for the geographic and man-made constraints (other than wire centers) with which real-world carriers must contend. HM 5.3's failure to account for the ultimate demand to be served in a given area would make it impossible for Verizon NW not only to fill requests for new orders in a timely and cost-effective manner, but also to manage the growth and churn that every real-world network is designed to accommodate. In prior proceedings, AT&T/MCI's OSP expert, Mr. Donovan, claimed, consistent with industry guidelines,[60] that DAs should contain between 200 and 600 households.[61] Mr. Donovan has abandoned these guidelines and recommends that HM 5.3 model much larger DAs, with a maximum of 6,451 lines. In addition, HM 5.3 assumes incorrectly that all of these lines can be served by a single SAI or collocated SAIs placed in a single location.

[59] AT&T Practice Standard, Section 901-350-201, Outside Plant Engineering, Long Range Outside Plant Planning, Issue 3 (Sept. 1983) at p. 20. *See also,* AT&T Outside Plant Engineering Handbook, Exchange Network Design (Aug. 1994) at p. 3-10.
[60] AT&T Outside Plant Engineering Handbook, Exchange Network Design (Aug. 1994) at p. 3-10.

As such, HM 5.3 is fundamentally incapable of recognizing the efficiency tradeoffs between feeder and distribution investments,[62] which necessarily result from the 200 to 600 household sizing criteria. By design, the network modeled by HM 5.3 fails to "adequately capture the salient cost characteristics of the network,"[63] thereby understating Verizon NW's costs.

In addition, Mr. Dippon has identified the fact that HM 5.3 is quite insensitive to changes in the DA (cluster) size[64] -- a result that is directly contrary to AT&T's practice guidelines which define the engineer's job as being " . . . to balance distribution cable costs and feeder interface efficiency to form optimally sized DAs."[65]

B. HM 5.3'S EXCESSIVE USE OF "SINGLE DA" RTs LOCATED IN CEVs IS UNREALISTIC

Q. HOW DOES HM 5.3 MODEL CEVs?

A. The developers of HM 5.3 took an inappropriate shortcut in attempting to force the Model to include DLC RTs housed in underground CEVs in their cost studies.[66] HM 5.3 always (and inappropriately) places the SAIs serving a single

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[61] Before the Washington Utilities and Transportation Commission, Docket Nos. UT-960369, -370, -371, *Workshop Transcript* (Feb. 17, 1997) at pp. 158-59.
[62] *See* AT&T Practice Standard, Section 901-350-201, Outside Plant Engineering, Long Range Outside Plant Planning, Issue 3 (Sept. 1983) at p. 20; AT&T Bell Labs Technical Journal (April 1978).
[63] 1998 Eighth Supp. Order at ¶ 14.
[64] *See* Dippon Reply Testimony at Section IV.
[65] *See* AT&T Practice Standard, Section 901-350-201, Outside Plant Engineering, Long Range Outside Plant Planning, Issue 3 (Sept. 1983) at p. 20.
[66] The California Public Utility Commission's request to include CEVs posed an apparent dilemma for the developers of HM 5.3 since their Model's platform was incapable of modeling a proper network construct for RTs with multiple subtending DAs. As a result, the HAI Model developers responded by drastically increasing the size of HM 5.3's clusters in violation of standard DA sizing guidelines. Before the

DA adjacent to the RTs, and assumes (again inappropriately) that there will be one DA per RT. This is done without regard to the type of RT structure that is placed (e.g., CEV, pad-mounted cabinet, pole-mounted cabinet, etc.). The Model designs 165 of these single DA CEVs for Verizon NW's serving area. As discussed below, such a number is incredibly overstated and entirely unrealistic.

Q. WHAT TYPE OF NETWORK DESIGN WOULD BE EMPLOYED BY AN OSP ENGINEER WHEN PLACING SAIs AND RTs ?

A. In the real world, SAIs and RTs are not required to be collocated, nor does there necessarily have to be a single RT serving a single SAI. To the contrary, under the CSA design concept, RTs are strategically sized and placed to serve multiple DAs, each of which requires a separate SAI. These SAIs, in turn, are connected to the RTs (the DLC electronic equipment) that serve them via a length of copper feeder cable ("feeder stubs"), which provide each fiber-DLC loop with a copper feeder pair termination on the SAI. This construct enables *any* feeder pair to be cross connected to *any* distribution pair that is terminated on the distribution side of that SAI.[67] Moreover, a CSA may contain up to five DAs, each with its own SAI, served by a single RT (collectively the "derived copper feeder network"). While the actual location of the SAI in each DA is typically in the quadrant closest to the RT, the distance between the RT and SAI in each DA can be significant, and will vary for each DA within the CSA served by the RT. In actual practice, this CSA design concept enables OSP engineers to take advantage of

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California Public Utilities Commission, Application Nos. 01-02-024 et al., *Deposition of John C. Donovan* (Nov. 21, 2002) at pp. 92-93 ("SBC Donovan Deposition").

opportunities to share RT sites, as well as equipment and investment among multiple distribution areas, while simultaneously adhering to the established, standard DA sizing guidelines.

HM 5.3 is incapable of modeling this construct, and consequently designs a network that violates widely-accepted engineering design standards. As AT&T/MCI admit, "HM 5.3 is not explicitly designed to serve multiple clusters by a single DLC RT."[68] Accordingly, HM 5.3 neither designs, nor accounts for the costs of, the derived copper feeder network that would exist in a realistic, forward-looking network.

Q. HOW DID AT&T/MCI INCLUDE THE CEVs IN HM 5.3'S NETWORK DESIGN?

A. Rather than accept the fact that the addition of CEVs (and feeder stubs with their associated structure) would increase the cost estimates produced by the Model, AT&T/MCI abandoned their original cost estimates and network design assumptions and resorted to modeling much larger clusters and much larger RTs. They did this by increasing the "target" maximum number of lines in a cluster from 1,800 voice-grade equivalents to an incredible 6,451 lines,[69] and ignoring completely the DA-sizing criteria. These economies of scale work to

[67] Donovan Direct Testimony at p. 9, n.4.
[68] Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Joint Responses of AT&T & MCI to Verizon's Second Set of Data Requests* (July 29, 2003) at Response No. 2-1(a).
[69] For purposes of this discussion, "lines" are not voice-grade equivalents. Rather, "lines" are loops without regard to their capacity. For example, for purposes of "density" calculations, a DS-3 is considered by the Model sponsors to be one line even though it contains the capacity of 672 voice-grade equivalents. Similarly DS-1s are treated as 1 line when they have the capacity of 24 voice-grade equivalents. For purposes of cluster sizing calculation, all "Hi Cap Optical" services are ignored. Thus, the change from

offset the added cost of the CEVs, but enable AT&T/MCI to manufacture economies of scale that were absent from previous versions of the HAI Model, and would never exist in a real-world network.

C. HM 5.3'S LOOP DESIGN IGNORES WIDELY-ACCEPTED SERVICE QUALITY STANDARDS

Q. WILL A LOOP NETWORK DESIGNED ACCORDING TO HM 5.3'S LOOP DESIGN CRITERIA PROVIDE ACCEPTABLE SERVICE QUALITY?

A. No. HM 5.3 violates the CSA Design Standard, which was developed to identify distinct geographic areas that can be served by a single DLC RT, and could encompass a single DA or multiple DAs.[70] As Mr. Donovan recognizes, all CSA loops must be non-loaded.[71] The Model violates the transmission design rules established by the CSA Design Standard by routinely designing copper distribution cable lengths that exceed 12,000 feet. The Model sponsors claim that the Revised Resistance Design standard, which *pre-dates* the CSA Design Standard, allows for non-loaded copper loop lengths of up to 18,000 feet. They also claim that the clustering process actually limits the cluster sizes based on a 17,000-foot right-angle route from the centroid so that theoretically no loop within the cluster would exceed 17,000 feet. However, in reality, the Model produces copper distribution lengths in excess of 18,000 feet in 215 clusters, with some as

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1,800 voice-grade equivalents to 6451 lines is a significantly more dramatic increase than it would have been had a consistent definition been maintained.

[70] Donovan Direct Testimony at p.10.

[71] "Non-loaded lines" are defined as cable pairs or transmission lines with no added inductive loading coils (i.e., straight raw copper pairs). Newton's Telecom Dictionary (16th ed. 2000).

long as 38,000 feet; and the average being over 22,000 feet.[72] Since the forward-looking construct mandated by the FCC does not permit the use of load coils (and HM 5.3 does not provide for them), these excessively long copper loops are incapable of providing reliable POTS services, much less advanced services.[73]

D. HM 5.3'S DIGITAL LOOP CARRIER DESIGN IS UNREALISTIC AND PRODUCES SUBSTANTIALLY UNDERSTATED UNE COST ESTIMATES

1. HM 5.3'S DLC LOOPS CANNOT BE UNBUNDLED

Q. DOES HM 5.3 MODEL DLC LOOPS THAT CAN BE UNBUNDLED?

A. No. HM 5.3 models all fiber-based voice-grade level loops using GR-303 integrated digital loop carrier ("IDLC," also referred to as next generation digital loop carrier or "NGDLC" by AT&T/MCI),[74] and makes the erroneous assumption that stand-alone UNE loops[75] provisioned on IDLC can be individually unbundled. Even AT&T/MCI's own witnesses recognize that loops carried over GR-303 IDLC systems are delivered to the switch (or to CLECs under HM 5.3's modeling assumptions) in a multi-channel digital format, packaged within DS-1 signals, thereby eliminating the need for (and cost of) central office POTS channel unit

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[72] *See* Dr. Tardiff's Reply Testimony for a further discussion of the "strand distance" adjustment and an explanation of why this failure occurs in the Model. Mr. Dippon's Reply Testimony discusses why HM 5.3's faulty clustering process causes the Model's strand distance to be too long.
[73] The FCC's outside plant design criteria specify that the modeled network shall "not impede the provision of advanced services." Fifth Report and Order at ¶ 54.
[74] Donovan Direct Testimony at p. 86.
[75] "Stand-alone UNE loops" are loops that are discretely handed off on a physical medium at both the customer and central office ends of the loop. Stand-alone UNE loops are not handed off embedded within a higher speed signal, and are not associated with UNE-P arrangements or retail services.

plug-ins and main distribution frame ("MDF") appearances.[76] Thus, individual, IDLC-provisioned loops do not have a physical appearance in the central office, and do not have a physical switch port appearance in the switch. As a result, stand-alone UNE loops provisioned on IDLC cannot be individually unbundled.[77]

As a threshold matter, it is not possible, and may never be operationally feasible, to unbundle two-wire switched loops using GR-303 IDLC in a multi-carrier (i.e., "multi-hosting") environment, as advocated by Mr. Donovan. While Mr. Donovan may claim that he has heard of a rumored test case in 2001,[78] supposedly conducted in Wisconsin by Qwest (an ILEC that has no operations in that state), this rumor has never been confirmed.[79] Indeed, Mr. Donovan himself admits that he is unaware of any real-world carrier that currently provides individual voice-grade unbundled loops in a multi-carrier environment using GR-303 IDLC.[80]

Q. WHAT PROBLEMS ARE ASSOCIATED WITH UNBUNDLING LOOPS USING GR-303 IDLC?

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[76] Donovan Direct Testimony at pp. 86-87.

[77] Furthermore, because the GR-303 IDLC architecture terminates directly in a local switch, it is normally only used to provision switched loops. Non-switched loops do not utilize this architecture for a variety of reasons, not the least of which is that non-switched loops are usually "full period" loops (i.e., they are always connected), and therefore, do not require the call set-up and take-down functionality of a local switch or the "dynamic" time slot assignment feature of GR-303, which only provides a channel when the connection is active. Since valuable switch resources are not required for non-switched services, ILECs typically do not provision any non-switched loops over GR-303 IDLC (or any other any other form of IDLC). Thus, there is always a need to deploy some amount of UDLC for both retail and wholesale products, including loop UNEs.

[78] Before the California Public Utilities Commission, Application Nos. 01-02-024 et al., *Workshop Transcripts* (Nov. 21, 2002) at pp. 219-221 ("Nov. 21 SBC Workshop Transcript").

[79] Before the California Public Utilities Commission, Application Nos. 01-02-024 et al., *Reply Declaration of Ian McNeill filed on behalf of SBC California Bell Telephone Company* (Feb. 7, 2003) at p. 29 (stating

A. One of the main drawbacks to handing loops off to a CLEC bundled within a virtual interface group ("VIG") using GR-303 IDLC is the fact that any carrier taking one or more of these loops would have full access to the operations functionality (provisioning, alarm reporting, test access, etc.) of the entire system. This would include not only access to the system's equipment, but more importantly, full access to the individual lines of the ILEC's (or other CLECs') customers that reside on the same system. The DLC vendors must resolve these security issues before the arrangement advocated by Mr. Donovan can even be considered. Not only have they not done so, there is no indication that a "fix" is even available.

Compounding the aforementioned problems is the fact that current technology limits the maximum number of GR-303 interface groups available for such access to four. Since at least one interface group must be assigned to the ILEC that owns the system, the maximum number of CLECs that could theoretically obtain wholesale access to customers served on these GR-303/IDLC systems is three. This is problematic since there may be as many as twelve different CLECs requesting UNE access in certain areas of Washington.[81]

The deployment of GR-303 IDLC in a multi-carrier environment is a long way from becoming a reality. Industry standards and technical interfaces need to be developed. IDLC suppliers need to create additional security, error-detection,

that he "contacted personnel at Qwest to inquire about this alleged test case and no one was aware of any such activity").

[80] Nov. 21 SBC Workshop Transcript at p. 220.

and other capabilities necessary to support the use of the same GR-303 IDLC RT and central office terminal ("COT") by multiple carriers. And, any standards and interfaces ultimately established will require an evaluation of existing OSS to ensure compatibility with the systems currently in use, and to provide support for the use of GR-303 in a multi-carrier environment. The documentation relied upon by Mr. Donovan recognizes that these problems have yet to be remedied.[82]

Q. WHAT IS THE CORRECT WAY TO PROVISION UNBUNDLED ACCESS TO STAND-ALONE DLC LOOPS?

A. The most efficient and economic way to provision unbundled access to DLC-served stand-alone loops is over universal digital loop carrier ("UDLC"). UDLC systems, unlike IDLC systems, provide per-line equipment and physical access to individual, stand-alone loops at the central office MDF. In the UDLC configuration, physical access to individual loops is accomplished in exactly the same manner as access to all-copper loops. GR-303 IDLC, on the other hand, does not (and indeed cannot) provide the discrete loop access that non-switched loops require.

Q. HAS THE FCC SAID ANYTHING ABOUT THE NEED TO MODEL UDLC IN A FORWARD-LOOKING ENVIRONMENT?

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[81] *See* Commission Interconnection Agreements, March 26, 2004 and Commission CLEC Report, February 3, 2004.

[82] Donovan Direct Testimony at Attachment JCD-6, p. 12-55 (Telcordia Notes on the Network, SR-2275, Issue 4 (Oct. 2002)). Mr. Donovan also acknowledges that a "critical mass" of subscribers is necessary for the GR-303 IDLC configuration to be cost-effective. *Id.*

A. Yes. The FCC agrees that, contrary to AT&T/MCI's assumptions, TELRIC requires the modeling of UDLC in a forward-looking network:

> AT&T and WorldCom challenge both state commission's acceptance of BellSouth's assumption of 100 percent UDLC in setting the prices for stand-alone loops. The commenters claim that UDLC is not forward-looking and therefore does not comply with TELRIC . . . *we are not persuaded, based on the record before us, that a correct application of TELRIC would require 100 percent use of [IDLC] for that purpose* . . . Therefore, we find no error, on the present record, in either state commission's approval of BellSouth's deployment of UDLC for stand-alone loops.[83]

Decisions in other jurisdictions are consistent with Verizon NW's and the FCC's position on this issue.[84] For example, the Florida Public Service Commission recently concluded that, because IDLC with a GR-303 interface could not be used to unbundle a single stand-alone loop, it rejected the use of IDLC with the GR-303 interface outright for unbundling stand-alone loops.[85] In short, by modeling technology configurations that have never been deployed in the real

[83] BellSouth Order at ¶¶ 48-50 (emphasis added).

[84] Obviously ILECs are obligated to provide requesting carriers with access to stand-alone UNE loops provisioned over IDLC. However, as the FCC has stated, "We recognize that in most cases this will be either through a spare copper facility of through the availability of Universal DLC systems. Nonetheless even if neither of these options is available, incumbent LECs must present requesting carriers a technically feasible method of unbundled access." *See* Before the Federal Communications Commission, CC Docket No. 96-45, *Report and Order on Remand and Further Notice of Proposed Rulemaking* (Aug. 21, 2003) at p. 177.

[85] Before the Florida Public Service Commission, Docket No. 990649-TP, *Final Order On Rates For Unbundled Network Elements Provided By Verizon Florida* (Nov. 15, 2002) at p. 129 ("[W]itness Ankum has ignored the fact that no switch or NGDLC vendors have offered products with the functionality required to support a multi-carrier operation of a GR-303 interface. Further, we share Verizon witness Tucek's concern that witness Ankum's claims about unbundled digitally derived loops from an IDLC are wrong and not technically feasible. *Therefore, we conclude that the TELRIC of stand-alone unbundled loops should be based on the UDLC configuration assumed in Verizon's cost study filing.*") (emphasis added). *See also* Before the New Hampshire Public Utilities Commission, *Order No. 23,738* (July 6, 2001) at p. 66 (rejecting AT&T/MCI's proposal to use 100 percent GR-303 on the basis, that "GR-303 IDLC should not be included as a portion of the technology in a TELRIC NRC model" because "GR-303 has not been deployed in the New Hampshire network nor proven to work in a multi-carrier environment").

world, HM 5.3's GR-303/IDLC unbundling assumptions violate the FCC's TELRIC principles, which AT&T/MCI acknowledge are appropriate.[86]

2. HM 5.3'S DLC COSTS ARE UNDERSTATED

Q. DOES HM 5.3 CALCULATE DLC COSTS CORRECTLY?

A. No. Even assuming AT&T/MCI's use of the GR-303/IDLC configuration to provide unbundled stand-alone loop access were feasible, which it is not, HM 5.3 is unable to produce accurate DLC costs because the Model does not account fully for CLEC requests for this arrangement. Mr. Donovan states that DLC equipment should be sized based on the number of lines (derived from current demand at current locations) adjusted by a 90 percent channel unit-sizing factor. However, as I explained above, each CLEC request for a GR-303 IDLC loop would require that an entire interface group be dedicated solely to that CLEC.

For example, consider an area where Verizon NW currently serves 1,800 lines and HM 5.3 has modeled a 2,016 line DLC (four interface groups). Assume four CLECs have decided to offer service in this area. The first CLEC's order for a single stand-alone loop UNE would require that an entire interface group (or 25 percent of the total interface groups) be dedicated to this CLEC, leaving Verizon NW with three interface groups. Similarly, the second and third CLECs' initial orders would require the dedication of two more interface groups, leaving Verizon

[86] *See e.g.*, Before the Public Utilities Commission of the State of California, Application Nos. 01-02-024 et al., *Workshop Transcripts* (Dec. 4, 2002) at p. 266 ("Dec. 4 SBC Workshop Transcript") (Ms. Murray recognizing that it is absolutely critical to ". . . look at the technologies that are proven out there that are really being bought to provide telecommunications services").

NW with only one interface group, even if the number of Verizon NW lines remains exactly the same. Since Verizon NW needs to keep one of the four interface groups for itself (for testing, monitoring, etc.), as soon as the fourth CLEC places an initial order for service, Verizon NW would be required to place a second system and dedicate one of that system's four interface groups to that CLEC. As such, if the Model were able to account fully for CLECs' requests for the GR-303/IDLC arrangement, it would take only four CLECs' requests for a UNE in a given area to double the common equipment requirements modeled by HM 5.3, even when Verizon NW's line requirements (i.e., the total of Verizon NW's retail and wholesale loops) remain unchanged. HM 5.3 completely ignores this fact. This modeling flaw is exacerbated by the fact that HM 5.3 models very large clusters, and thus very large RTs, thereby increasing the likelihood that multiple CLECs will request loop UNEs on any given system. Thus, by only considering Verizon NW's current demand and failing to consider how many CLECs demand service, the network modeled by HM 5.3 would necessarily require costly relief jobs to provision the requisite interface groups for even a few CLEC initial requests -- a result that is clearly neither forward-looking nor cost effective.

