BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

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

SUPPLEMENTAL DIRECT TESTIMONY OF DR. ROBERT A. MERCER

on behalf of

AT&T COMMUNICATIONS OF THE PACIFIC NORTHWEST, INC.

January 23, 2004

I. IDENTIFICATION OF WITNESS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Robert A. Mercer. I am the Principal of BroadView Telecommunications, LLC ("BVT"), a consulting firm specializing in analyses of the telecommunications infrastructure. The address of the firm is 5201 Holmes Place, Boulder, Colorado, 80303.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of AT&T Communications of the Pacific Northwest, Inc. ("AT&T"). My testimony replaces the Direct Testimony of Dr. Mark T. Bryant filed on June 26, 2003.

Q. PLEASE SUMMARIZE YOUR BACKGROUND AND QUALIFICATIONS.

A. I received a Bachelor of Science degree in Physics from Carnegie Institute of Technology (now Carnegie - Mellon University) in 1964, and a Ph.D. in Physics from Johns Hopkins University in 1969. After receiving my Ph.D., I was an Assistant Professor of Physics at Indiana University from 1970 until 1973.

I then joined Bell Telephone Laboratories. Over the next eleven years, I held a variety of positions in the Network Planning organizations at Bell Labs and AT&T General Departments. My final position at Bell Labs was Director of the Network Architecture Planning Center, where I managed an organization that was responsible for early Bell System planning of the Integrated Services Digital Network ("ISDN"), as well as systems engineering for new data services being planned by AT&T.

I joined Bell Communications Research (Bellcore, now Telcordia Technologies) in January 1984, where I was Assistant Vice President of Network Compatibility Planning. Among other responsibilities, I directed Bellcore's technology analysis of various legal and regulatory proceedings at the federal and state levels. I also coordinated and provided direction to Bellcore's participation in domestic and international standards-setting activities, and served as a member of the Board of Directors of the American National Standards Institute.

After leaving Bellcore in late 1985, I held positions with BDM Corporation and AT&T Bell Laboratories before joining Hatfield Associates, Inc., in early 1987. At Hatfield Associates, I held the positions of Senior Consultant, Senior Vice President, and President of the firm. On October 1, 1997, the former principals and employees of Hatfield Associates, Inc. formed HAI Consulting, Inc. and I became the President of that firm. At Hatfield Associates and HAI, I was extensively involved in the development of the various versions of the HAI Model. I also presented testimony on and defended the model in a large number of regulatory proceedings pertaining to the cost of unbundled network elements ("UNEs") and universal service.

In March of 2000, I left HAI to form BroadView Telecommunications. The firm provides strategic planning, education, and expert services related to public and private telecommunications infrastructure, dealing specifically with network architectures, technologies, services, and service providers. At BroadView, I have continued to present and defend the HAI Model in numerous regulatory proceedings, as well as working with HAI to further evolve the HAI Model as appropriate.

I also hold an adjunct faculty position in the Interdisciplinary Telecommunications Department at the University of Colorado in Boulder. In that program, I have taught courses on telecommunications techniques, advanced data communications, and computer networking, as well as serving on Masters Thesis committees. I have taught many other courses and seminars as well for other organizations and institutions in the areas of the telecommunications infrastructure, network technologies, broadband networks, data and voice communications, computer networking, and network management.

Attachment RAM-1 to this testimony describes my educational and professional qualifications in more detail. In summary, virtually my entire 30 year career in telecommunications has been focused on analyses and education related to the telecommunications infrastructure. Much of my work over the past ten years has been focused on the modeling of local exchange carrier costs.

II. TESTIMONY PURPOSE AND SUMMARY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purposes of this testimony are fourfold: 1) to describe the HAI Model, Release 5.3 (“HM 5.3”, or “the Model”); 2) to explain the advantages of using the Model to estimate the costs of the UNEs offered by Verizon Northwest, Inc. (“Verizon”) in Washington; 3) to describe how the Model has been used to estimate Verizon’s UNE costs; and 4) to present the UNE cost estimates produced by the Model.