Q. ARE HM 5.3'S DLC INPUT VALUES APPROPRIATE?

A. No. HM 5.3's understated DLC costs are further exacerbated by the artificially low input values used by the Model. AT&T/MCI achieve these understated DLC costs by substantially understating the material and labor costs necessary to install the equipment.[87] These material and labor inputs have already been considered and rejected by the FCC because they are based solely on the unsubstantiated opinions of AT&T/MCI's consultants, and are devoid of supporting data.[88] Mr. Donovan has completely ignored the real-world data provided to him by Verizon NW,[89] which identified the costs and parameters of the DLC equipment used in Verizon NW's network. Instead, Mr. Donovan relies on DLC equipment prices derived solely from mere guesses at what the appropriate DLC costs should be.

3. HM 5.3'S ALLOCATION OF DLC COMMON EQUIPMENT INVESTMENT TO DS-1 DEMAND VIOLATES TELRIC'S COST CAUSATION PRINCIPLE

Q. DOES HM 5.3'S ALLOCATION OF DLC COMMON EQUIPMENT INVESTMENT TO DS-1 DEMAND COMPLY WITH THE TELRIC PRINCIPLE OF COST CAUSATION?

A. Absolutely not. HM 5.3's DLC common equipment investment allocation to DS-1 services is unfounded, internally inconsistent, and at odds with the principles of cost causation. AT&T/MCI's consultants inappropriately allocate HM 5.3's DLC common investments to DS-1 services based on the relative space occupied by

[87] *See* Richter Reply Testimony at Section IX (pp. 49-52) for a description of the labor and tasks required to install DLC systems.
[88] While these inputs are in a different format than those rejected by the FCC, and reflect a 5 percent increase over the labor investment rejected previously, the inputs employed in HM 5.3 are essentially the same inputs as those previously rejected by the FCC. Tenth Report and Order at ¶¶ 270, 281; Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, 251, *Memorandum Opinion and Order* (rel. Aug. 29, 2003) at ¶¶ 326-27 ("Virginia Arbitration Order").
[89] *See* Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Verizon's Responses to MCI's First Set of Data Requests* (June 27, 2003, July 10, 2003 and July 31, 2003) at Response Nos. 52 through 54.

the DS-1 plug-in unit within the channel bank assembly, rather than on the relative proportion of the common equipment circuit capacity that the DS-1 services consume. This method of allocation violates cost causation principles because the amount of DLC common investment is not determined either in HM 5.3 or in reality by the amount of shelf space required by a line card, but rather, by the actual bandwidth and power the DS-1 services utilize on the DLC. Mr. Joseph P. Riolo, a member of the HAI Model's development team, acknowledged this when he testified before the FCC's Common Carrier Bureau in the Virginia Arbitration:

> It makes no sense to apportion that cost based on the space occupied by individual line cards in the Channel Bank Assembly ["CBA"] . . . The capacity of the Common Control Assembly is not limited by the space occupied by line cards. Indeed, the line cards in the Channel Bank Assembly can never be filled by channel units, because 4 of the 60 slots are always reserved for auxiliary units . . . it is power and bandwidth and other similar factors that affect the capacity of the common equipment, not the amount of space occupied in the CBA.[90]

The common equipment in any DLC system enables the derivation of a finite amount of system capacity over the common electronics, the common optics, the common fiber strands, and the common support structure. Disregarding the impact of fill factors, fiber, and structure (for simplification purposes), a 2,016 DLC system is capable of deriving 2,016 total DS-0s regardless of whether or not those DS-0s are associated with the provision of POTS, 4-wire DS-0 specials,

[90] Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, -251, *Surrebuttal Testimony of Joseph P. Riolo on Behalf of AT&T and WorldCom, Inc.* (Sept. 21, 2001) at pp. 9-10.

DS-1s, or some combination of these services. Thus, a maximum of 2,016 POTS or 84 DS-1 services can be provisioned over a 2,016 DLC system.

To illustrate HM 5.3's flawed methodology, consider a scenario where a DLC system is being used to provide 1,008 POTS services and 42 DS-1s. A total of 294 channel unit cards (252 POTS and 42 DS-1) would be required for this combination of services. Under this scenario, HM 5.3 would estimate a total common equipment cost of $163,150.[91] Based on its erroneous assumption that, because DS-1 channel unit cards occupy 14 percent (i.e., 42/294) of the slots required, they should be assigned 14 percent of the common equipment cost (i.e., $23,307), and the POTS services should be assigned the remaining 86 percent of the common equipment cost (i.e., $139,843). In reality, however, the DS-1 and POTS services each consume 50 percent of the circuit capacity (bandwidth) provided by the common equipment. As such, HM 5.3's flawed allocation to DS-1 services would inappropriately impose a $58,268 subsidization on POTS services to the benefit of DS-1 services. Correcting this improper allocation of common equipment costs would raise HM 5.2's unit costs for DS-1s by $15.90 (from $49.26 to $65.16).

By allocating DLC investment on the basis of space occupied by a DS-1 line card, as illustrated above, HM 5.3 in effect subsidizes DS-1 services by erroneously shifting cost recovery away from the DS-1 loops onto the POTS loops. This methodology is inappropriate and contrary to the principles of cost

[91] Of this $163,150 only $16,000 is associated with the channel bank assembly investment.

causation. To ensure that Verizon NW recovers its total costs from the services that cause the costs, common equipment investments should be apportioned based upon the capacity used (as is the case with VzCost and the FCC's Synthesis Model), and not upon the space occupied by the DS-1 channel unit card.

III. LOOP DESIGN ERRORS CONTAINED IN HM 5.3 RESULT IN FEEDER PLANT BEING CHARACTERIZED AS DISTRIBUTION PLANT

A. HM 5.3'S CLUSTERS ARE GROSSLY OVERSIZED

Q. ARE YOU AWARE OF THE RESULTS OF A SENSITIVITY ANALYSIS DONE ON BEHALF OF SBC CALIFORNIA WHERE THE HM 5.3 PREPROCESSED CUSTOMER LOCATION DATABASE WAS RE-CREATED WITH A TARGET MAXIMUM LINE COUNT OF 1,800 RATHER THAN THE DEFAULT VALUE OF 6,451 USED BY TNS?

A. Yes. Mr. Christian Dippon from NERA performed that particular sensitivity analysis. Mr. Dippon provides a significant number of similar sensitivities documenting his findings with respect to HM 5.3's overall insensitivity to changes in cluster size in his Reply Testimony.

Q. WHAT WERE THE RESULTS OF MR. DIPPON'S ANALYSIS?

A. The change produced a counterintuitive result: a significant increase in the number of clusters, but a minimal impact on cost. This is contrary to what one would expect – i.e., that a significant increase in the number of clusters would have a significant, as opposed to a minimal, impact on the final cost of the overall network.

Q. WOULD YOU EXPECT THAT THE OVERALL LENGTH OF THE LOOP FACILITIES WOULD NOT CHANGE SIGNIFICANTLY REGARDLESS OF THE SIZE OF THE CLUSTERS, SINCE THE BASIC TREE AND BRANCH ARCHITECTURE IS USED IN EITHER CASE?

A. No. As explained more fully below, while *distribution network lengths or costs* generally should not change to any significant degree as the size of the cluster changes (because customer locations and the streets and roads along which they are located are "fixed"), *the feeder and sub-feeder lengths and costs* should increase when the size of the cluster is reduced, and should decrease when the size of the cluster is increased. This is so because smaller clusters particularly in non-rural areas require more, but smaller, SAIs because each cluster requires its own SAI. This in turn creates the need for additional lengths and quantities of feeder and sub-feeder routes.

Q. WHY THEN DOES THE SIZE OF THE CLUSTERS DESIGNED BY THE MODEL MATTER?

A. While it is not unreasonable to expect that the overall distribution loop facility length would not change significantly when the size of clusters change, one would expect the Model to generate different costs for the feeder, DLC, and SAI components since their lengths and quantities would change when the size of clusters change. For instance, a larger number of smaller DAs should require more SAIs, more (and smaller) DLC RTs, and longer sub-feeder cables. This conclusion is partially confirmed by Dr. Mercer's attempt to explain Mr. Dippon's sensitivity analysis,[92] in which Dr. Mercer stated:

> As the table shows, my logic and Mr. Donovan's analysis are borne out. When going from the default run [of 6,451 lines] to the 1,800 line run, there is a substantial increase in total feeder investment ($300 million) and concentrator investment ($60 million) and a substantial decrease in distribution investment ($345 million), netting to nearly the same total investment.[93]

Since the increase in the feeder, sub-feeder and concentrator investment is inappropriately offset by a decrease in the distribution investment, the Model exhibits virtually no sensitivity to significant increases (or decreases) in the overall size of HM 5.3's clusters.

Q. WHAT ABOUT THE DECREASE IN DISTRIBUTION INVESTMENT THAT DR. MERCER OBSERVED?

A. While I was unable to definitively identify the cause of the unexpected decrease in distribution investment, referenced by Dr. Mercer, and confirmed by Mr. Dippon, in the time available to analyze the Model and file my Reply Testimony, it is important to remember that, in the real world, the total mileage of distribution cable is a function of the lengths of the roads and streets along which customers are located. In addition, the total number of distribution pairs is a function of the number of current and forecasted customer lines. Distribution cable must pass

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[92] SBC Mercer Decl. at ¶¶ 41-44.
[93] SBC Mercer Decl. at ¶ 44.

each and every residence and business location in order to provide service. If a cost model is developing a truly representative picture of the network that it models, the total lengths of the roads and streets, and the total number of customer lines (and therefore, the total distribution cables lengths and total distribution pair requirements), should not change to any significant degree because of an arbitrary change in the size of the distribution area clusters into which the customers are grouped. HM 5.3 ignores all this, and causes distribution investment to decrease when the number of modeled clusters increases and the size of the modeled clusters decreases.

Q. WHY IS PLANT CATEGORIZATION A CONCERN?

A. Plant categorization refers to the modeling of a particular portion of the loop (i.e. distribution versus feeder) and utilizing the appropriate plant mix (e.g., buried versus underground) assumptions and inputs for that portion of the loop. Feeder and distribution have very significant differences in plant mix and input assumptions, with feeder generally being much more expensive than distribution. It is thus critical that the piece parts that make up the sub-loop elements be assigned to the proper investment category, and that the costs that are developed are based on the correct sub-loop network input values (i.e., feeder versus distribution). HM 5.3 fails systematically in this regard. For example, when the Model creates “outlier fiber” feeder cable, it calculates the cable and structure investment using the *distribution* plant mix assumptions and inputs (e.g., sharing inputs and pole spacing assumptions).[94] The Model then assigns the reported distance to the total *distribution* route (structure) distance in the cluster from which they are served.[95] Even though the Model subsequently transfers the improperly calculated cable and structure investment out of the distribution module and into the feeder module, clearly, the investment required to build these outlier fiber feeder cables should be calculated using feeder (as opposed to distribution) plant mix assumptions and inputs.

Indeed, even the HM 5.3 Model Description states, "Outlier clusters are associated with a main cluster, from which *feeder* cable extends to the outlier location."[96] However, HM 5.3 mistakenly calculates the investment in over 6.8 million feet of loop fiber feeder cable (nearly one third of the total feeder distance) and its associated structure as if it were *distribution* plant.[97] This modeling error further reduces the already understated investment in feeder plant and its corresponding UNE cost estimates.

Q. IS FEEDER PLANT MORE COSTLY TO BUILD THAN DISTRIBUTION PLANT?

A. On a per route foot basis, it is typically more expensive to build feeder plant than it is to build distribution plant because it transports many more lines over its structure, and because there is much more underground feeder plant (manholes and conduit systems), thereby making it practical to augment feeder facilities as

[94] Mercer Supplemental Direct Testimony at RAM-4 (Model Description), p. 14.
[95] *See* HM532K, R53_distribution.xls Module, calculations Worksheet, Column BO.
[96] Mercer Supplemental Direct Testimony at RAM-4 (Model Description), p. 22.

needed. However, on a per-line basis, feeder plant is typically less costly than distribution plant because many more lines are concentrated on feeder routes versus distribution routes that have relatively few lines. Feeder plant can also be operated at higher fill levels because it is designed with the assumption that its capacity will be augmented as demand levels increase. Buried plant -- the capacity of which cannot be readily increased without costly excavation and disruption of property, vehicular traffic flow, etc. -- is thus wholly inappropriate for feeder purposes.

The proper balance of distribution plant length and feeder plant length is thus critical to the overall long-term, least-cost loop design.[98] This is precisely why AT&T's engineering guidelines state that the engineer's ". . . job is to balance distribution cable costs and feeder interface efficiency to form optimally-sized DAs."[99] Table 1 below compares HM 5.3's per route foot investment for feeder and distribution structure, and demonstrates how HM 5.3's per foot investment is significantly higher for feeder than for distribution plant.

[97] *See* HM532K, R53_distribution.xls Module, calculations Worksheet, Column AH.
[98] Mr. Richter discusses this in more detail in his Reply Testimony at pp. 12-15.
[99] AT&T Practice Standard, Section 901-350-201, Outside Plant Engineering, Long Range Outside Plant Planning, Issue 3 (Sept. 1983) at p. 20.

TABLE 1

	Feeder	Distribution
Total Structure Investment (prior to sharing with other carriers)[100]	$80,566,231	$168,912,547
Distance in Feet	14,983,127	80,659,622
Structure Investment per foot	$5.38	$2.09

Q. DOES HM 5.3 ACCURATELY ESTIMATE THE COSTS OF BUILDING THE LESS EXPENSIVE DISTRIBUTION PLANT?

A. No. Unlike its copper feeder calculation, the Model does not place manholes for underground distribution cables, and eliminates pole investment for up to 30 percent of the distribution cable distance in the dense urban areas. As a result, HM 5.3's costs of building distribution plant are significantly understated. While a simple user-adjustable input change (i.e., setting the block/building fraction of total distance to zero in all zones) can restore the pole investment, a change in the Model's platform would be required to restore the missing manhole investment.

B. HM 5.3 FAILS TO ACCURATELY CATEGORIZE AND COST THE FEEDER AND DISTRIBUTION SEGMENTS OF THE NETWORK

Q. IF A CHANGE IN THE SIZE OF THE CLUSTERS DOES NOT CAUSE THE OVERALL LOOP LENGTH, LOOP INVESTMENT, AND RESULTING COSTS TO CHANGE SIGNIFICANTLY, WHY SHOULD THE COMMISSION BE

[100] Structure investments reflect the reductions made by HM 5.3 for the so-called sharing between feeder, distribution, IOF, and the high-capacity fiber network.

CONCERNED ABOUT THE CLUSTERING DECISIONS AND LOOP FACILITY CATEGORIZATION IN THE MODEL?

A. By creating excessively large clusters (which serves to minimize feeder length, feeder investment, and feeder costs), and calculating the cost of sub-feeder cable using distribution investment assumptions, HM 5.3 significantly understates the overall UNE loop rates. These results are attractive to CLECs, which are generally most interested in concentrations of customers that are typically served by indoor SAIs (in many cases on DLC). In addition, in order to accurately calculate sub-loop UNE costs for either the feeder or distribution sub-loop UNEs, the size of the clusters is critical. Dr. Mercer's testimony in the SBC California UNE proceeding makes clear that cluster size does indeed impact the cost of HM 5.3's sub-loop UNEs.[101] This is despite the fact that changing the cluster size from the default size (6,451 lines) to a more reasonable size (e.g., 1,800 lines) has very little impact on HM 5.3's overall loop cost estimates, as I discussed previously. As such, the distribution and feeder sub-loop costs estimated by HM 5.3, and endorsed by Mr. Spinks,[102] should be rejected outright.

Q. WHAT LED YOU TO THIS CONCLUSION?

A. AT&T/MCI (and most other CLECs, for that matter) are most interested in marketing their services to large- and medium-sized business customers. In a real OSP network, such as that shown in Diagram 3 below, the majority of multi-line business customers are located in office buildings or industrial parks where

[101] SBC Mercer Decl. at p. 25.

the feeder plant terminates on a SAI in the basement of the building or office park. In such a case, the CLECs can get all the way from the ILEC wire center to their customers entirely on feeder facilities. There is no ILEC-owned distribution cable since all of the inside wiring (i.e., the building riser cables and "campus" cable facilities) is privately-owned.

HM 5.3, however, treats the loop network serving these customer locations as shown in Diagram 4 below with a single outdoor SAI and lower cost distribution cable and structure from the SAI to each building. Using HM 5.3 to develop UNE loop investments effectively understates the forward-looking cost of constructing all-feeder loops that reach all the way to the customer premises by replacing it with lower cost distribution facilities. As a result, Verizon NW is denied full recovery of the costs incurred in making these all-feeder loop-elements available.

[102] Spinks Supplemental Direct Testimony at pp. 15-16.

Diagram 3

Business/Commercial OSP Network
Actually Purchased by CLECs

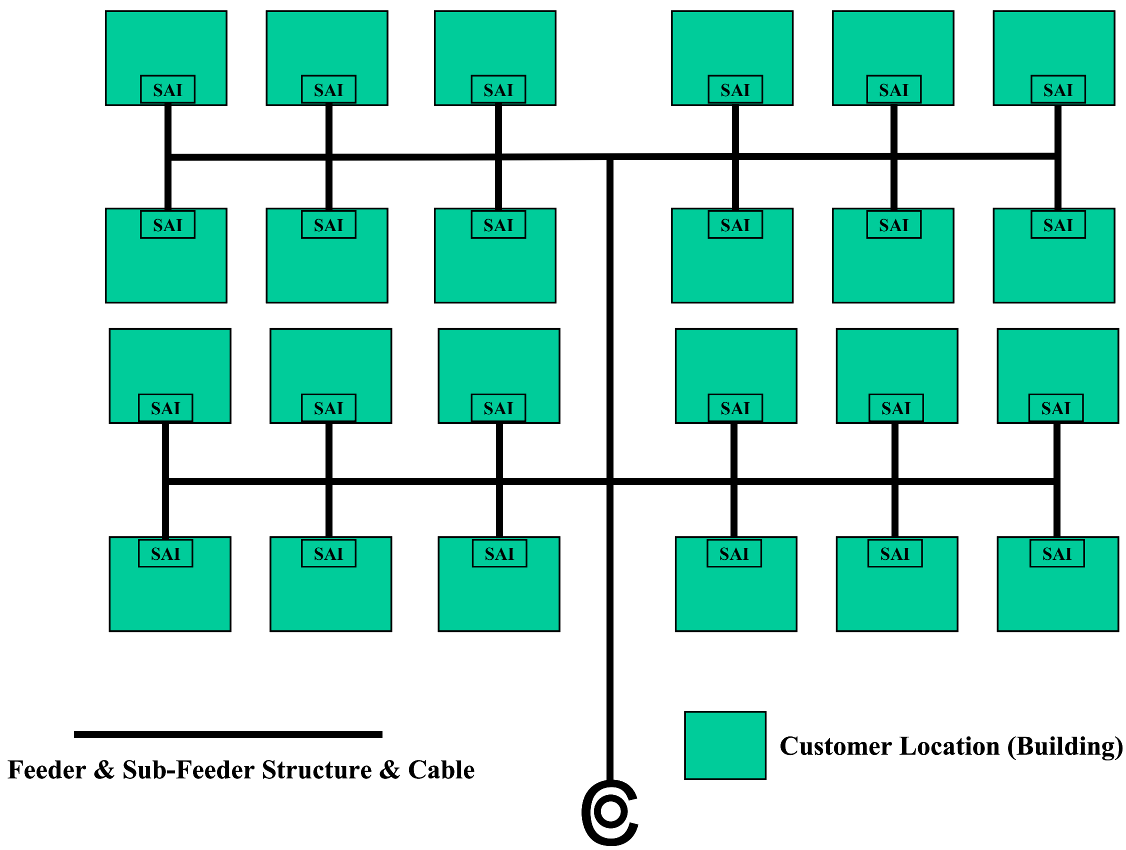
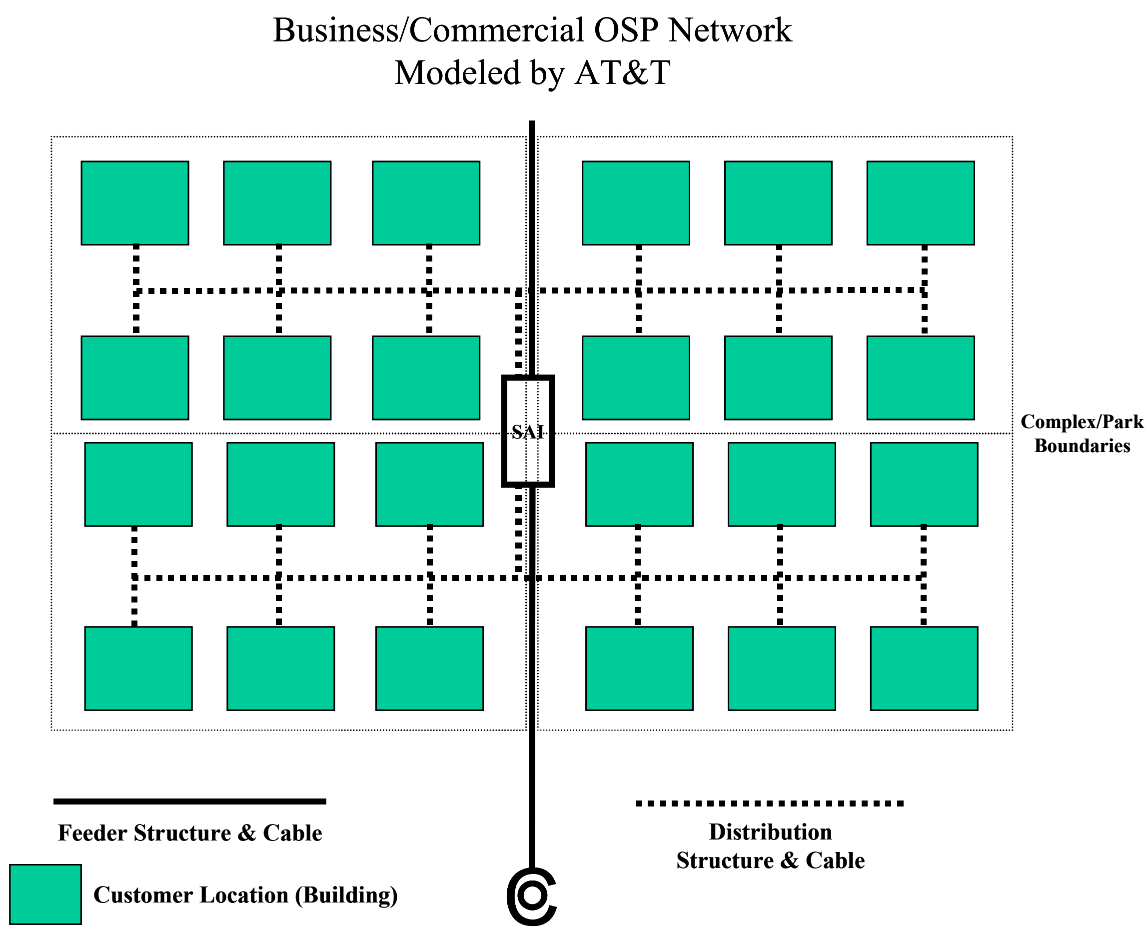


Diagram 4


Business/Commercial OSP Network
Modeled by AT&T
SAI
Complex/Park Boundaries
Feeder Structure & Cable
Customer Location (Building)
Distribution Structure & Cable

Q. CAN THESE CONCERNS BE ADDRESSED BY INVOKING THE OPTION TO LIMIT THE SIZE OF THE SAI BY CREATING ADDITIONAL, SMALLER DAS AND ADDING SUB-FEEDER CABLE?

A. No. The reason this option fails to provide a remedy is that the "inexpensive"[103] solution (i.e., adjusting the maximum SAI size constraint, as opposed to the maximum cluster-line size, to reduce size of the clusters) implemented by the Model developers in this proceeding does not work. Although one would expect that the creation of smaller DAs would increase the sub-feeder cable lengths and structure distances because HM 5.3 is supposedly splitting the areas served by the "oversized" SAIs in to subdivisions and extending the *SAI sub-feeder cable* into them, the main feeder and sub-feeder cable lengths produced by the Model do not change.[104] In fact, the main feeder and sub-feeder cable lengths produced by the Model never change when any of the user-adjustable inputs are altered. This modeling anomaly directly contradicts Dr. Mercer's statement that, when you split a serving area "into more than one area, each with its own SAI … you can conceivably end up with more cable."[105] And, inexplicably, over 21,000 lines are shifted from the DLC category to the non-DLC category, even though the original cluster boundaries and customer locations are unchanged.[106] Equally troublesome is the fact that, by failing to add the sub-feeder and structure

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[103] Verizon California Workshop at p. 3638.
[104] Based on a comparison of columns F, G, and H of the distribution output cluster worksheets from the HM Workfiles produced by the default and sensitivity run with "Enable SAI Size Limit" (2,100 default maximum) selected.
[105] Verizon California Workshop at p. 3635.

investment required to subdivide the DAs, the Model leaves over 850,000 lines in 259 clusters with no connection to the feeder cable that is supposed to serve them.

On the other hand, if these new algorithms were working as designed (which they are not), the Model would simply subdivide the clusters contained in its preprocessed database whenever the SAI limit was exceeded. However, even this network design and the "new" serving areas created by such an approach would look nothing like a network that an outside plant engineer would design.

Q. HAVE YOU ANALYZED THE DROP DISTANCE PRODUCED BY HM 5.3?

A. Yes. I have looked at this issue from two perspectives. First, I calculated the average drop distance produced by the Model and compared it to the support data AT&T/MCI provided in the HM 5.3 Inputs Portfolio.[107] Second I compared the default drop lengths to the lot size calculations in the Model.

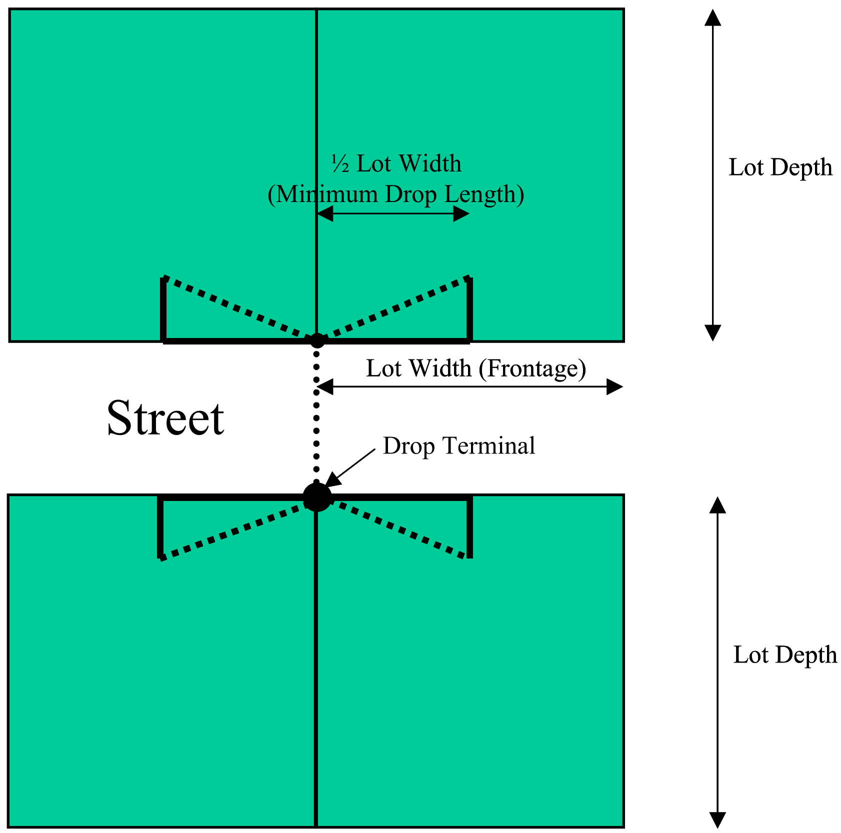
Q. WHAT WERE THE RESULTS OF THESE ANALYSES?

A. The first analysis produced an average drop length of 72 feet, which is consistent with the 73-foot average contained in the HM 5.3 Inputs Portfolio. However, the second analysis highlights the danger of using national averages for input values.

[106] This result directly contradicts Dr. Mercer's claim that invoking this option could result in copper loop lengths exceeding 18,000 feet, thereby increasing the number of DLC served lines. *See* Verizon CA Workshop at pp. 3635-36.
[107] HIP Section 3.2.1, p. 18.

In HM 5.3, drops are assumed to run from shared terminals located at the front of the property line to NIDs on each customer premises, as shown on Diagram 5.

DIAGRAM 5



It is obvious from the lower shaded area of the diagram that the minimum drop length for the customer premises located on the same side of the street as the drop terminal is ½ the lot frontage. (Even longer drops are required to serve the two customer premises on the opposite side of the street.) When I compared the drop length inputs in HM 5.3 to the lot frontages produced by the Model, I found that HM 5.3's drops are too short to serve 90 percent of the customer locations contained in the Model. Table 2 summarizes those findings.

TABLE 2

Total Locations	**435,027**
Locations With Drop Length < 1/2 Lot Frontage	**390,504**
Locations With Drop Length < 1/2 Lot Frontage	**90%**

C. HM 5.3 SYSTEMATICALLY IGNORES MOST HIGH-DENSITY AREAS, AND THUS INAPPROPRIATELY DESIGNS LOOP UNE COST ESTIMATES USING INCORRECT DENSITY PARAMETERS

1. HM 5.3 FAILS TO IDENTIFY AND ACCURATELY MEASURE THE DENSITY OF AREAS WHERE MEDIUM AND LARGE BUSINESSES AND RESIDENTIAL APARTMENT BUILDINGS ARE LOCATED

Q. PLEASE DESCRIBE THE MANNER IN WHICH LOOP PLANT SHOULD BE DESIGNED TO BUILDINGS AND CUSTOMER LOCATIONS WITHIN THE DENSE "DOWNTOWN" AREAS IN URBAN AND SUBURBAN COMMUNITIES.

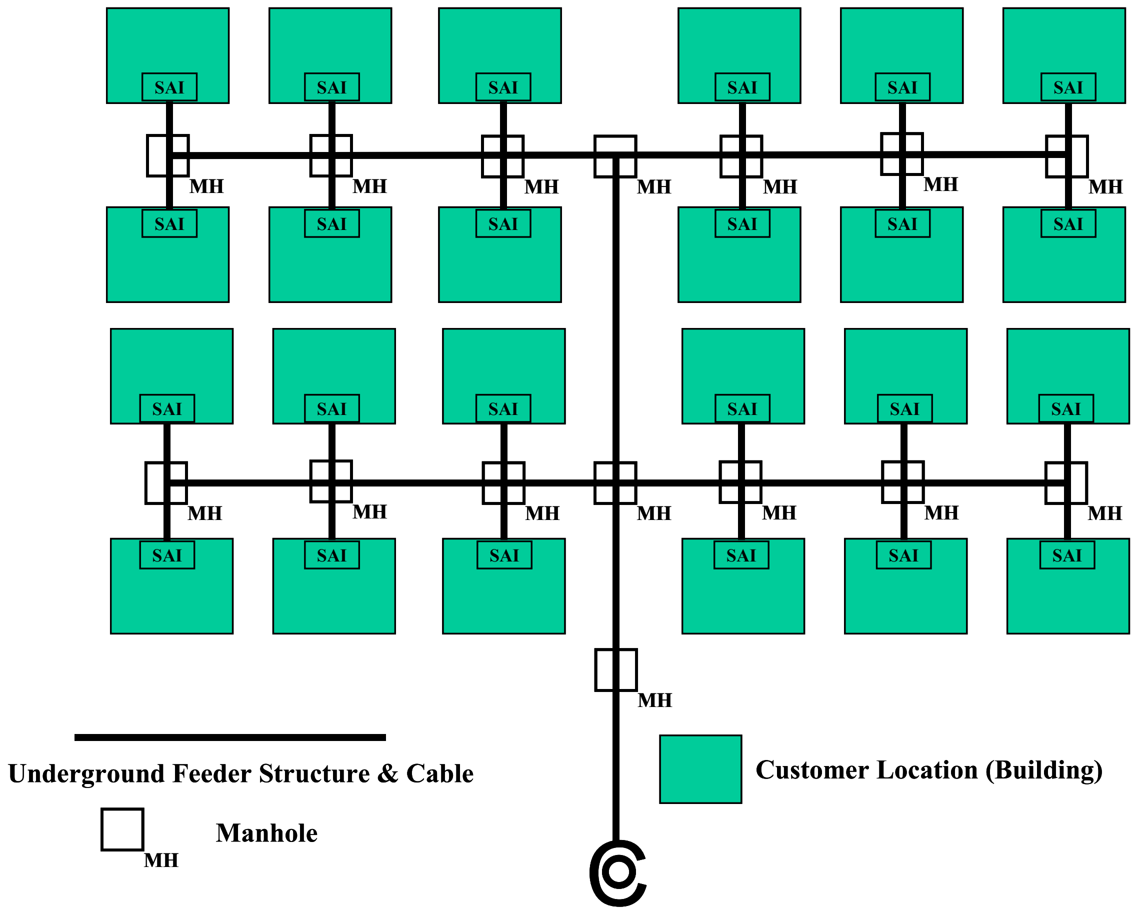
A. In downtown core areas, business districts, urban communities, as well as in many suburban communities, the most efficient, least-cost loop design is to model each building as a DA, with underground feeder cable terminating in an SAI located in the basement of each building. This is similar to the way in which HM 5.3 designs the loop plant to serve the few so-called "high-rise" buildings that it recognizes.

The only distribution plant in these downtown areas (as with the limited amount of HM 5.3 high-rise buildings) is the building (or riser) cable, which is generally privately-owned and maintained by the building owners, not the ILEC. This design is more efficient and less costly than other alternatives and conforms to industry standard design practices.[108] It eliminates the need to create a complex underground distribution system of structure and cable paths between the SAIs and the multi-story, multi-tenant buildings typically found in these core areas. It also eliminates the need to purchase property or negotiate for easements for SAIs in areas where open space is at a premium. Diagram 5 below entitled “Standard OSP Design – Core Area” illustrates this network design.

[108] *Step 1-19 Establish Distribution Areas in the Core Area of a Wire Center*, AT&T Practice Standard, Issue 3, Section 901-350-201, Long Range Outside Plant Planning (Sept. 1983) at p. 27.

Diagram 6

Standard OSP Design - Core Area



Even AT&T/MCI's outside plant consultant, Mr. Donovan, agrees that, in downtown areas, designing each building as a DA is the current and appropriate engineering loop design plan:

> Based on my experience, it is reasonable to expect a small amount of underground feeder cable in lower density zones and a very high percentage of underground feeder cable, and associated high-cost structures, in higher density zones. For example, in downtown Seattle, underground feeder cable would be placed between central offices and basements of buildings (distribution cable would consist of building riser cables).[109]

In addition, in response to a Verizon NW data request, AT&T/MCI acknowledged:

> An indoor SAI is generally used in multi-unit buildings housing business establishments or residential accommodations. The construction of an outdoor SAI involves the additional cost of metal cabinets for housing protection and connection materials. Thus, the cost of constructing an outdoor SAI tends to be somewhat higher than the cost of constructing an indoor SAI. Consequently, an outdoor SAI is generally used only when there is no place to house an indoor SAI.[110]

And finally, an MCI witness testifying before the FCC recognized that "some customer locations can be directly served from feeder cable, while other customer locations require the use of distribution plant."[111]

Q. WHAT PROBLEMS HAVE YOU IDENTIFIED REGARDING THE MANNER IN WHICH HM 5.3 DESIGNS LOOP PLANT TO BUILDINGS AND CUSTOMER

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[109] Donovan Direct Testimony at p. 17.

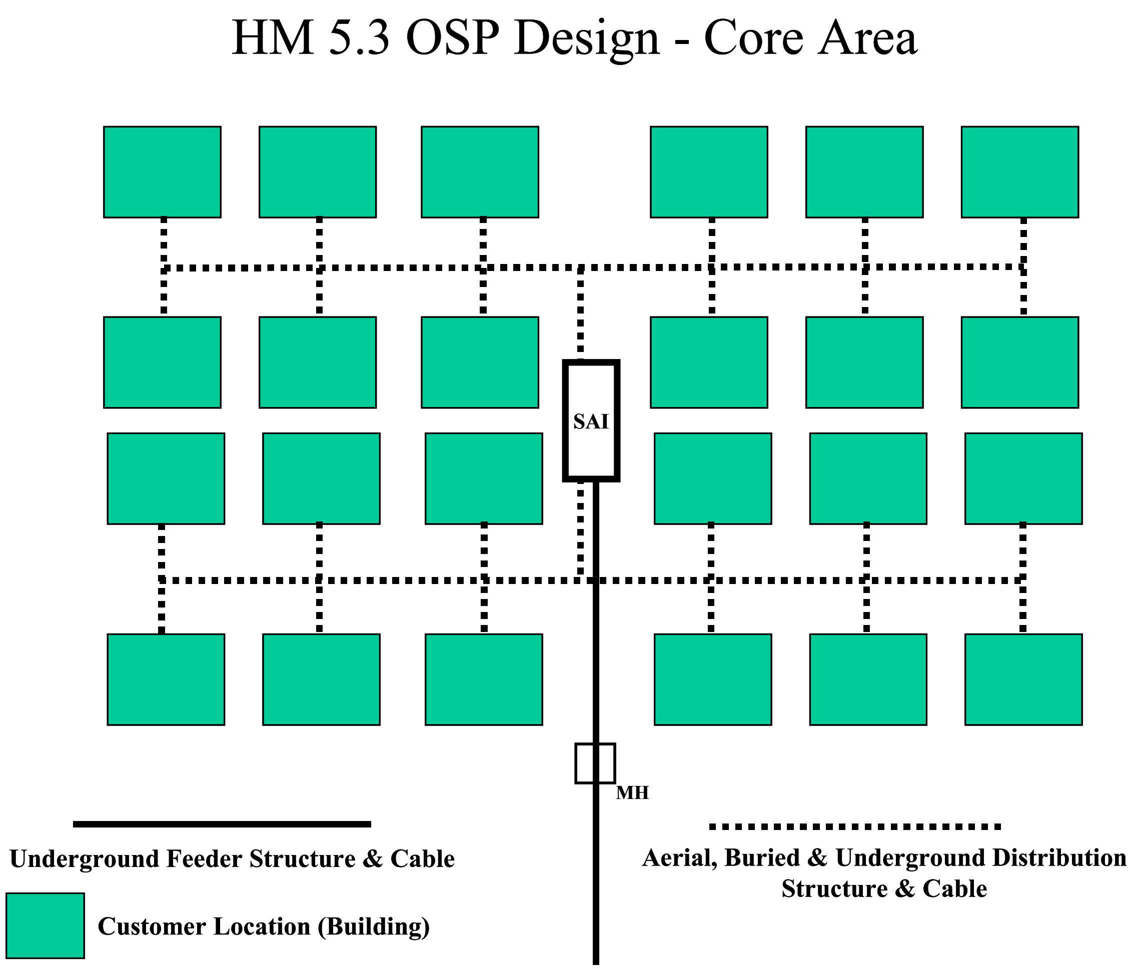
[110] Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Joint Responses of AT&T & MCI to Verizon's Sixth Set of Data Requests* (Aug. 5, 2003) at Response No. 6-23.

[111] Before the Federal Communications Commission, WC Docket No. 03-173, *Declaration of Michael D. Pelcovits on behalf of MCI* (Dec. 16, 2003) at p. 23.

LOCATIONS WITHIN DENSE "DOWNTOWN" URBAN AND SUBURBAN AREAS?

A. Instead of adhering to the aforementioned standard network design practices, the HM 5.3 developers designed the loop plant in dense "downtown" areas more like suburban, residential tracts with feeder cables terminating in outdoor SAIs, with distribution backbone, branch and "block" cables connecting to terminals, and with drops being used to serve the multi-story, multi-tenant buildings typically found in these areas. Diagram 7 below entitled "HM 5.3 OSP Design – Core Area" illustrates this flawed network design.

Diagram 7



Q. WHAT IS THE RESULT OF THESE DESIGN PROBLEMS?

A. These design problems cause the Model to place significant amounts of distribution cable, shared structure and outdoor SAIs in clusters where there should be little or none -- a modeling error that has a substantial downward effect on the feeder costs, and therefore the UNE cost estimates, produced by HM 5.3.[112]

2. HM 5.3 DOES NOT ACCURATELY MODEL UNDERGROUND FEEDER PLANT AND USES BLOCK CABLE INCORRECTLY

Q. PLEASE EXPLAIN THE ERRORS ASSOCIATED WITH HM 5.3'S MODELING OF UNDERGROUND FEEDER PLANT AND BLOCK CABLE.

A. HM 5.3 reduces costs in core areas by utilizing a mix of 50 percent aerial, 15 percent buried, and 35 percent underground *distribution* cable and structure, rather than the nearly 100 percent underground *feeder* cable and structure mix that would be expected. By doing so, HM 5.3 fails to account for the following costs:

- The costs associated with the placement of manholes at each intersection and building entrance.
- The costs associated with the pole investment of 30 percent of the aerial distribution cable in the most densely populated areas. (HM 5.3 calculates no pole investment in the highest density zone, erroneously assuming that aerial cable is strung from building to building.)
- The reduction in the investment associated with the use of distribution structure sharing factors. (HM 5.3 assigns only 25 percent of the already-reduced aerial structure, and only 33 percent of the low-cost buried distribution structure investment, to the ILEC versus 33 percent of the much more expensive underground feeder structure that HM 5.3 would have modeled had it properly designed the requisite underground feeder systems.)