Q. PLEASE SUMMARIZE YOUR TESTIMONY

A. HM 5.3 is a highly sophisticated costing tool that provides a reliable and accurate estimation of Verizon's economic costs for substantially the entire Verizon local exchange service network, including the set of UNEs under consideration in this proceeding. The local exchange network elements for which costs are estimated include the loop, switching, and interoffice transmission facilities associated with switched voice (referred to as "POTS," a well-known industry acronym that refers to "Plain Old Telephone Service"), as well as non-switched voice grade, DS-0, DS-1, and DS-3 loops, and non-switched interoffice circuits. The Model develops costs for these various network elements starting with customer location data for the customers being served by Verizon's network. I will henceforth refer to POTS, along with non-switched voice-grade analog and DS-0 digital circuits, as "narrowband" UNEs.[1]

The fact that the Model deals with network elements associated with substantially all of the components of the entire local exchange network, including those associated with elements not being directly costed in this proceeding, is a key asset of the Model. By doing so, the Model properly recognizes the relationships and synergies between the different components of the network and between different UNEs. For example, a properly-crafted model such as HM 5.3 should to the extent practical:

[1] While there is some ambiguity in the industry's use of the terms narrowband, wideband, and broadband, in this declaration I will use the term "narrowband" to refer to analog circuits capable of carrying voice signals as well as digital circuits supporting digital bit rates up to 64 kilobits per second ("kbps"), "wideband" to describe digital circuits supporting bit rates of 128 kbps to 768 kbps, and "broadband" to describe digital circuits operating at 1.544 megabits per second ("Mbps") and above. Within these ranges, however, some specific services with well-known designations, such as ISDN and ADSL, will be referred to by those names. Note that the term "hi-cap" is often used in place of broadband and sometimes wideband services.

- Reflect an appropriate degree of outside plant structure sharing between different loop types on a given feeder or distribution route, between feeder and distribution routes, and between feeder and interoffice routes;
- Construct a set of interconnected interoffice fiber rings with sufficient capacity to support all of the switched and non-switched interoffice circuits; and
- Associate general support and some non-plant-specific operational expenses with different network elements in appropriate amounts.

If a model does not deal with such relationships in a unified fashion,[2] and/or describes these relationships in terms of statistics derived from the existing network,[3] it is virtually impossible for that "model" to appropriately reflect forward-looking costs and efficiencies.

HM 5.3 fully complies with the Federal Communications Commission's ("FCC") total element long run incremental cost ("TELRIC") principles for developing forward-looking UNE costs. Indeed, the FCC adopted a substantial portion of an earlier version of the HAI Model into its own Synthesis Model used for the purpose of determining the cost of providing universal service and distributing the federal universal service fund ("USF").

HM 5.3, and its predecessors, have benefited enormously from several years of scrutiny by regulators, including this Commission, and by other, often hostile, parties. This scrutiny includes public forums conducted by the FCC and state regulatory staffs to examine the desirable attributes of a cost model and the appropriate values for inputs to

[2] An example would be a "model" that actually consists of a number of independent models, each of which deals with only certain components of the network.

that model. One key facet of the model evolution that has taken place as the result of such scrutiny and advances in modeling technology is that HM 5.3 dramatically improves the way in which it determines customer locations and configures outside plant to serve those customers, using data that have been provided by Verizon itself that contain customer locations for all types of loops. Using that data allows HM 5.3 to model not only a network used to provide POTS and other narrowband services, but also additional loop types, such as DS-1, DS-3, and ADSL loops, while developing and reporting the costs of those elements that are specifically at issue in a proceeding. As a result, HM 5.3 models the network more accurately and more completely, and more accurately assigns joint costs of outside plant structure, network operations, and general support to this wider range of loop elements than could prior versions of the Model. Finally, with data on the actual loop types and counts available, the Model is able to avoid an issue that has often been contentious in the past – how to translate so-called "voice-grade equivalents" ("VGEs") reported by Verizon in its ARMIS data into physical facilities.[4] Such translation is not necessary when the actual location and facility requirements of individual loops are known.