[112] While outdoor SAIs are more expensive than indoor SAIs, the total number of SAIs that would be placed if these design issues were corrected would be significantly greater than the number of SAIs HM 5.3 currently models. More importantly, had the requisite numbers and locations of indoor SAIs been modeled, HM 5.3 would have modeled significantly more of the relatively more expensive feeder cable.

- The reduction in feeder structure costs because of the alleged "sharing" structure with distribution structure (which effectively has no structure when "block cable" is present).

D. OTHER SIGNIFICANT ERRORS IN HM 5.3'S LOOP DESIGN

Q. WHAT OTHER SIGNIFICANT MODELING ERRORS HAVE YOU FOUND IN HM 5.3'S LOOP DESIGN?

A. As Dr. Tardiff discusses in detail in his Reply Testimony, there is a shortfall in the SAI terminations for distribution and feeder cables.[113] Compounding this modeling error is the fact that HM 5.3 omits entirely the investment in fiber "patch panel capacity" for splicing fiber feeder cable to the distribution fiber cable(s).[114] In addition, the splice panel investment associated with DLC RTs is unchanged at $1,000 per RT regardless of whether there are high-capacity optical services associated with the cluster served by the RT or not. As such, HM 5.3 does not provide sufficient investment in fiber patch panels to terminate (or splices to connect) the 4,302 distribution fibers and 11,476 feeder fibers it models for high-capacity optical services. Simply dividing the number of fibers requiring termination by 48 (i.e., the number of fibers terminated on a 48 fiber patch panel) and multiplying the result by the cost of a 48-fiber patch panel,[115] it is obvious that there is *at least* $440,000 in missing investment. Moreover, HM 5.3's investment in high-capacity optical services at the wire center only includes the

[113] Tardiff Reply Testimony at Section VII B 2.
[114] This is contrary to the statement in the HM 5.3 Model Description that, "[f]or each cluster, the model determines if one or more all-fiber services are located in the cluster [and] [i]f so, the model extends fiber through the DLC or SAI located at the cluster's centroid, providing sufficient additional patch panel capacity at the DLC/SAI for splicing the feeder fiber cable to distribution fiber cable(s)." Mercer Supplemental Direct Testimony at RAM-4 (Model Description) at p. 40.
[115] *See* Mercer Direct Testimony at Exhibit RAM-5 (HM 5.3 Inputs Portfolio ("HIP")) at p. 40.

investment required to terminate 891 fibers associated with 668 DS-3 services, thereby leaving 10,585 (i.e., 11,476 – 891) fibers un-terminated, and thus not connected (or able to be connected) to anything. Using the assumptions above, this omission produces an additional $295,000 in missing fiber patch panel investment, for a total of almost *three quarter-million dollars* in missing investment.

IV. HM 5.3 EMPLOYS UNREALISTIC STRUCTURE SHARING ASSUMPTIONS

Q. WHAT TYPES OF STRUCTURE SHARING ARE REFLECTED IN HM 5.3?

A. Various versions of the HAI Model have accounted for several types of OSP structure sharing, albeit inaccurately, including: (1) sharing between an ILEC and other utilities, (2) sharing between an ILEC's distribution and feeder facilities, and (3) sharing between an ILEC's feeder and IOF facilities. HM 5.3, however, fails to accurately model realistic levels of structure sharing, and creates nonexistent fiber routes upon which nonexistent high-capacity fiber services are assumed to share OSP structure. While at first the creation of HM 5.3's all-fiber high-capacity network appears to be adding more investment and cost into the Model than necessary, in the end, all of the overstated investment *plus* a good portion of the OSP structure costs are removed entirely from the UNE cost calculations because certain services (and thus their associated structure costs) are allegedly not at issue in this proceeding. Such an assumption is not only misleading, it results in artificially, and unrealistically low UNE costs, as discussed more fully below.

A. HM 5.3 ERRONEOUSLY ASSIGNS STRUCTURE COSTS TO OTHER UTILITIES

Q. PLEASE EXPLAIN THE ERRORS ASSOCIATED WITH HM 5.3'S ASSUMED STRUCTURE SHARING WITH OTHER UTILITIES.

A. With respect to structure sharing with other utilities, HM 5.3's structure costs do not reflect the additional costs necessary to support the sharing of facilities with other services or other utilities (e.g., IXCs, CLECs, electric power companies, CATV operators, and municipalities). HM 5.3 erroneously models only enough structure to satisfy the incorrect amount of demand assumed by HM 5.3. As a result, HM 5.3 fails to account for the additional structure required to accommodate the level of structure sharing assumed by HM 5.3. Indeed, recognizing these many flaws, both the FCC and the Commission declined to adopt structure sharing assumptions substantially similar to those of HM 5.3.[116] Notably, HM 5.3 assigns up to 65 percent less structure to the ILEC than the values adopted by the FCC for use in its Synthesis Model.[117] For example, while AT&T/MCI assume that buried facilities will be shared extensively with other users, the costs they model for buried installation and restoration are insufficient to accommodate the relatively large trenches that would be necessary to support such extensive amounts of sharing. Moreover, larger trenches are necessary if

[116] Tenth Report and Order at ¶¶ 241-249; 1998 Eighth Supp. Order at ¶ 75; Before the Washington Utilities and Transportation Commission, Docket No. UT-980311(a), *Tenth Supplemental Order Establishing Costs* (Nov. 20, 1998) at ¶ 107.

Verizon NW is to comply with utility separation requirements. Since HM 5.3 does not model the requisite wider and deeper trenches, it is inappropriate to assume that any of the modeled trenches are shared with other users. Indeed, in discussing structure sharing assumptions between the ILEC and other utilities, the Florida Public Service Commission noted:

> While this proceeding is to determine the cost of a forward-looking scorched node network, there needs to remain a basis in reality if the costs developed for the network are to have any relevance to the cost of basic local telephone service. We believe that assuming sharing percentages which require, for example, power and cable TV companies to rebuild their networks so that more of the cost of a telephone network can be shifted to other industries, means a network severed from reality.[118]

Q. DO YOU HAVE ANY OTHER CONCERNS WITH HM 5.3'S ASSUMPTIONS REGARDING STRUCTURE SHARING WITH OTHER UTILITIES?

A. Yes. To assume that the entities sharing the pole with Verizon NW will pay a proportionate share of the material and labor costs associated with constructing and maintaining the pole is flat wrong. Typically, entities sharing Verizon NW's poles (with the exception of electric utilities) do not share in the material and labor costs associated with constructing or maintaining the structure, as assumed by HM 5.3. Instead, they pay annual attachment fees established by regulators.[119] As such, in the real world, Verizon NW actually pays the cost of constructing and maintaining

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[117] Before the California Public Utilities Commission, Application Nos. 01-02-024, et al., *Declaration of John C. Klick in support of AT&T's Opening Statement* (Oct. 18, 2002) at JCK-2, p. 19 ("CA Klick Decl.").
[118] Before the Florida Public Service Commission, Docket No. 98-0696TP, *Order No. PSC-99-0068-FOF-TP* (Jan. 7, 1999) at p. 129.

the pole and receives a minimal annual attachment fee, which can be used to offset the annual cost of the pole. The revenue from this minimal attachment fee does not come close to the substantial -- and utterly unrealistic -- cost reductions assumed by HM 5.3.

Q. HOW DOES THIS ASSUMPTION REGARDING STRUCTURE SHARING IMPACT THE UNE COST ESTIMATES?

A. This failure to account for the fact that many entities sharing Verizon NW's poles pay minimal attachment fees, as opposed to a proportionate share, significantly reduces the UNE cost estimates produced by the Model. The following table illustrates the impact of HM 5.3's erroneous aerial structure sharing assumptions. For illustrative purposes, a pole investment of $700 and an annual carrying charge (i.e., maintenance, depreciation, and capital costs) of 20 percent are used.

[119] Mr. Richter discusses these aerial sharing assumptions in more detail in Section V (pp. 17-22) of his Reply Testimony.

TABLE 3

Impact of HM 5.3's Aerial Structure Sharing Assumptions with Other Utilities

	Impact of HM 5.3 Sharing
Annual Cost of Pole	**$140**
Cost Assigned to Other User	**$98 =(70% of $140)**
ILEC Annual Cost after HM 5.3 Sharing	**$42**
	Actual "Sharing"
User Attachment Fee	**$3.60**[120]
ILEC Actual Cost Based on Real Attachment Fees	**$136.40=($140 - $3.60)**

This table shows that HM 5.3's aerial structure sharing fraction produces a yearly cost per-pole of only $42 (30 percent of the cost of the pole). This is significantly less than the actual cost that Verizon NW would incur, even given the annual attachment fees it receives from other carriers.[121]

Q. HAVE YOU IDENTIFIED ANY ADDITIONAL PROBLEMS WITH HM 5.3'S SHARING ASSUMPTIONS?

[120] All numbers in this table are illustrative except for the $3.60 attachment fee, which is the actual 2003 fee that Verizon NW is allowed to levy annually. *See* Section V (pp. 17-22), of Mr. Richter's Reply Testimony.
[121] Dr. Tardiff's Table 2A conclusively demonstrates that HM 5.3 produces only $26.7 million in pole investment, far less than Verizon NW's current investment ($66 .8 million).

A. Yes. The approach used by HM 5.3 to develop the investments that are "shared" is also wrong, as it includes items of OSP that are not "shared" with other carriers. As the HM 5.3 Inputs Portfolio recognizes, "The exempt material load on direct labor includes ancillary material not considered by FCC Part 32 as a unit of plant. This includes items such as down-guys and anchors that are already included in the placement labor cost."[122] Because down-guys are placed by a specific carrier based on the stress of their plant on a specific pole, down-guys are not shared plant and their costs should not be assumed to be shared between carriers. AT&T/MCI's inclusion of these exempt materials as a loading on the labor rate causes the associated investment to be inappropriately shared with other utilities, thereby further understating the structure costs attributable to Verizon NW.

Q. WHAT HAS AT&T/MCI'S OUTSIDE PLANT CONSULTANT, MR. DONOVAN, SAID WITH RESPECT TO ATTACHMENT FEES?

A. Mr. Donovan long ago advised the HAI Model developers that the attachment fees for the sharing of poles and the rental schedules for underground conduit can be readily identified and are publicly available. In a Colorado deposition, Mr. Donovan was asked if he made any recommendations that were not included in the Model. He responded, "The one that I clearly remember is a recommendation that the model utilize attachment fees for poles and occupancy fees for conduits, since they were established in most venues and already priced

[122] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 3.4.1, p. 28.

by a variety of regulatory bodies."[123] He apparently advised the HAI Model developers to use this real-world information in order to identify and reflect the revenue offsets that should be the basis for structure sharing with other utilities. The HAI Model developers -- including the sponsors of HM 5.3 in the instant proceeding -- chose to ignore Mr. Donovan's recommendation. Nevertheless, Mr. Donovan continues to support HM 5.3's structure sharing assumptions. Conversely (and consistent with Mr. Donovan's initial recommendations to the model developers), VzCost specifically identifies Verizon NW's solely-owned poles, jointly-owned poles, attachment fees paid to other utilities, and attachment fees received from other utilities when calculating the costs associated with structure sharing with other utilities.

Q. HAS AT&T EVER TAKEN A DIFFERENT POSITION WITH REGARDS TO STRUCTURE SHARING?

A. Yes. AT&T was quoted in an article entitled "Can You Dig It?" (which discusses the sharing of trenches for placing fiber-optic cable) as stating:

> The battle between cities tired of torn-up streets and optical fiber companies trying to meet the demand for fast Internet access is intensifying … Even if co-trenching information does get out, the odds that all interested carriers will agree on the exact location of a trench are slim, since most extend fiber when customers order it. To lay fiber in a city's designated area, just in case, is 'inefficient business'….[124]

[123] Before the Public Utilities Commission of the State of Colorado, Case No. 96S-331T, *Deposition of John Donovan* (April 9, 1997) at p. 18.
[124] "Can You Dig It?" by Max Smetannikov, Interactive Week (Feb. 12, 2001).

In another proceeding, a witness testifying for AT&T Broadband stated, "AT&T Broadband, in generally upgrading its facility, doesn't have an opportunity to share our facilities. Considering our market, they're specific for our network and to the coaxial cable, so there may be no sharing opportunity."[125] As the aforementioned quotes make clear, Verizon NW's opportunities for sharing structure are quite limited, and not nearly as extensive as AT&T/MCI would have the Commission believe.

B. THE CUMULATIVE EFFECT OF THE VARIOUS AND OVERSTATED SHARING ASSUMPTIONS PRODUCE UNREALISTIC RESULTS

Q. WHAT IMPACT DOES THE MODEL'S SHARING ASSUMPTIONS HAVE ON FEEDER STRUCTURE INVESTMENT?

A. Just as HM 5.3's unreasonable sharing assumptions result in the removal of 70 percent of the distribution structure investment from the loop UNE costs, the same is true for the Model's feeder structure investment.[126] As shown in Chart 3 below,[127] HM 5.3 begins with $125,149,799 in feeder structure investment, and assumes that portions of this investment will be shared with other utilities, and thus are removed from the feeder structure investment. As can be seen from this chart, $34,694,302 (28 percent of the total) of DS-0, DS-1 and DS-3 investment

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[125] Before the Public Service Commission of Utah, Docket No. 01-049-85, *Statements by Letty S.D. Friesen on behalf of AT&T Broadband and AT&T Communications* (Oct. 22, 2002).

[126] I discuss why HM 5.3 understates feeder investment prior to the application of "sharing" values in Section IV.

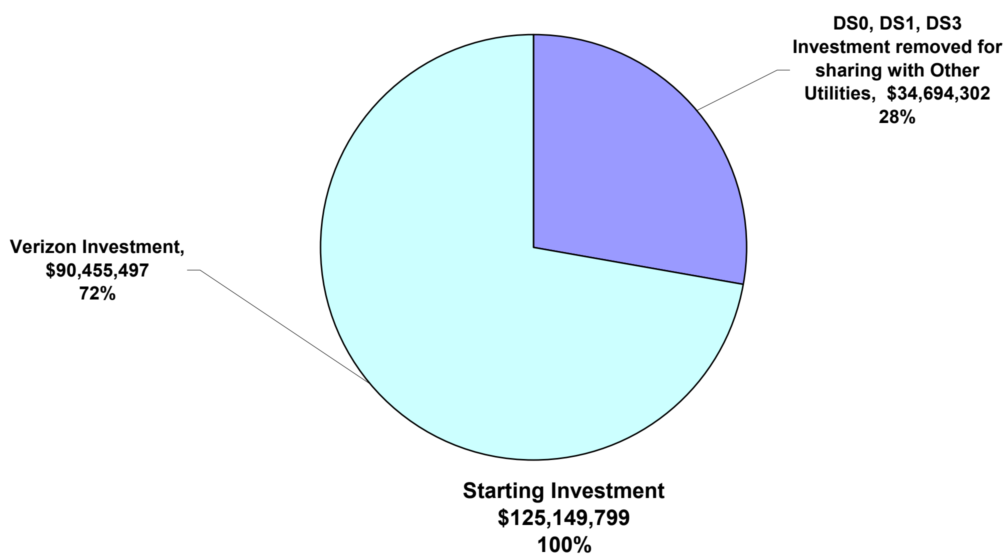
[127] Because HM 5.3 actually calculates sharing investments in different modules and in convoluted manner, the exact value of the investment loss for each of the differing sharing assumptions (e.g., feeder/distribution, other carriers, etc.) may vary depending on the procedure used. Therefore, there may be slightly different values for the various types of sharing (i.e., with distribution, with IOF, with high-

are removed for sharing with other utilities, leaving $90,455,497 of feeder structure investment that is assigned to Verizon NW's feeder facilities.

CHART 3

FEEDER SHARING WITH OTHER CARRIERS

Verizon NW
HM 5.3 Feeder Structure Investment



The remaining feeder structure investment is then further reduced by the dubious sharing assumptions and definitions, which were derived almost entirely from the unsupported opinions of AT&T/MCI's consultants. As shown in Chart 4 below, $22,480,355 (25 percent of the remainder) of the feeder structure investment is removed to account for the sharing of feeder with IOF; and $5,829,560 (six

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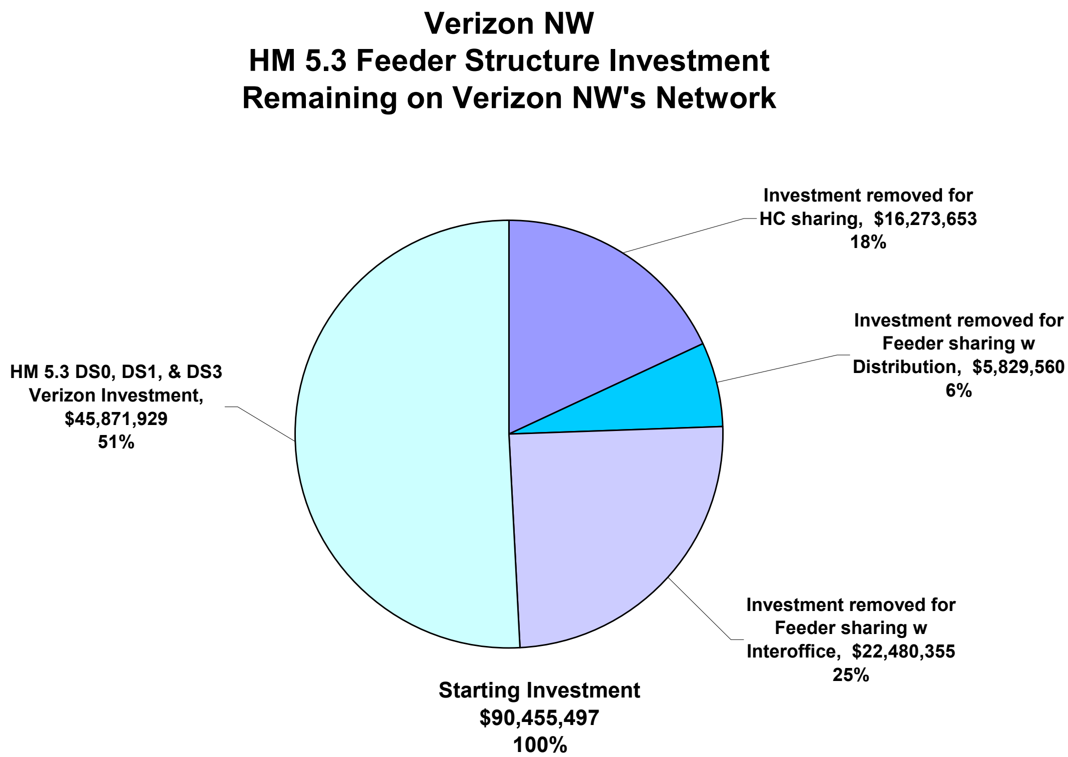
capacity, and with other carriers) depending on the method and sequence used to isolate the values. Nevertheless, the total investment loss will remain the same.

percent of the remainder) of the investment is removed to account for the sharing of feeder with distribution facilities. To understand the total impact of the sharing of feeder and distribution facilities, the reductions computed by HM 5.3 for feeder structure ($8,505,929 from Chart 2), and the reductions for distribution structure ($5,829,560 from Chart 4) must be combined, for a total of $14,335,489 in investment that is removed from the Model. In addition, because the Model now includes an all-fiber high-capacity network (on too many routes with too many fiber strands, as I explain later) another $16,273,653 (18 percent of the total) is removed from the feeder structure investment. In the end, only $45,871,929 (37 percent of the original feeder structure investment of $125,149,799 shown on Chart 3) is actually assigned to the feeder facilities and ultimately to HM 5.3's loop and sub-loop UNE cost estimates.

CHART 4

FEEDER SHARING WITH IOF, DISTRIBUTION & HI-CAP SERVICES



Q. DO YOU AGREE WITH MR. SPINKS THAT THE ADOPTION OF THE COMMISSION'S SHARING INPUTS FROM THE PREVIOUS UNE PROCEEDING WILL REMEDY THIS INAPPROPRIATE ELIMINATION OF INVESTMENTS?[128]

A. Only in a very limited way. The Commission and Mr. Spinks are right to identify the unrealistic aspects of AT&T/MCI's exaggerated sharing assumptions; and the revised inputs Mr. Spinks advocates will remedy the problems associated

[128] Spinks Supplemental Direct Testimony at pp. 8-9.

therewith to some extent by restoring some of the structure investment presently shared with other utilities. Adopting the Commission's sharing inputs from the previous UNE proceeding (as Mr. Spinks recommends) will do nothing to remedy the fact that HM 5.3 improperly discards investments under the guise of sharing between different portions of the network (i.e., distribution, feeder, IOF and, the newly-created high-capacity network investment).

C. SHARING ASSUMPTIONS ARE INCONSISTENT WITH HM 5.3'S NETWORK DESIGN

Q. ARE HM 5.3'S SHARING INPUTS CONSISTENT WITH THE MODEL'S FEEDER, DISTRIBUTION, AND IOF NETWORK DESIGN ASSUMPTIONS AND INPUT VALUES?

A. No. AT&T/MCI's structure sharing inputs are inconsistent with HM 5.3's network design assumptions and input values. HM 5.3 erroneously designs the network for loop feeder, loop distribution, and interoffice transport based solely on the unsupported assumptions of AT&T/MCI's consultants regarding the demand requirements unique to each portion of the network -- HM 5.3 completely fails to account for the demand associated with other services and other users. As such, the structure costs incorporated into each of these separate, and effectively isolated, network designs do not reflect the additional costs that would be required when designing a real-world network, which necessarily must be based on the total feeder, distribution, and IOF demand, as well as the needs of other utilities that share structure with Verizon NW.

Q. CAN YOU PROVIDE SOME EXAMPLES?

A. Yes. One example of the Model's internally inconsistent sharing assumptions relates to the sharing of structure between interoffice fiber cables and feeder cables. HM 5.3 assumes that these cables share structure over 75 percent of the modeled IOF route distance. However, when spacing the poles to support these cables, the Model assumes, with respect to interoffice fiber cables, that the poles are always spaced 150 feet apart; whereas the poles used to support the feeder cables (and assumed to be sharing structure with the IOF cables) are spaced differently depending on the density zone.

Another example of HM 5.3's internal inconsistencies is that, despite the high degree of sharing assumed by the Model for interoffice and feeder cables, the structure mix for IOF is fixed regardless of the density zone, whereas the structure mix for feeder varies depending on the density zone. The same types of inconsistencies can be found when comparing copper-to-fiber feeder structure and feeder-to-distribution structure across the various density zones, as discussed earlier in Section III of my Reply Testimony. In short, the Model's separated, and effectively isolated, network designs are incapable of consistently building structure for feeder and IOF routes such that the structure sharing assumptions used therein do not resemble what one would expect to find in the real world.

D. ERRONEOUS SHARING ASSUMPTIONS ASSOCIATED WITH HM 5.3'S HIGH-CAPACITY FIBER NETWORK

Q. PLEASE EXPLAIN THE SHARING PROBLEMS ASSOCIATED WITH HM 5.3'S MODELING OF ALL-FIBER LOOPS.

A. The root of the problem lies in HM 5.3's incorrect demand estimates, its erroneous use of that demand, and the incorrect network design associated with HM 5.3's high-capacity all-fiber network, which I discuss in the next section of my testimony. The net effect of these errors is to maximize the amount of OSP structure the Model assigns to the high-capacity services allegedly not at issue in this proceeding, thereby allowing AT&T/MCI to discard a substantial amount of OSP structure investment that should be included in HM 5.3's UNE costs.

HM 5.3 allocates the structure investment equally between the copper and fiber facilities on a cable sheath basis in the distribution network. For feeder, it allocates the structure first on the basis of cable sheaths, and then among the fiber facilities themselves based on the number of fiber strands modeled for POTS (i.e., DLC), DS-3, and other high-capacity services. HM 5.3 uses only the fiber costs associated with DLC systems and DS-3s in developing UNE costs. The rest of the fiber costs and the associated "shared" structure investment are discarded, including those associated with the DS-1s contained in HM 5.3's "Hi Cap optical" services category. Because of the demand errors in the all-fiber network, only a small percentage of the fiber network investment is actually used to estimate UNE costs, and a significant amount of OSP structure is inappropriately discarded. With respect to the demand for "Hi Cap optical" services,[129] HM 5.3 incorrectly includes and categorizes DS-1 (and probably DS-0) services in the same grouping as OC-N (i.e., the "Hi-Cap other" category). Had HM 5.3 correctly identified the 182[130] units of OC-N demand (of the total 2,869 units of Hi-Cap demand modeled by HM 5.3), only 6 percent of the high-capacity services (and their associated cost) would be appropriately categorized as not at issue in this proceeding -- not the ridiculous 77 percent that HM 5.3 uses to justify eliminating the $21,430,000 in OSP structure investment that HM 5.3 discards.[131]

V. HM 5.3 INCORRECTLY USES SERVICE DEMAND INFORMATION

A. HM 5.3 INCORRECTLY CREATES NON-EXISTENT DEMAND FOR HIGH-CAPACITY SERVICES

Q. DOES HM 5.3 ACCOUNT FOR VERIZON NW'S HIGH-CAPACITY DEMAND IN THE INTEROFFICE NETWORK?

A. No. HM 5.3 ignores the actual IOF demand for most of the HM 5.3's so called "Hi Cap optical" services (i.e., OC-N, DS-0 and DS-1 services) on fiber facilities when designing the modeled IOF network. Thus, AT&T/MCI are wrong to claim

[129] Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Twenty-First Supplemental Order Establishing Issues List* (April 6, 2004) at Appendix B ("Twenty-First Supp. Order") ("High capacity loops (except Ocn loops)").
[130]Verizon's Response to AT&T/XO's Request No. 001-005 (Dec. 17, 2002) identifies a total of 666 DS-3s and a total of 182 OC-N services in Verizon NW's current network.
[131] Dr. Tardiff notes that when he ran HM 5.3 eliminating all of the Hi-Cap optical demand, there was little impact to the basic 2-wire loop UNE. Tardiff Reply Testimony at Section VII A. That is because much of the inappropriately discarded $21,430,000 (i.e., distribution and feeder) in structure investment when brought back into the Model ends up being shared with other utilities, as opposed to being reassigned to the basic 2-wire loop, DS-1 and other loop UNE investment when the Hi-Cap demand is reduced. This is

that HM 5.3 has been enhanced and is now able to design a network capable of handling DS-1, DS-3, and other higher-capacity services (i.e., OC-N services).[132] Perhaps most notably, HM 5.3 only accounts for the demand (albeit incorrectly) for high-capacity optical services when constructing theoretical fiber routes *in the loop*. Other than a small portion of the "Hi Cap optical" category (i.e., the demand for DS-3s), HM 5.3 does not consider *any of the demand* for the remainder of the services contained in the "Hi Cap optical" category when designing the fiber cable and transmission equipment requirements in the IOF network.[133] That is, even though the majority of these services require IOF, the Model provides none, thereby understating IOF investment requirements.

1. HM 5.3'S TREATMENT OF HIGH-CAPACITY LOOPS IS FUNDAMENTALLY FLAWED

Q. WHAT ARE HIGH-CAPACITY LOOPS?

A. High-capacity loops are loops that provide high-speed digital services to end user subscribers (or CLECs in the case of UNEs). The minimum speed for the high-capacity loops discussed in this section is generally the DS-1, which is capable of carrying 24 simultaneous voice-grade conversations. The DS-1 loop UNE is one of two high-capacity loop UNEs at issue in this proceeding. The other high

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one reason why using Mr. Spinks' structure sharing assumption with other utilities only partially addresses the overly aggressive sharing problem.

[132] Mercer Supplemental Direct Testimony at RAM-4 (Model Description) at pp. 40 and 48.

[133] In fact AT&T/MCI have admitted that they do not know the quantities of services by circuit speed (i.e., capacity) that are assigned to the "Hi Cap optical" category. Before the Washington Utilities and Transportation Commission, Docket No. UT-023303, *Joint Responses of AT&T & MCI to Verizon NW's Ninth Set of Data Requests* (March 26, 2004) at Response No. 9-8b ("Joint Responses to Verizon's Ninth Set of Data Requests"). AT&T/MCI were asked to "[i]dentify the quantity, by circuit speed (i.e., DS-0, DS-1, OC-3, etc.), of all 'other high-capacity services' referenced therein." AT&T/MCI responded, "These

capacity loop UNE is the DS-3, which has the capacity of 28 DS-1s or 672 (i.e., 28 X 24 = 672) simultaneous voice-grade conversations.[134] Although not at issue in the current proceeding, there are other high-capacity loops in Verizon NW's network. These include the OC-3 loops (with a capacity equal to 3 DS-3s, or 84 DS-1s (28 X 3) or 2,016 (84 X 24) simultaneous voice-grade conversations) and the OC-12 loops.

Q. ARE HM 5.3's HIGH-CAPACITY LOOP ENGINEERING AND NETWORK DESIGN ASSUMPTIONS APPROPRIATE?

A. No. HM 5.3's high-capacity loop calculations are premised on faulty engineering assumptions and unrealistic network designs. The Model designs the optical systems assumed to be carrying DS-3 loops with the unrealistic view that DS-3s are the only services that will be provisioned over such loop systems. Thus, HM 5.3 mistakenly assumes that these optical systems will never be of higher capacity than an OC-3 system, and thus ignores the fact that OC-12 and higher-capacity optical systems are required to provision multiple DS-3 loops and OC-3 services simultaneously. By failing to account for the full panoply of services that are provisioned over real-world optical systems, HM 5.3 produces cost estimates that are obviously wrong.

In addition, due to a mismatch between the number of OC-3 multiplexers that HM 5.3 designs for the wire center and customer premises ends of the

circuits are not broken down by individual circuit type, since the model does not require or utilize such information."

systems, two thirds of the modeled OC-3 optical systems (the exclusive and often inappropriate systems modeled for all high-capacity loops) are nonfunctional. I describe this modeling error in more detail below.

2. HM 5.3 DOES NOT CORRECTLY MODEL HIGH-CAPACITY LOOPS

Q. WHAT HIGH-CAPACITY DEMAND IS INCLUDED IN HM 5.3?

A. HM 5.3 contains 2,869 units of demand, which are categorized as “Hi Cap optical” services. While the aforementioned OC-N loops, as well as the all-fiber DS-1 loops, are allegedly included in this category,[135] HM 5.3 does not discretely identify any of these services.[136] Rather, they are all lumped into the non-specific “Hi Cap optical” category; and, the vast majority of them, are assumed not to be at issue in this proceeding. Verizon NW has tried to get a breakdown (by service type) of these 2,869 units of demand, but AT&T/MCI have steadfastly refused to provide this information.[137]

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[134] 1998 Eighth Supp. Order at Appendix C, p. 110, DS3 Definition (“Transmission of 672 voice channels at 44.736 megabits per second”).

[135] Joint Responses to Verizon’s Ninth Set of Data Requests at Response No. 9-8a. AT&T/MCI were asked to “[i]dentify the ‘other high-capacity services’ referenced therein by circuit speed (i.e., DS-0, DS-1, OC-3, etc.). AT&T/MCI responded that “other high capacity circuits” are “OC-n circuits, as well as any lower speed services that are specifically designated by Verizon as being served over fiber in the customer records provided to AT&T. The latter category principally includes loops associated with services that are specifically identified as being DS-1 provided over fiber.”

[136] Joint Responses to Verizon’s Ninth Set of Data Requests at Response No. 9-8b. AT&T/MCI were asked to “[i]dentify the quantity, by circuit speed (i.e., DS-0, DS-1, OC-3, etc.), of all ‘other high-capacity services’ referenced therein.” AT&T/MCI responded, “These circuits are not broken down by individual circuit type, since the model does not require or utilize such information.”

[137] Joint Responses to Verizon NW’s Ninth Set of Data Requests at Response No. 9-9. AT&T/MCI were asked to “identify how many of the 2869 HC optical services are DS-1, DS-3, OC-3, OC-12, OC-18, OC-24, OC-n (i.e., all other OC- services), DS-0 or other type of service.” AT&T/ MCI objected to this request and have yet to provide a response.

HM 5.3 also contains an identifiable subset of the "Hi Cap optical" category entitled "DS-3 optical," which contains some 668 units of demand. "DS-1 optical" is another subset, although the size of that subset is not identifiable.[138] In failing to identify the DS-1 optical subset, AT&T/MCI conveniently assume that the other 2,201 units of demand are the high-capacity optical services allegedly not at issue in this proceeding. Contrary to the assumption contained in HM 5.3, DS-1 loop UNEs are clearly at issue in this proceeding.[139]

In light of the foregoing, there is absolutely no merit to Staff witness Spinks' claim that HM 5.3 "explicitly models high capacity loops in the network."[140] What HM 5.3 designs is anything but a realistic representation of high-capacity services.

Q. DOES AT&T/MCI ACCOUNT FOR HIGH-CAPACITY LOOP DEMAND CORRECTLY?

A. No. AT&T/MCI fail to recognize that it is absolutely critical for a cost model (such as HM 5.3), which purports to design and size the entire network, to account for the demand associated with high-capacity loops and optical systems, as well as their associated electronic equipment. A cost model must recognize how many of each type of these services (i.e., DS-1, DS-3, OC-3, OC-12, OC-48) there are in the network in order to design and cost appropriately-sized optical systems. The presence (or absence) of any of these loop types has a profound effect on the manner in which both the DS-1 and DS-3 loops (and more importantly the

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138 Verizon California Workshop at p. 3645.
139 Twenty-First Supp. Order at Appendix B ("High capacity loops (except Ocn loops)").
140 Spinks Supplemental Direct at p. 8.

optical systems upon which they ride) are designed and the manner in which the costs for the different loops and UNEs are developed.

HM 5.3, on the other hand, is simply incapable of identifying how many of which types of high-capacity loops should be modeled in Verizon NW's forward-looking network. Nor is it able to accurately estimate the demand for high-capacity services or their requisite electronic equipment. For example, despite the fact that Dr. Mercer acknowledged in his testimony that DS-1s were included in the broader category of high-capacity optical loops,[141] and despite the fact that the costs of DS-1 UNEs are indeed at issue in this proceeding, HM 5.3 does not identify the cost of *any* fiber-based DS-1 loops included in the HM 5.3 "Hi Cap optical" category. The Model only estimates DS-1 UNE loop costs for the subset of DS-1 demand that AT&T/MCI arbitrarily have modeled over the narrowband HM 5.3 network.

Q. HOW ARE HIGH-CAPACITY LOOPS GENERALLY PROVISIONED?

A. With the exception of DS-1 loops, high-capacity loops are generally provisioned over fiber cables that extend all the way to the customer premises in a forward-looking network. ILECs typically build a fiber network to provide high-capacity loops.

Q. DOES HM 5.3 DESIGN HIGH-CAPACITY LOOPS TO THE CUSTOMER PREMISES?

[141] Mercer Supplemental Direct Testimony at p. 18.

A. No. Equally in error is Dr. Mercer's suggestion that HM 5.3 designs high-capacity fiber facilities directly to the customer premises. Even though the TNS clustering process geocoded and surrogated the locations of these "high-capacity" customers, AT&T/MCI removed all of these points from their analyses, and assumed (obviously incorrectly) that all high-capacity services were located at the same places as the POTS customers.[142] By allegedly assuming that there are four all-fiber services per route,[143] and assuming incorrectly that fiber route lengths are equal to only one-half the maximum possible loop length of the cluster, HM 5.3 is simply incapable of modeling high-capacity loops to the customer premises. In other words, HM 5.3 has replaced what was alleged to be a process whereby customer and service locations were precisely identified with a highly inaccurate set of simplifying assumptions, as described below.

For example, AT&T/MCI's assumption of four all-fiber services per route has a rather significant impact on the manner in which the Model allocates OSP loop structure between POTS and high-capacity loops. Consider a cluster that contains forty high-capacity loops. Because the Model assumes that there are four high-capacity services per route, the Model will assume that there will be ten (40/4) high-capacity optical service routes in that cluster. Since the Model also assumes that the length of each high-capacity optical route will be ½ the maximum distribution loop length in the cluster, the total high-capacity optical loop length in the cluster would be five times the maximum loop length (10 x ½ x

[142] Dippon Reply Testimony at Section II.
[143] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 3.12.4, p. 45.

maximum loop length). In some instances, this value even exceeds the total structure route length in the cluster.[144]

As I explained in the previous section, because the fiber routes are allegedly common with the copper distribution routes, the Model would allocate 50 percent of the distribution structure along the common route to high-capacity optical services. However, as I explain below, in some cases, this amount will exceed 50 percent of the total distribution structure in the cluster. According to the Model's calculations, in Verizon NW's serving area, 77 percent of that high-capacity optical loop structure investment (over $5 million) simply disappears from HM 5.3 at this point in the development of overall loop investment because just 23 percent of the "Hi Cap optical" category corresponds to DS-3 investment. As discussed in Section IV, AT&T/MCI's justification for eliminating this investment is that it is used to provide services and UNEs that do not "correspond to UNEs that are at issue in this proceeding."[145] However, as I have demonstrated, AT&T/MCI have incorrectly included services and UNEs that are at issue in this docket in their definition of "Hi Cap optical" services, and used this demand to design HM 5.3's all-fiber network. By over estimating the "Hi Cap optical" demand associated with these services, AT&T/MCI have incorrectly assigned excessive amounts of structure cost from the feeder and distribution networks to the all-fiber network, the vast majority of the costs of which they then disregard entirely.

[144] *See e.g.*, R53_distribution.xls, calculations, CBG/cluster 530610420061/c017, columns AN and FZ.
[145] Mercer Supplemental Direct Testimony at p. 20.

Q. WHAT OTHER ERRORS HAVE YOU IDENTIFIED WITH HM 5.3'S MODELING OF HIGH-CAPACITY SERVICES?

A. In a number of instances, HM 5.3's high-capacity optical cable distance calculations produce incredulous results. For example, in three clusters, HM 5.3 places much more high-capacity optical cable than there is structure to support it.[146] And in twenty-three clusters, the high-capacity optical cable distance calculated by the Model is more than 50 percent of the total distribution structure length.[147]

Based on our understanding of the information provided in the HM 5.3 Model Description and in response to Verizon's data request inquiries,[148] this should not happen. The fact that "[i]t is assumed the distribution fiber routes are overlaid on the cable routes required to serve copper-based service,"[149] combined with the Model's assumption that "each fiber route has a length measured from the DLC/SAI location equal to ½ the maximum possible loop length calculated for the cluster," leads to the conclusion that this fiber network should occupy the same structure (i.e., poles, trenches and conduit) as the distribution backbone and branch cables for up to ½ the total backbone and branch distance. As previously discussed, it does not.

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[146] This result contradicts Section 8.8 of the Model Description, which states, "This (the Model's provision for structure sharing) is done by comparing the total Fiber route distance to the total POTS distribution route distance in the cluster (capped at 1.0), and applying a user adjustable fiber structure sharing factor."
[147] While HM 5.3 models 271 clusters with high-capacity services, these twenty-three clusters contain 49% of the 2,869 high-capacity services.
[148] AT&T/MCI have thus far failed to respond to our request for their definition of "distribution fiber routes." *See* Joint Responses to Verizon's Ninth Set of Data Requests at Response No. 9-10.
[149] Joint Responses to Verizon 's Ninth Set of Data Requests at Response No. 9-10.

Q. ARE THE FIBER CABLE SIZING CALCULATIONS THAT HM 5.3 PERFORMS CONSISTENT BETWEEN THE DISTRIBUTION AND FEEDER MODULES?

A. No. HM 5.3's calculation of fiber cable sizes between the distribution and feeder modules is inconsistent, and ultimately makes no sense.