AT&T has used the HM 5.3 results to develop its proposed set of UNE costs. Loop UNEs have been deaveraged into three wire center zones by grouping wire centers with

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[3] For example, many incumbent models treat each interoffice circuit type independently, and uses broad average statistics derived from the present incumbent networks to determine the degree of sharing of transmission facilities and terminal equipment between different circuit types.

[4] The number of VGEs is the total number of multiples of the DS-0 data rate (64 kbps) provided to customers. Given the existence of wideband and broadband services containing multiple DS-0s offered over different media (one copper pair, two copper pairs, four fiber strands, etc.), the issue in the past, now eliminated, is how to figure out how many copper pairs and fiber strands are associated with the reported number of VGEs.

similar basic loop costs.[5] Attachment RAM-2 presents AT&T's UNE rate proposals. Key examples of the monthly proposed UNE rates are set forth in the following table:

Loops	Statewide	AT&T Zone 1	AT&T Zone 2	AT&T Zone 3
Basic 2-wire	$8.49	$5.51	$9.09	$30.02
DS-1/HDSL	$51.17	$46.04	71.86	$119.36
DS-3	$712.76	$664.69	$964.19	$1970.67
Local Switching – Non-Usage Related	$2.95			
Dedicated Transport	$5.23 per DS-0			

Table 1: Key UNE Rate Proposals

Later, I will discuss the results provided in Attachment RAM-8b, which presents the UNE results by individual wire center. These individual wire center results are rolled up into the wire center zone averages shown in Attachment RAM-2, as discussed subsequently. Presenting the individual wire center results as well allows the Commission (or any party) to develop a different deaveraging proposal.

Q. HOW IS THE REMAINDER OF YOUR TESTIMONY ORGANIZED?

A. Section III provides an overview of HM 5.3 and the UNEs for which it estimates costs. The overview extensively references and provides a roadmap to the HM 5.3 Model documentation provided in several attachments to my declaration. Section IV summarizes the advantages of using the Model to estimate Verizon's UNE costs. Section V discusses how the Model has been used to estimate Verizon's UNE costs, and presents AT&T's proposed UNE prices for Verizon. Section VI summarizes my testimony.

[5] AT&T believes it is not necessary or appropriate to deaverage local or tandem switching, interoffice transport,

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Q. ARE THEIR ATTACHMENTS TO YOUR TESTIMONY?

A. Yes, my testimony includes eight attachments as follows:

- Attachment RAM-1: Curriculum vitae for Dr. Robert A. Mercer;
- Attachment RAM-2: AT&T's UNE Price Proposals;
- Attachment RAM-3: Details on particular aspects of HM 5.3;
- Attachment RAM-4: HM 5.3 Model Description and User Guide;
- Attachment RAM-5: HM 5.3 Inputs Portfolio ("HIP");
- Attachment RAM-6: "Actuals" worksheet from HM 5.3 Expense Module showing expense to investment ratios for each plant category;
- Attachment RAM-7: Description of Deaveraging Optimization Program; and
- Attachment RAM-8: Expense Module Outputs.

A Copy of a CD-ROM containing the electronic version of the HM 5.3 Model, along with the expense module outputs of the Model, is being filed with this testimony.

III. OVERVIEW OF HM 5.3

Q. PLEASE DESCRIBE THE OVERALL PURPOSE OF HM 5.3.

A. HM 5.3 estimates in a consistent fashion the forward-looking economic costs that Verizon would incur to build a complete forward-looking network, including a defined set of UNEs. These UNEs include those related to POTS, as well as broadband loops and interoffice circuits. The Model also estimates the cost of universal service, the interconnection of Verizon's local network with other competitive local exchange carriers ("CLECs"), and of access to interexchange carriers ("IXCs"). Such costs appear in the

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or interoffice signaling. If the Commission disagrees, those UNE rates can be deaveraged as well.

standard output of the Model, but I will not discuss them further since they are not the focus of this proceeding.