HM 5.3 uses an input value of 2,869 high-capacity optical services,[150] which includes 668 DS-3 services,[151] for Verizon NW's Washington serving area. Since AT&T/MCI base their high-capacity route design on an "observation in the geocoded database that there are approximately four high-cap services per building,"[152] the Model should design fiber to approximately 717 buildings (i.e. 2,869 services/4 services per building = 717.25 buildings). There does not appear to be any disagreement between the parties that using technology available today, virtually any combination of high-capacity services (i.e., DS-1, DS-3, OC-3, OC-12, etc.) could be provisioned to a customer building using four (or fewer) fibers.[153] As such, the number of required fibers should equal the units of demand -- i.e., the Model should produce a requirement for approximately 2,869 working fibers (i.e., 717.25 buildings x 4 fibers per building = 2,869 fibers) to provide all of the high-capacity services in these 717 buildings. However, HM 5.3 produces an inflated requirement of 3,420[154] working fibers in its high-capacity fiber cable investment calculations, and artificially adds fiber-optic cable

[150] HM532k, R53_distribution.xls, cluster input data, col. AS.
[151] HM532k, R53_distribution.xls, cluster input data, col. AT.
[152] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 3.12.4, p. 47.
[153] Verizon California Workshop at pp. 3654-3655.
[154] HM532k, R53_distribution.xls, calculations, col. FX. The Model sponsors may attribute this difference to modularity. However, the difference would be much less if the "four-fiber, four-service" per route issue discussed above was corrected.

(carrying 551 additional working fibers)[155] for non-existent high capacity service demand to an additional 138 buildings over distribution cable "routes" that do not require fiber optic cable. This brings the total buildings served with high-capacity optical services to 855 (not 717), for an average high-capacity services per location of 3.35, not 4 as stated in the Model documentation.[156] This obviously inflates the number of distribution "routes" required.

HM 5.3's creation of cable investment for non-existent high-capacity service demand does not end with the investment calculations that are done in the Model's distribution module. By assigning 4 fibers per service, instead of per building, the feeder module calculates cable investment for high-capacity services based on an astounding 11,476 working fiber strands (i.e., 2,869 high-capacity optical services x 4 feeder fibers per service = 11,476 feeder fibers).[157] In developing investment for this highly inflated quantity of working fibers, HM 5.3 produces enough fiber feeder cable investment to provide high-capacity fiber service to 2,869 buildings -- four times the number expected based on the four services per building assumption in the Model documentation. Not only is 11,476 working feeder fibers four times the number of fibers one would expect, such results make no sense technically. The number of working high-capacity optical feeder fibers should be exactly the same as the number of working high-capacity

[155] These additional fiber requirements are created prior to cable sizing and are, therefore, not the result of breakage due to HM 5.3's use of discrete fiber cable sizes. In addition, it is important to note that my discussion of excessive fiber cable in the loop is focused on required/working fibers, not on spare fiber levels.
[156] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 3.12.4, p.47.
[157] HM532k, R53_feeder.xls, cable inv, cols. CY and CZ.

optical distribution fibers (i.e., 1 distribution fiber = 1 feeder fiber) required. As the aforementioned examples demonstrate, this is certainly not the case.

At bottom, HM 5.3's overstatement of high-capacity fibers required in the distribution and feeder loop networks ultimately decreases all of the loop UNE cost estimates "at issue" in the instant proceeding. This is evident when one forces the Model to use the same number of high-capacity feeder fibers as it does for high-capacity distribution fibers. This single change results in an increase of over $10,000,000 in total investment associated with the loop UNEs "at issue" in this proceeding. It also has a significant impact on the unit cost produced for DS-3 loops, which jump nearly 4.5 percent (to $682 per month). While similar corrections to all of the Model's flawed structure sharing and loop design assumptions are simply impossible given that so many of HM 5.3's key cost drivers and inappropriate engineering assumptions are buried in the Model's preprocessing, and/or would require extensive reprogramming of its algorithms, it is clear that the cumulative effect of correcting these errors and flawed assumptions would be to increase substantially the loop UNE costs at issue in this proceeding.

Q. DOES HM 5.3'S FEEDER MODULE CONSISTENTLY TREAT HIGH-CAPACITY SERVICES?

A. No. HM 5.3's inconsistent treatment of high-capacity services permeates the Model's feeder module as well. While the feeder module begins with a requirement for over 11,000 working fiber strands for "Hi Cap optical" services,[158] it inexplicably produces only 4,896 working fiber strands for both high-capacity and POTS services at the wire center end of the feeder routes.[159] As a result, the modeled network is simply nonfunctional.

3. HM 5.3'S TREATMENT OF DS-3 SERVICES IS FLAWED

Q. HOW ARE DS-3S PROVISIONED IN A REAL-WORLD, FORWARD-LOOKING NETWORK?

A. In a real-world, forward-looking network, DS-3s will always ride on fiber, whether or not the DS-3 is traversing the loop or the IOF portion of the network. In order to get on a fiber transport medium, the DS-3 must go through an OC-N multiplexer.

DS-3s are provisioned over optical systems of sufficient capacity to meet all of the demand on the specific route that must be traversed. For example, consider an end user that demands 8 OC-3s, 18 DS-3s and 32 DS-1s. The engineer must look at this level of total demand for high-capacity service at this location and determine the overall capacity requirements of these demanded fiber-based services. This enables the engineer to verify the appropriate quantity and types of multiplexing equipment that can be placed on a single fiber optic

[158] HM 5.3's allocation of OSP feeder structure is based in part on this highly inflated working fiber requirement.
[159] The 4,896 working fiber strands are not the basis for HM 5.3's allocation of OSP feeder structure.

system.[160] In this example, the engineer would begin by assessing the required optical system capacity beginning with the DS-1s and working up through the OC-3s. Ultimately, the engineer would determine the overall capacity required for the optical system used to provide all of the demanded services to the customer location. The following table displays the required calculations:

TABLE 4

Service Demand	Calculation of Required DS-3s	DS-3s Required
32 DS-1s	32 DS-1s / 28 DS-1s per DS-3 (rounded up)	2
18 DS-3s	18 DS-3s	18
8 OC-3s	8 OC-3s x 3 DS-3 per OC-3	24
	Total DS-3 equivalents required	44

Having performed these calculations, the engineer would next examine which of the available circuit speeds has the capacity to handle the overall demand for service to this location. These OC-N systems only come in discrete sizes and, once established, are fixed. As such, the appropriate choice in this case would be to establish an OC-48 optical system over the all-fiber network to this customer location. The OC-48 optical system would then be demultiplexed to provide the demanded services and/or UNEs. Since HM 5.3 cannot and does not differentiate between the types of high-capacity loops demanded (other than DS-3s), it cannot possibly model the correct types (i.e., speeds) or quantities of multiplexing equipment required to provision any of these services.

[160] This fiber optic system may consist of a set of either 2 or 4 fiber strands, depending on the configuration chosen.

Q. DOES MR. DONOVAN UNDERSTAND HOW DS-3S ARE PROVISIONED IN THE REAL WORLD?

A. Apparently so. Mr. Donovan was recently asked how he would provide service to real-world customers, where one requests two DS-3s, and another requests three DS-3s and one OC-3.[161] Mr. Donovan stated that he would provide service to the first customer with a single OC-3 multiplexer using from one to four fibers, and that he would use a single OC-12 multiplexer and from one to four fibers to serve the second customer.[162] In contrast, since the Model assigns one multiplexer and four fibers for each DS-3, it would serve the first customer with two multiplexers using 8 fibers and the second customer with 3 multiplexers using 16 fibers. Thus, the Model will overstate fiber requirements to these two customers by at least 16 fibers, and will fail completely to provide the OC-3 service. Further, as discussed previously, the Model would discard the vast majority of the overstated costs attributed to this portion of the all-fiber network.

Q. DOESN'T AT&T/MCI CLAIM TO HAVE MODIFIED HM 5.3 SO THAT IT MODELS ALL-FIBER LOOPS FOR DS-3 SERVICES?

A. Yes, but the Model's overall approach to modeling all-fiber loops for DS-3 services is wrong, and results in substantially understated investment for the equipment needed to provision these services.

[161] Verizon California Workshop at pp. 3654-55.
[162] *Id.*

The Model assumes that each of the 668 DS-3s that it designs is provisioned over an OC-3 *point-to-point optical system* at the customer location, and that the wire center end of these systems is part of a *SONET loop ring system*. In other words, the point-to-point optical system at the customer locations follows the same backbone and branch routes assumed for the narrowband loop network, whereas the SONET loop ring system is looped through customer premises in a continuous fiber ring. This type of a mismatched network configuration would never work because most of the customer multiplexers and fiber optic cables could not be physically connected to the network.

Moreover, there is a mismatch between the number of multiplexers and fibers modeled at the customer premises and the wire center -- again, resulting in a nonfunctional network configuration. Specifically, the Model assumes that there will be one OC-3 multiplexer at the customer premises for each unit of DS-3 high-capacity demand, and approximately one-third of an OC-3 multiplexer (adjusted by a 90 percent fill factor) for each unit of DS-3 high-capacity demand at the wire center.[163] Each customer premises multiplexer is connected to a set of fiber cables (i.e., four fiber strands) extending from the customer location to the wire center. Each of a considerably smaller amount of wire center multiplexers is assumed to be connected to a similarly smaller number of fiber cable sets (approximately 1.3 pigtail fibers[164] for each unit of DS-3 demand)

[163] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 3.12.6, p.46.
[164] Pigtail fiber cables provide individual fibers that are spliced to the outside plant fibers at one end and plugged into the optical multiplexer at their other end.

extending from the wire center multiplexer to the loop fiber feeder splice patch panel. As mentioned above, HM 5.3 assumes that the OC-3 multiplexers at the wire center will have a 90 percent fill, meaning that the vast majority of these multiplexers are assumed to serve three DS-3s each, while the customer premises multiplexers are assumed to serve only one DS-3 each. The result is a 3-to-1 mismatch between the multiplexer and fiber counts at the central office and customer ends of the DS-3 circuits. Putting aside the fact that this faulty network configuration would never work, it is impossible to have a point-to-point OC-3 loop system with different utilization levels at the two ends of the point-to-point system.[165]

Q. ARE HM 5.3'S LOOP MULTIPLEXER COSTS CONSISTENT WITH HM 5.3'S IOF MULTIPLEXER COSTS?

A. No, they are not and the disparity raises some questions. There is absolutely no reason to think that an OC-3 multiplexer will have a radically different cost when used in the loop versus the IOF portion of the network. However, AT&T/MCI's reliance on "expert opinion" for the loop multiplex costs, combined with their use of BellSouth cost inputs for the IOF multiplex costs,[166] achieve precisely that result. Had AT&T/MCI modeled these loop multiplex costs consistent with the HM 5.3's inputs, costs would be significantly higher than the $8,000 assumed for the OC-3 multiplexer shelf in the central office and the $8,799 cost for the

[165] In order to have varying levels of utilization at different nodes on a fiber optic transmission system, there must be a minimum of *three* nodes, each with an add-drop multiplexer. HM 5.3 erroneously models two node loop systems.
[166] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 5.5.1, p. 106.

customer premise multiplexer. In fact, the IOF OC-3 multiplexer costs used in the Model -- which are realistic and verifiable inputs developed by BellSouth -- range from $33,764 to $21,260, depending on the level of DS-1 tributary requirements.[167] The installed costs for OC-3/DS-1 multiplexers used by Verizon NW in its cost model are within this same price range.[168]

Equally problematic is the fact that HM 5.3 omits essential equipment and understates the material and installation investment for fiber loops. For example, HM 5.3 models the DS-3 equipment at the customer premises, but fails to account for the costs of the cabinet to house that DS-3 equipment. Moreover, as discussed above, HM 5.3 fails to model the requisite amount of fiber strand terminations (i.e., duplex fiber pigtails at $60 each) in the central office, and ignores completely the need for patch panel or splice investment at the feeder/distribution interface point. These omissions, among others, operate to significantly reduce the cost estimates produced by HM 5.3.

In short, HM 5.3's approach to modeling high-capacity loops in general, and DS-1 and DS-3 loops in particular, is a gross oversimplification that is riddled with errors. The Model's approach to designing and costing high-capacity loops is entirely divorced from the manner in which Verizon NW provides (or would provide) such loops today or on a going-forward basis.

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[167] An IOF OC-3 ADM with DS-1 tributary cards is $33,764, whereas an IOF OC-3 ADM without DS-1 tributary cards is $21,260. Had AT&T/MCI modeled the all-fiber DS-1s properly, many of the loop OC-3 multiplexers would have been equipped with the DS-1 interface cards.
[168] VzCost Model, WA FLM 150, v2.xls.

B. HM 5.3'S IOF DESIGN IS FUNDAMENTALLY FLAWED BECAUSE ITS ERRONEOUS TREATMENT OF SERVICE DEMAND

Q. HOW DOES HM 5.3 MISHANDLE THE SERVICE DEMANDS FOR IOF FACILITIES?

A. The Model builds IOF (and switching) facilities to only a handful of IXC POPs based on a faulty non-TELRIC compliant approach that relies upon the total amount of end-office DEMs for switched trunks and a convoluted, misguided guess at the amount of dedicated IOF demand. Even assuming that HM 5.3's approach was appropriate, which it is not, the premise upon which it is based is erroneous and fails to reflect the manner in which actual carriers construct telecommunications networks. In the real-world, point-to-point IOF facility requirements (for trunks and transport elements) are determined based on current and forecasted switched and non-switched demand between specific originating and terminating locations, including local switches, tandem switches, as well as the actual demand generated by CLECs, wireless carriers, and IXCs.

In contrast, the Model generally does not develop any point-to-point demand for switched or non-switched circuits, and completely ignores switched trunk demand from CLECs and wireless carriers. For switched trunk demand, it relies instead on a formula that melds (1) the historical switched minutes of use for the entire network (i.e. ARMIS reported DEMs), and (2) the numbers of customer lines at each switch into per-switch trunk requirements. As explained below, the Model makes further imprecise approximations to determine facility requirements for private line services.[169]

C. HM 5.3 INCORRECTLY ACCOUNTS FOR PRIVATE LINE DEMAND

Q. DOES HM 5.3 ACCURATELY MODEL POINT-TO-POINT SPECIAL SERVICES?

A. No. AT&T/MCI attempted, unsuccessfully, to model network demand that previous versions of the HAI Model were not equipped to handle. In doing so, HM 5.3 introduced numerous errors into its treatment of demand for network components, was riddled with errors, and, in some instances, ignored such demand completely. One obvious modeling flaw is the manner in which HM 5.3 attempts to model the facilities necessary to accommodate demand for dedicated, point-to-point (non-switched) intraLATA special services. The version of HM 5.3 filed with the Commission on June 26, 2003 erroneously treated 100 percent of this demand as dedicated access going to an IXC POP. (In response to testimony filed in a California UNE proceeding, AT&T/MCI dismissed the significance of this modeling error, claiming that the criticism "has merit, but only inasmuch as HM 5.3 lacks the data to determine the actual endpoints of the special service circuits in the network and, therefore, overstates the investment in entrance facilities."[170]) In reality, this modeling error decreases significantly the cost of dedicated transport, and to a lesser extent, common and direct transport.

[169] The Model only considers the local loop portion of point-to-point private line services in designing the network.
[170] Mercer CA SBC Rebuttal Declaration at p. 49.

It was not until their January 26, 2004 filing that AT&T/MCI introduced a user-adjustable input and an associated algorithm to reduce from 100 percent to 50 percent the amount of dedicated, point-to-point (non-switched) DS-1 and DS-3 special services that are treated as dedicated access going to IXC POPs.[171] Unfortunately, this "fix" did not solve the problem. While the Model treats the remaining 50 percent of these circuits as intra-office demand, it does not assign any of this non-switched, point-to-point interoffice, intraLATA service demand correctly. These errors infect nearly 92 percent of the dedicated access trunks designed by HM 5.3, and thus represent a significant modeling flaw. As shown in the following table, the costs of dedicated transport facilities can change by more than 300 percent depending on the treatment of non-switched point-to-point services in HM 5.3.[172]

TABLE 5

Dedicated Transport Price Sensitivity to Non-Switched Services Routing

Non-Switched Services Routed to IXC-POPs		UNE Recurring Price			
		Dedicated Transport per DS0	Dedicated Transport Terminal per DS0	Dedicated Transport Total per DS0	% Difference from Filed Costs
VGEs	%				
802,058	100%	$ 0.44	$ 2.91	$ 3.35	-27%
413,426	52%	$ 0.71	$ 3.86	$ 4.57	-
24,794	3%	$ 3.43	$ 11.13	$ 14.56	219%
-	0%	$ 4.63	$ 13.38	$ 18.01	294%

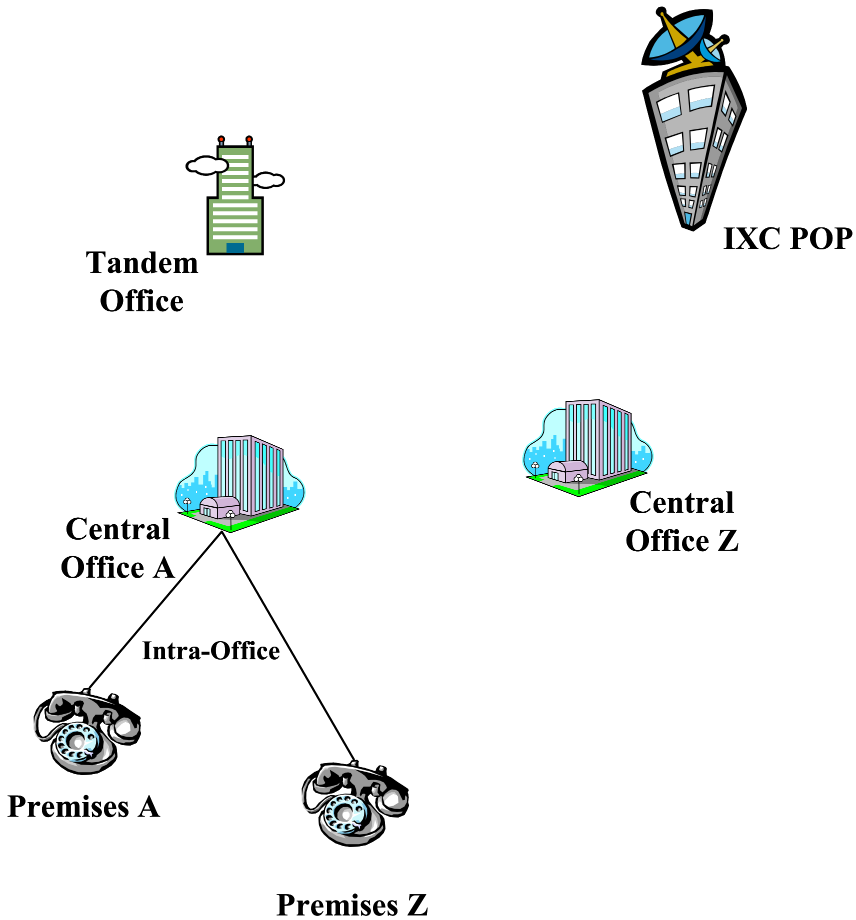
[171] It is important to note that the user-adjustable input only applies to the DS-1 and DS-3 services, and not the DS-0 services. All the DS-0s are routed through the IXC POP. Therefore, when the DS-1s and DS-3s are reduced to 50 percent, the number routed through the IXC POP is 52 percent of the total.
[172] *See* Dr. Tardiff's Reply Testimony for a further discussion of HM's "optimal rings" and the ring configuration's insensitivity to demand. It is important to note that, within the ring configurations, changes in demand create significant changes in cost outputs.

Q. CAN YOU ILLUSTRATE THE PROBLEMS ASSOCIATED WITH THE MODEL'S ERRONEOUS TREATMENT OF THESE SERVICES?

A. Yes. The problems associated with the Model's erroneous treatment of these services and the reason behind these wild price swings are demonstrated by the following Illustrations.

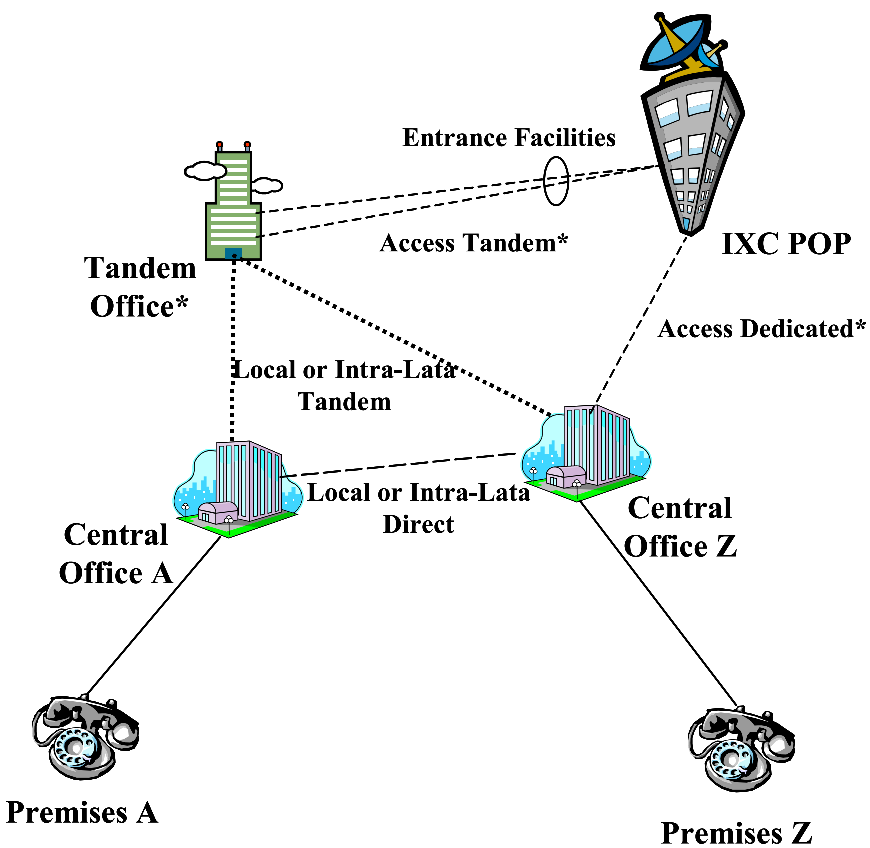
As shown in the Illustrations on the following pages, both ends of the facilities over which these point-to-point special services travel generally terminate at a customer's premises, with a few that have one end terminating in a central office. For some percentage of these circuits, the A and Z ends are in the same wire center and no interoffice facilities are required, as shown in Illustration 1.

Illustration 1



The balance of these types of circuits have their A and Z ends in different wire centers and the IOF demand is spread across various Verizon NW local and tandem facilities. For a small percentage, the A and Z ends are in different LATAs or states, and access facilities are used, as shown in Illustration 2.

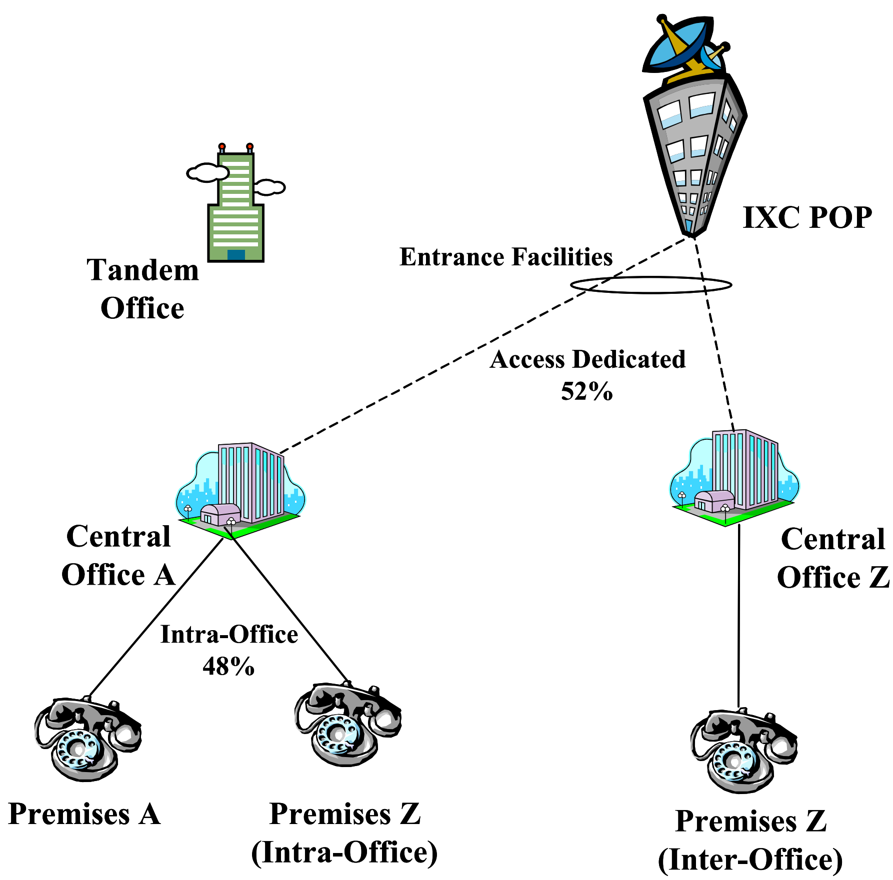
Illustration 2



•Notes: The Model inappropriately applies the 50% reduction to all non-switched DS-1s and DS-3s including those that are Access Circuits.
In some instances, the Tandem Offices and Local Central Offices are collocated In the same wire center.

Illustration 3 demonstrates the erroneous manner in which HM 5.3 routes these facilities. Rather than representing the facility demand for these point-to-point private-line services properly, HM 5.3 models 52 percent of the dedicated special services as special access lines routed via a pair of entrance facilities through an IXC POP.

<u>Illustration 3</u>



As a result of this flawed modeling assumption, HM 5.3 invents excessive demand for dedicated entrance facilities by incorrectly assuming that 100 percent of the individual non-switch services and all but 50 percent of non-switched DS-1 and DS-3 services require entrance facilities that terminate at an IXC POP.[173] HM 5.3 assumes two units of demand for entrance facilities for each circuit, which then inflate the denominator used in the Model's calculation of the per line Dedicated Transport Facility and Terminal costs used to develop the transport UNE rates. In fact, over 400,000 point-to-point special service circuits are arbitrarily included in the access direct trunk requirements, while another 400,000 are simply "assumed" to traverse only local loop facilities. None of these circuits are modeled on local or intra-LATA direct or tandem routed facilities. By using these arbitrary assumptions rather than the actual data provided by Verizon NW, the transport UNE rates produced by HM 5.3 may be understated by as much as $18 per DS-0 per month (see Table 5 above).

D. HM 5.3 IGNORES THE FACILITIES ORDERED BY SOME OF VERIZON NW'S LARGEST CUSTOMERS

Q. HOW DOES HM 5.3 TREAT THE FACILITIES ORDERED BY VERIZON NW'S NON-IXC INTERCONNECTING CUSTOMERS?

A. It does not account for them at all. HM 5.3 erroneously assumes that an ILEC builds only enough switched facilities to accommodate the understated amount of IXC switched trunks assumed by AT&T/MCI. As such, HM 5.3 fails to account

[173] Mercer Supplemental Direct Testimony at RAM-4 (Model Description) at Section 10.3.2.

for the actual number of trunks ordered by IXCs and ignores completely the demand for switched trunks ordered by wireless carriers, CLECs, and other carriers. This is a blatant violation of TELRIC requirements, and a flaw of which AT&T/MCI are well aware. This same modeling error was identified in a recent SBC California UNE proceeding and, while not disputing that this modeling flaw existed, AT&T/MCI did nothing to correct it.[174]

In the real world, an ILEC has to build facilities to meet the demand required by all these carriers. As such, the network modeled by HM 5.3 necessarily contains insufficient facilities to meet the IXCs', CLECs' and wireless carriers' demand for switched trunks, and significantly understates the investment needed for Verizon NW's IOF and switching networks. The reason for this model failing is unclear -- AT&T/MCI had ready access (through discovery) to Verizon NW's demand data, and thus were aware (or should have been) of the investment needed to operate a fully-functional network. Their reason for ignoring these data, and instead relying upon unverified (and ultimately erroneous) assumptions, is unknown.

The impact of this understated demand for switched trunks from other carriers is summarized in the table below.

[174] SBC Mercer Rebuttal Decl. at pp. 45-46.

TABLE 6

*****BEGIN VERIZON NW PROPRIETARY DATA**

END VERIZON NW PROPRIETARY DATA***

This understatement of investment is dramatic considering the fact that HM 5.3 models only four tandem switches. While HM 5.3 started with a basic tandem switch investment of $1,000,000, it reduced that amount by $500,000 to allow for "scaling of tandem switching investment according to trunk requirements."[175] HM 5.3 also reduced the remaining investment by the .4 tandem/EO factor, thereby leaving only $300,000 per tandem in common equipment and the majority of the tandem investment inappropriately dependent on the number of understated trunks. This error also significantly impacts the switched transport per minute of use rate elements, since the understated trunk quantities and their associated costs are ultimately divided by the total ARMIS reported DEMs including those DEMs associated with CLEC and wireless calls, thereby producing understated per minute of use costs.

VI. MANY OF HM 5.3'S INPUTS ARE UNSUPPORTED, RELY SOLELY ON THE UNSUBSTANTIATED OPINIONS OF AT&T/MCI'S CONSULTANTS, AND

[175] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 5.8.6, p. 122.

OFTEN CONFLICT WITH THE ASSUMPTIONS OF OTHER COST MODELS SPONSORED BY AT&T/MCI

A. MANY OF HM 5.3'S INPUTS RELY ON UNSUBSTANTIATED "EXPERT OPINION"

Q. ARE HM 5.3'S DEFAULT INPUT VALUES SUPPORTED BY ACCURATE, VERIFIABLE DATA?

A. No. The vast majority of HM 5.3's default inputs that have a significant impact on UNE costs are supported by nothing more than the unverifiable, subjective opinions of AT&T/MCI's consultants and the HAI Model developers,[176] often times despite the fact that verifiable empirical data are readily available. An extensive list of the instances in which HM 5.3's inputs are supported by nothing more than unsubstantiated "expert opinion" is attached hereto as Exhibit FJM-3.

Q. WHAT HAS THE FCC SAID CONCERNING THE HAI MODEL'S EXTENSIVE RELIANCE ON UNSUBSTANTIATED "EXPERT OPINION?"

A. The FCC rejected the HAI Model's extensive reliance on unsubstantiated "expert opinion" to support its modeling assumptions and input choices, stating, "We find that the expert opinions on which AT&T and MCI's proposed methodology relies lack additional support that would permit us to substantiate those opinions."[177] Notwithstanding the FCC's finding, AT&T/MCI continue to rely extensively on the

[176] *See* Donovan Direct Testimony at p. 26 ("The principal outside plant assumptions and inputs utilized in HM 5.3 reflect years of cost modeling efforts and the participation of multiple subject matter experts developing model inputs. The subject matter experts, including myself, have extensive outside plant engineering and construction experience in the design, construction and maintenance of local loop networks. The Model's principal outside plant inputs are based on expert opinion . . .").

unsubstantiated opinions of the HAI Model developers to substantiate many of the Model's most important inputs.

Q. WHAT HAS THE COMMISSION SAID CONCERNING THE HAI MODEL'S RELIANCE ON UNSUBSTANTIATED "EXPERT OPINION?"

A. The Commission has also rejected the HAI Model's extensive reliance on the HAI Model developers' unsubstantiated opinions to support the Model's assumptions and input choices, stating:

> The Commission agrees with GTE that the method used by AT&T to collect data from vendors was flawed … We find that the outside plant data collected from the vendors by the Hatfield engineering team do not provide sufficient validation for the opinion of these experts … In summary, the Commission disagrees with the method used by the Hatfield team to collect data from outside plant contractors … Furthermore, we find that it was inappropriate of the Hatfield engineering team to obtain the cost of labor from one bid and the cost of materials from another.[178]

AT&T/MCI have ignored the Commission's Order and continue to rely extensively on the faulty opinions of their consultants (much of it unchanged from what was filed in Washington previously) to substantiate many of the Model's inputs and assumptions.

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[177] Tenth Report and Order at ¶ 115. There are at least a dozen such cites in the FCC's Tenth Report and Order. *See Id.* at ¶¶ 102, 113, 115, 165, 171, 172, 211, 270, 279, 281, 297, and 327.
[178] 1998 Eighth Supp. Order ¶¶ 91-103.

B. "EXPERT OPINIONS" CHANGE WITHOUT ANY LEGITIMATE JUSTIFICATION

Q. PLEASE DESCRIBE SOME OF THE INSTANCES IN WHICH THE HAI MODEL DEVELOPERS HAVE CHANGED THEIR OPINION WITHOUT A LEGITIMATE JUSTIFICATION.

A. One instance in which the HAI Model developers changed their opinion without a legitimate justification is when they increased the maximum line size of a cluster from 1,800 lines in HM 5.2 to 6,451 in HM 5.3. As I described previously, using an exaggerated maximum line size for the clusters results in numerous violations of industry engineering guidelines and network design flaws. HM 5.3's sponsors have not offered a single, legitimate reason for their unnecessary -- and wholly inappropriate -- increase in the maximum line size of a cluster. Indeed, in developing the line-limit for its Synthesis Model, the FCC found the appropriate maximum distribution area size to be 1,800 lines.[179]

Q. HAVE THE HAI MODEL DEVELOPERS CHANGED THEIR OPINIONS REGARDING THE LABOR AND ENGINEERING ASSUMPTIONS ASSOCIATED WITH INSTALLING COPPER LOOP CABLE?

A. Yes. HM 5.3 invoked a radical change in this regard. Just a few years ago (in support of the assumption made by HM 5.2a), AT&T/MCI stated:

> In the opinion of expert outside plant engineers whose experience includes writing and administering hundreds of outside plant "estimate cases" (large undertakings), material

[179] Tenth Report and Order at Appendix A, p. A-1 (Input Values).

> represents approximately 40% of the total installed cost. This is a widely used rule of thumb among outside plant engineers. Such expert opinions were also used to determine that the average engineering content for installed copper cable is 15% of the installed cost. The remaining 45% represents direct labor for placing and splicing cable, exclusive of the cost of splicing block terminals into the cable.[180]

Mr. Donovan was one of AT&T/MCI's consultants responsible for the cable placement assumptions referenced above.[181]

Now, only three years later, the productivity assumptions and labor rates advocated by Mr. Donovan have changed substantially. For example, with respect to the labor task times and productivity inputs associated with copper cable, the changes are drastic, as the two tables below demonstrate.[182]

TABLE 7

	Percent of Copper Loop Cable Investment		
	HM 5.2	**HM 5.3**	**% Difference**
Material	40%	73%	82%
Placing & Splicing	45%	21%	-53%
Engineering	15%	6%	-61%

[180] Before the California Public Utilities Commission, Application Nos. 01-02-024, et al., HAI Model 5.2a Inputs Portfolio filed August 20, 2001, p. 22.
[181] Verizon California Workshop at p. 3649.
[182] For larger cables, the discrepancies are even worse, as shown in Table 8 of Dr. Tardiff's Reply Testimony.

TABLE 8

	HM 5.3 Copper Loop Cable Investment		
	Using HM 5.2 Labor	**Using HM 5.3 Labor**	**Difference**
Material	$69,659,339	$69,659,339	$0
Placing & Splicing	$78,459,335	$20,376,320	$(58,083,015)
Engineering	$26,235,404	$5,618,330	$(20,617,073)
Total Labor	$174,354,077	$95,653,989	$(78,700,088)

Q. ARE YOU AWARE OF ANY MAJOR CHANGES IN INSTALLATION PROCEDURES OR LABOR COSTS THAT WOULD JUSTIFY THESE DRASTIC CHANGES BETWEEN THE TWO VERSIONS OF THE MODEL?

A. No, I am not. In fact, you would have to go back about twenty-five years to find any significant changes in methods, procedures or technologies available to justify changes of the magnitude advocated by Mr. Donovan. There is thus no merit to Staff witness Spinks' claim that it was unnecessary to make the Commission's adjustments for cable costs because "the HAI cable cost inputs reflect more current cable cost information."[183]

Q. HAVE THE HAI MODEL DEVELOPERS CHANGED THEIR OPINION REGARDING THE LABOR REQUIRED TO INSTALL POLES?

[183] Spinks Supplemental Direct at p. 10.

A. Yes. In this proceeding, the labor input they used for installing poles is $216.[184] However, in a recent California proceeding, they filed a value of $242.50.

Q. WHAT IS THE MAJOR DIFFERENCE IN THESE TWO DIFFERENT INPUTS?

A. The difference has nothing to do with the relative difference in labor costs between the two states. Rather, the California version of HM 5.3 includes $25.66 per pole for labor associated with down-guys and anchor material, while the Washington version ignores these labor costs.

Q. WHO PROVIDED THESE MODEL INPUTS?

A. Mr. Donovan, AT&T/MCI's lead outside plant consultant, provided these model inputs in Washington and California.

Q. HAVE YOU DETERMINED WHAT THE CHANGE WOULD BE TO THE WASHINGTON LOOP UNE IF THE $242.50 LOOP INPUT WAS USED IN THE WASHINGTON VERSION OF HM 5.3?

A. Yes. The loop UNE would increase three cents, to $7.67 from the default value of $7.64.

Q. WHAT HAVE THE HAI MODEL DEVELOPERS DECIDED TO USE FOR SWITCH INVESTMENT INPUTS?

A. They are using the switch investments developed in 1998 for the Synthesis Model in the FCC USF proceeding. As I discuss below, use of these dated

[184] Mercer Supplemental Direct at RAM-5 (HIP) at Section 3.4.1, p. 25.

investment inputs creates a number of inconsistencies and flaws in the Model's logic.

Q. HOW IS THIS USE OF VINTAGE SWITCH INVESTMENTS INCONSISTENT WITH THE OTHER MODELING ASSUMPTIONS?

A. The Model's reliance on vintage FCC switch investments is inconsistent with the HAI Model developers' uncertainty as to what percentage of switching investments should be considered traffic sensitive. The Model developers justify using switch inputs that reflect zero usage sensitivity by claiming, "All recent versions of the HAI Model ensure the switches deployed by the Model include inputs that capture the capacity constraints on the switches."[185] But this is entirely inconsistent with the use of the dated Synthesis Model switch input investments, which are 70 percent traffic sensitive.

HM 5.3's assumption of zero usage sensitivity is also incorrect because forward-looking switch technologies have usage capacity limitations and a significant portion of the investment is usage sensitive. Thus, a per minute UNE is appropriate to reflect cost causation. This point is explained in more detail in the Reply Testimony of Willet Richter, Thomas Mazziotti and Harold West, III.[186]

Despite the fact that there have been no significant changes in the digital switching technologies used in the various versions of the HAI Model identified below, the HAI Model developers have changed their opinions significantly with

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[185] Mercer Supplemental Direct at RAM-5 (HIP) at Section 6.5.9, p. 141.

regard to the traffic sensitive nature of switching costs. Indeed, even if switching technologies had changed, HM 5.3 relies upon the switch inputs that were developed in 1998 for the FCC's Synthesis Model. There is thus no legitimate basis upon which the HAI Model developers can claim that their change is justified -- using vintage data, with a newly-derived expert gloss, does not make years-old data somehow "forward-looking."

TABLE 9

Model	Year	End Office Non Line-Port Cost Fraction
HM 5.2 NY	Feb. 2000	70%
HM 5.2a SBC CA	Aug. 2001	40%
HM 5.3 WA	Jan. 2003	0%

Q. WHAT EFFECT DOES THE REDUCTION OF HM 5.3'S TRAFFIC SENSITIVE INPUT HAVE ON THE COST ESTIMATES PRODUCED?

A. By reducing to zero the percentage of the switch assumed to be traffic sensitive, AT&T/MCI effectively eliminate the local switching per minute cost estimate and the rate element for local usage. Conversely, by including switch investment costs that result from the demands of high-usage customers into the costs of switch port rate element, HM 5.3 increases the prices paid by low-usage residence and business customers, and in effect subsidizes the prices paid by

[186] *See* the Reply Testimony of Messrs. Richter, Mazziotti and West for discussion of why the use of

the high-usage customers. As such, AT&T/MCI's proposed change appears to be a backdoor effort to adjust access usage fees by using UNE local switch usage as a proxy for access local switching. The Commission should reject their proposal outright.

Q. HAVE THE HAI MODEL DEVELOPERS CHANGED ANY OTHER SWITCH INPUTS?

A. Yes. In addition to the traffic sensitive nature of switching costs, the HAI Model developers have changed their opinion regarding the appropriate size of the switch room.

Q. WHO PROVIDES THE SUPPORT FOR AT&T/MCI'S CURRENT ASSUMPTIONS REGARDING SWITCH ROOM SIZE?

A. Mr. John Klick provided the support for the switch room size assumed by HM 5.3.[187] Mr. Klick is not a witness in this proceeding.

Q. HAS MR. KLICK PROVIDED SUPPORT FOR THE SWITCH ROOM SIZE PREVIOUSLY?

A. Yes. Mr. Klick originally provided AT&T/MCI with support for the switch room size in several collocation proceedings conducted several years ago (including Washington and California).[188] Since then, Mr. Klick has provided support for the

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usage-sensitive pricing is appropriate when estimating the costs of switching UNE.
[187] Mercer Supplemental Direct at RAM-5 (HIP) at Section 5.3.4, pp. 100-01.
[188] Before the Public Utilities Commission of the State of California, Docket Nos. I. 93-04-002/R.93-04-003, et al., *AT&T Communications of California, Inc.'s Response to Verizon California Inc.'s Data Request*

switch room size assumed by earlier versions of the HAI Model (see Table 10 below).

Q. WHAT DID MR. KLICK RECOMMEND WHEN HE SUPPORTED AT&T/MCI'S COLLOCATION COST MODEL ("CCM")?

A. When AT&T/MCI's CCM was filed, Mr. Klick claimed that the space required for the ILEC switch and MDF was almost 11,000 square feet.[189] However, in the last two versions of the HAI Model, the space required for the largest switch, and related equipment, has decreased significantly -- to 10,000 square feet in HM 5.2a and 4,500 square feet in HM 5.3. These current reductions are based solely on the unsubstantiated opinions of AT&T/MCI's consultants, and cite to no proven technological or other change that would justify the new space requirements. Indeed, even Mr. Klick admitted in a deposition that he had no study to support his recommended changes in switch room size.[190] The table below shows the changes in switch room size assumed by the HAI Model, all of which are based solely on the ever-changing and unsubstantiated opinions of their consultants. These changes ignore completely the fact that switching technologies over the years has remained relatively constant,[191] and thus there is

9-19 (Feb. 9, 2004) ("HM 5.3, and HM generally, has been coordinated with the Non-Recurring Cost Model ('NRCM') and the Collocation Cost Model ('CCM') that AT&T and MCI have filed, jointly in California as in many other jurisdictions.").

[189] The CCM also identified approximately 25,000 square feet of ILEC equipment space for cable vault, power, transport, tandem and other required equipment. The CCM assumed a central office with 12,000 square feet of floor space per floor and ancillary space for corridors, stairs, service shafts, etc. at 25 percent over the equipment space yielding a total of 15,000 square feet per floor. With an assumption of four floors per building, the total gross space was assumed to be 60,000 square feet per central office.

[190] CA Klick Depo. at p. 40.

[191] Mr. Klick acknowledged during his deposition in the SBC California UNE proceeding that any change would not be significant "to the extent I'm relying on something from circa '98, '99, if any change had

no credible reason why switch room sizes (and their associated costs) would be decreasing so drastically.

TABLE 10

Switch Room Size Sq. Feet of Floor Space Required		
Lines	**HM 5.3 Verizon NW Jan. 2004**	**HM 5.2a SBC CA Aug. 2001**
0	500	500
1,000	750	1,000
5,000	1,500	2,000
25,000	3,000	5,000
50,000	4,500	10,000

taken place since then, I would expect it to be a change that would result in yet smaller, more compact equipment. And, therefore, if one were to do such a study, one might find switch room sizes to be slightly smaller." CA Klick Depo at p. 40.

C. THE OPINIONS OF THE HAI MODEL DEVELOPERS AND AT&T/MCI'S CONSULTANTS DO NOT CHANGE EVEN WHEN THEY HAVE BEEN CRITICIZED AND REJECTED

Q. DO THE OPINIONS OF THE HAI MODEL DEVELOPERS AND AT&T/MCI'S CONSULTANTS GENERALLY CHANGE WHEN NEWER VERSIONS OF THE HAI MODEL ARE DEVELOPED?

A. No. In many instances, the opinions of the HAI Model developers and AT&T/MCI's consultants do not change at all, despite the passage of many years and the introduction of new technologies and operational realities. In fact, on numerous occasions, the opinions of AT&T/MCI's consultants have not wavered even in the face of valid criticisms (that have gone unaddressed). For example, a number of the HAI Model's default values were rejected in the FCC's Tenth Report and Order because the "expert opinions" on which they were based were "unsupported, and therefore unreliable."[192] The Commission criticized many of these same inputs and the faulty data used to support or validate the so-called "expert opinions" upon which they relied.[193] Despite HM 5.3's sponsors' claims

[192] Tenth Report and Order at ¶¶ 165 and 171.

[193] 1998 Eighth Supp. Order at ¶ 69 ("The Hatfield Model assumes that incumbent local exchange carriers would pay only one-third of the cable placement costs which would be required to reconstruct an efficient network."); *Id.* at ¶ 73 ("Commission Staff contends that the historical rate of sharing did not result in providers minimizing their production costs. They cautioned that the degree of sharing that takes place is constrained by the 'difficulty coordinating joint facility work.' … Staff's proposal is also designed to reflect that opportunities for sharing would be fewer in low density areas."); *Id.* at ¶ 76 ("For the Hatfield and BCPM scenarios we run in this proceeding, we have adopted the sharing assumptions recommended by Commission Staff."); *Id.* at ¶ 91 ("Mr. Fassett, AT&T's outside plant expert, added that the vendor price data were used to validate his and other experts' opinions."); *Id.* at ¶ 93 ("The Commission agrees with GTE that the method used by AT&T to collect data from vendors was flawed. … The AT&T questionnaire did not define the terms used in the questionnaire."); *Id.* at ¶ 95 ("Even if the terms had been defined in the questionnaire, the collection of data should have been done in a manner consistent with the way in which the information was to be used in the Hatfield Model."); *Id.* at ¶ 96 ("We find that the outside plant data collected from the vendors by the Hatfield engineering team do not provide sufficient validation for the opinion of these experts.").

that the Model has benefited from, and been updated to reflect, the criticisms of regulators,[194] this is just not so.

Q. WHAT INPUTS AND OPINIONS OF THE MODEL DEVELOPERS HAVE NOT CHANGED DESPITE THE FACT THAT REGULATORS HAVE REJECTED THEM?

A. Just a few of the default inputs and opinions that have remained constant in the face of valid extensive criticism, and rejection, by regulators are:

- Aerial drop placement;[195]
- Sharing amounts on drop wire;[196]
- Numerous plant structure cost inputs;[197] and

[194] Mercer Supplemental Direct at p. 32.
[195] 1998 Eighth Supp. Order at ¶ 96 ("We find that the outside plant data collected from the vendors by the Hatfield engineering team do not provide sufficient validation for the opinion of these experts."); Tenth Report and Order at ¶ 113 ("our tentative decision to rely on the NRRI Study was predicated on our inability to substantiate the default input values for cable costs and structure costs provided by the HAI and BCPM sponsors."); Tenth Report and Order at ¶ 115 ("We find that the expert opinions on which AT&T and MCI's proposed methodology relies lack additional support that would permit us to substantiate those opinions.").
[196] 1998 Eighth Supp. Order at ¶ 73 ("Commission Staff contends that the historical rate of sharing did not result in providers minimizing their production costs. They cautioned that the degree of sharing that takes place is constrained by the 'difficulty coordinating joint facility work.' … Staff's proposal is also designed to reflect that opportunities for sharing would be fewer in low density areas."); *Id.* at ¶ 76 ("we have adopted the sharing assumptions recommended by Commission Staff.").
[197] Tenth Report and Order at ¶ 211 ("In the *Inputs Further Notice*, we rejected the HAI and BCPM sponsors' default input values for structure costs because they were based upon the opinions of their respective experts and lacked supporting data that allowed us to substantiate these values. As noted above, we have received other structure cost data from a number of LECs, as well as AT&T, including data received in response to the structure and cable cost survey and data submitted in *ex parte* filings.").

- The use of an analog line circuit offset,[198] which I discuss in the next section.

Also, as I previously explained, the DLC inputs have been reformatted, but are essentially the same as they were in 1998. All of the foregoing items are key cost drivers, and their current, discredited values contribute significantly to the understated cost estimates produced by HM 5.3.

VII. HM 5.3'S SWITCHING COSTS ARE UNREALISTIC AND FAIL TO REFLECT VERIZON NW'S FORWARD-LOOKING COSTS

A. HM 5.3'S SWITCH INPUTS ARE OUTDATED AND INCONSISTENT WITH MANY OF HM 5.3'S ASSUMPTIONS AND CALCULATIONS

Q. CAN THE SWITCHES DESIGNED BY HM 5.3 PROVISION THE UNES BEING COSTED IN THE CURRENT PROCEEDING?

A. No. HM 5.3's switching inputs, some dating back to 1983, involve switches that are not capable of provisioning the technology for which HM 5.3 is estimating UNE costs. A study by the National Regulatory Research Institute ("NRRI") stated:

> During the years covered by this data set the overwhelming majority of the lines were for voice service. Therefore, to a large extent, the per-line investment estimates do not reflect the additional costs associated with providing ISDN lines on a digital switching machine.[199]

[198] Tenth Report and Order at ¶ 327 ("AT&T and MCI's proposed analog line offset per line is based on assumptions that are neither supported by the record nor easily verified. For example, it is not possible to determine from the depreciation data the percentage of lines that are served by digital connections. It is therefore not possible to verify AT&T and MCI's estimate of the digital line usage in the 'historical' data. In the absence of more explicit support of AT&T and MCI's position, we conclude that the Analog Line Circuit Offset for Digital Lines should be set at zero.").
[199] Dr. David Gabel, Scott Kennedy, "Estimating the Cost of Switching and Cables Based on Publicly Available Data," National Regulatory Research Institute (NRRI) (April 1998) at p. 114 ("NRRI Study").

In addition, the study cautions that modifications "due to the technical requirements of the Signaling System Seven ('SS7') and Custom Local Area Signaling Services ('CLASS')"[200] are not reflected appropriately. ISDN, SS7 and CLASS are part of the full range of technologies (both hardware- and software-related) currently being deployed. As such, HM 5.3 fails to account for all of the switch functions required in a forward-looking network or for the services that Verizon NW provides to CLECs. As such, the Model is incapable of developing switching costs that properly compensate Verizon NW (or any efficient carrier) for the wide variety of switch functions currently being deployed.

Q. DO THE SWITCHES USED BY HM 5.3 PROVISION SERVICE USING IDLC?

A. Yes. The switching inputs used in HM 5.3 were developed from switch investment values that reflect savings associated with digital lines. All of the switches in the FCC's sample were digital switches capable of providing service using IDLC. Therefore, HM 5.3's switch investments reflect the efficiencies of IDLC, such as reduced main distribution frame ("MDF") terminations and the advantages of digital (as opposed to analog) terminations.

Q. IF THE SWITCH INVESTMENTS REFLECT THE IDLC EFFICIENCIES, IS THE USE OF A $30 ANALOG LINE CIRCUIT OFFSET FOR DLC LINES APPROPRIATE?

A. Absolutely not. The Model documentation states that the purpose of the offset is to account for these very same efficiencies; however, the FCC has already

[200] NRRI Study at pp. 120-21.

rejected the notion that switch investments need to be offset, stating that an analog line offset for DLC lines was inappropriate to use with the switch investment inputs:

> Analog Line Offset. In the *Inputs Further Notice*, we tentatively concluded that the "Analog Line Circuit Offset for Digital Lines" input should be set at zero. We now affirm that conclusion . . . The record contains no basis on which to quantify savings beyond those taken into consideration in developing the switch cost. We also note that the depreciation data used to determine the switch costs reflect the use of digital lines. The switch investment value will therefore reflect savings associated with digital lines. AT&T and MCI's proposed analog line offset per line is based on assumptions that are neither supported by the record nor easily verified . . . In the absence of more explicit support of AT&T and MCI's position, we conclude that the Analog Line Circuit Offset for Digital Lines should be set at zero.[201]

The FCC correctly found that this offset was unnecessary because the switch investment inputs already reflected the use and cost efficiencies of IDLC; and thus the use of an Analog Line Offset would result in an inappropriate double counting of these cost reductions.

Q. HAS HM 5.3'S USE OF THE SWITCH INVESTMENT INPUTS RESULTED IN ANY OTHER INCONSISTENCIES?

A. Yes. HM 5.3 does not model any OC-3/DS-1 ADM terminal multiplexing equipment in the wire centers allegedly "because modern switches directly interface to transmission facilities with an OC-3 or DS-3 interface, obviating DS-1 to OC-3 multiplexing."[202] This assumption is incorrect when made in the context

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[201] Tenth Report and Order at ¶¶ 325, 327.
[202] Mercer Supplemental Direct Testimony at RAM-5 (HIP) at Section 5.5.1, p. 106.

of the vintage switch investment inputs from 1998 and earlier used in HM 5.3. Switches at that time did not directly interface to transmission facilities with an OC-3 or DS-3 interface. As such, the costs associated with OC-3/ DS-1 multiplexers should not have been removed from HM 5.3.[203] While the input values for this equipment have been restored in this latest version of the Model,[204] the Model's algorithms have been modified to exclude the OC-3/DS-1 multiplexer cost from the calculation of wire center transmission terminal investment. In essence, while HM 5.3 may list the cost of this equipment, the Model does not use it, as it should when calculating UNE costs.

As a result of AT&T/MCI's faulty network design, the IOF network modeled by HM 5.3 simply will not work. Absent the requisite OC-3/DS-1 multiplexers, the switches modeled by HM 5.3 would not be able to interface with the modeled interoffice rings, and no interoffice calls could be completed. In addition, all interoffice non-switched DS-1s and DS-0 special services would not be able to

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[203] An OC-3/DS-1 multiplexer is an electronic device that, among other things, converts and consolidates DS-1 level electrical signals onto an OC-3 level optical signal. This multiplexer is a common and essential network component that is utilized in both the all-fiber loop network and the IOF network. The basic multiplexer unit comes with a shelf that accepts various plug-in units. An OC-3 level signal can carry up to 3 DS-3 level signals, each of which can in turn carry up to 28 DS-1 level signals. Thus an OC-3/DS-1 multiplexer can carry 84 DS-1 level signals (28 x 3). When the DS-1s have been consolidated onto the OC-3 optical signal, the optical signal can then be connected to, and further consolidated by, the OC-48 ADMs that are used as the interoffice fiber transport mechanism in the Model. In addition, all of the non-switched voice-grade private lines and special access lines must pass through this network component after previously having been multiplexed and consolidated onto a DS-1 level signal. As such, OC-3/DS-1 multiplexers are essential components of a fully functional IOF network.

[204] *See* Before the Washington Utilities and Transportation Commission, Docket No. UT-023003, *Direct Testimony of Dr. Mark T. Bryant on behalf of AT&T Communications of the Pacific Northwest Inc. and WorldCom, Inc.* (June 26, 2003) at MTB-4 (HM 5.3 Inputs Portfolio) at Section 5.4.1, p. 108 ("The OC-3/DS-1 multiplexers value is set to $0 because modern switches directly interface to transmission facilities with an OC-3 interface, obviating DS-1 multiplexing."); Mercer Supplemental Direct at RAM-5 (HIP) at Section 5.5.1, p. 106 ("The OC-3 multiplexers value is only used for host/remote rings and small offices that do not appear on a ring (*see* RAM-5 (HIP) at Section 5.7.4), because modern switches directly interface with an OC-3 or DS-1 interface, obviating DS-1 to OC-3 multiplexing.").

connect to the interoffice rings. In fact, the only modeled services that could be transported on HM 5.3's IOF network would be DS-3 loops. AT&T/MCI have offered no legitimate reason why the OC-3/DS-1 multiplexer should be eliminated from their cost model, as the need for these multiplexers can only be "obviated" if a switch contains the OC-3 interface capability; and the switches modeled by HM 5.3 clearly do not.

B. HM 5.3'S SWITCH AND IOF MODULE IS FUNDAMENTALLY FLAWED AND HAS ALREADY BEEN REJECTED BY THE FCC

Q. DR. MERCER CLAIMS THAT "THE FCC ADOPTED A SUBSTANTIAL PORTION OF AN EARLIER VERSION OF THE HAI MODEL INTO ITS OWN SYNTHESIS MODEL."[205] PLEASE EXPLAIN THE RELATIONSHIP BETWEEN HM 5.3'S SWITCHING AND IOF MODULE AND THE SWITCHING AND IOF MODULE USED BY THE FCC'S SYNTHESIS MODEL.

A. In its USF Order, the FCC adopted the HAI Model's switching and IOF module, with modifications. In doing so, the FCC noted that "…for universal service purposes, where cost differences caused by differing loop lengths are the most significant cost factor, *switching costs are less significant than they would be in, for example, a cost model to determine unbundled network element switching and transport costs*."[206] As the FCC recognized, the Synthesis Model's, and therefore HM 5.3's, treatment of the costs associated with the switching and IOF

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[205] Mercer Supplemental Direct at p. 6.
[206] Fifth Report and Order at ¶ 75 (emphasis added).

module, as well as their input values, are less exacting, and thus less representative of Verizon NW's forward-looking switching and IOF costs.

Q. WHAT ARE SOME OF THE DECISIONS THE FCC MADE REGARDING THE SWITCHING AND IOF MODULE ADOPTED FOR USE IN ITS SYNTHESIS MODEL?

A. As discussed above, the FCC did not include an analog line circuit offset. The FCC also took issue with the fact that the HAI Model failed to recognize the host-remote switch configuration in the network, and ordered that such a configuration be made part of the Synthesis Model.[207] While AT&T/MCI claim that HM 5.3 *is capable* of modeling explicit combinations of host, remote, and stand-alone switches, AT&T/MCI ignore this option and instead incorrectly assume that there are no remote switches in Verizon NW's network. Indeed, even AT&T/MCI recognize that ignoring these host-remote relationships will only produce simplified estimates of IOF costs[208] -- clearly an unacceptable standard for calculating Verizon NW's forward-looking costs of providing UNEs.

Q. WHAT CONCLUSIONS DID THE FCC'S WIRELINE COMPETITION BUREAU DRAW REGARDING THE HAI MODEL'S SWITCHING AND IOF MODULE IN THE VIRGINIA ARBITRATION?

A. The FCC's Wireline Competition Bureau flatly rejected the use of the HAI Model's switching and IOF module in the Modified Synthesis Model. The Bureau stated:

[207] Tenth Report and Order at ¶ 320 ("We therefore affirm our conclusion to use the LERG to determine host-remote switch relationships.").
[208] Mercer Supplemental Direct Testimony at RAM-4 (Model Description) at p. 55.

> We adopt the Verizon switching cost study, including the SCIS model, because it better satisfies the key cost model criteria that we identify above. Specifically, we find that the Verizon switching cost study, as compared to the MSM's Switching/Transport module, better complies with the Commission's TELRIC pricing rules and relies on cost inputs and assumptions that are more transparent, adjustable, and verifiable.[209]

The Bureau went on to state:

> *Dedicated Transport.* We adopt the Verizon dedicated transport cost study to establish dedicated transport rates . . . *Common Transport.* We adopt the Verizon cost study to generate rates for common transport. We find the Verizon common transport cost study preferable to the MSM transport module because the Verizon study is the same basic study that we adopt for dedicated transport rates, and because it models a lower-cost, efficient network design based on available technology than does the MSM . . . Between the two cost models, only the SCIS model can be adjusted to reflect our findings regarding the most fundamental switching cost input issue: the relative percentages of new and growth switch equipment and the vendor discounts associated with each. As we explain below, efficient carriers will grow their switches over time, and vendors offer different discounts to carriers for new switches than for growth switching equipment. The MSM Switching/Transport module uses inputs based on 100 percent new switch prices, and, presumably, those prices reflect the greater discounts associated with such switches.[210]

VIII. RECOMMENDATIONS

Q. BASED ON YOUR ANALYSIS OF HM 5.3, WHAT ARE YOUR RECOMMENDATIONS TO THE COMMISSION?

A. My Reply Testimony has established that HM 5.3 is riddled with platform and input flaws, and ignores numerous TELRIC, Commission, and FCC mandates. As such, it is simply incapable of producing realistic UNE cost estimates that reflect the costs that an efficient carrier would incur on a going-forward basis.

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[209] Virginia Arbitration Order at pp. 145-46.

Collectively, the numerous flaws and errors contained in HM 5.3 serve to significantly lower the UNE cost estimates produced thereby. AT&T/MCI's intent in sponsoring HM 5.3 is clear: to produce impossibly low UNE cost estimates regardless of the fact that the network designed would simply not function. For the reasons stated herein, and the reasons contained in the Reply Testimony of Dr. Tardiff and Messrs. Dippon, Richter, Mazziotti and West, the Commission should reject HM 5.3 for purposes of estimating Verizon NW's forward-looking costs of providing UNEs in Washington.

Q. DOES THIS CONCLUDE YOUR REPLY TESTIMONY

A. Yes.

[210] Virginia Arbitration Order at p. 199.