Q. DOES HM 5.3 ESTIMATE COSTS IN A MANNER THAT IS CONSISTENT WITH THE FCC'S TOTAL ELEMENT LONG RUN INCREMENTAL COST ("TELRIC) PRINCIPLES?

A. Yes. Specifically, it embodies the following TELRIC principles, as set forth in the FCC's First Local Competition Order from August 1996, paragraphs 690-691 (and, more generally, paragraphs 674-703):

- The increment that forms the basis for a TELRIC study is the entire quantity of the network element provided.
- All costs associated with providing the element are included in the incremental cost, including the investment costs and expenses related to primary plant used to provide that element, as well as the incremental costs of shared facilities and operations, which are attributed to specific elements to the greatest extent possible.
- Only forward-looking, economic costs are included, meaning those costs that are incurred in the provision of the network elements in the long run, where "the 'long run' used to capture such costs is the period long enough that all costs are treated as variable and avoidable" (para. 692).
- Costs are based on the incumbent LEC's existing wire center locations and most efficient technology available.

- Costs are attributed on a cost-causative basis, meaning the costs are incurred as a direct result of providing the network elements, or can be avoided, in the long run, when the company ceases to provide them.
- Costs attributed to UNEs include costs such as certain administrative expenses, which have traditionally been viewed as common costs, to the extent these costs vary with the provision of network elements.
- Forward-looking common costs are allocated among elements and services using a fixed allocator, such as a percentage markup over the directly attributable forward-looking costs (para. 696).

Furthermore, the model excludes certain costs that the FCC has specifically ordered should not be included in the TELRIC of UNEs. These include:

- *Retailing costs*, such as marketing and consumer billing costs associated with retail services (para. 691);
- *Embedded costs*, based, for instance, on "the costs reflected in the regulated books of account," or on "forward looking costs plus an additional amount reflecting embedded costs" (para. 704-705);
- *Opportunity Costs*, such as those estimated using the Efficient Component Pricing Rule (para. 708);
- *Universal Service Subsidies* (para. 712); and
- *Access charges applied to purchasers of local switching UNEs* (para. 716).

Q. IN SUMMARY, UNDER THE FCC TELRIC CONSTRUCT, AND AS IMPLEMENTED IN HM 5.3, WHAT COST COMPONENTS ARE INCLUDED IN

THE UNE COSTS CALCULATED BY THE MODEL?

A. The cost estimates produced by the Model appropriately include capital carrying costs (debt costs, after-tax return on equity, and depreciation costs). They also include all operating costs associated with the network components used to provide the UNEs, a portion of general support expenses that cannot be directly attributed to specific UNEs, and a fair share of Verizon's common costs. Thus, all efficient, forward-looking recurring costs incurred by Verizon in providing the UNEs in question are included in the costs calculated by the Model. In particular, because the cost of capital includes return on equity, the UNE costs include the "reasonable profit" mentioned in the Telecommunications Act of 1996.

Q. PLEASE DESCRIBE THE BASIC METHODOLOGY BY WHICH HM 5.3 ESTIMATES COSTS.

A.. The HM 5.3 Model Description, included as Attachment RAM-4 to this declaration (hereafter, the "Model Description"), provides a detailed description of the local exchange network modeled by HM 5.3, and how the Model calculates costs based on that network. Like earlier versions of the HAI Model, HM 5.3 is a bottom-up economic-engineering costing model. Section A of Attachment RAM-3 explains in more detail how a "bottom-up" model calculates costs. In a nutshell, HM 5.3 starts with the best available information on the location of an incumbent's business and residential customers. In this proceeding, Verizon has provided customer location and service type data in response to an AT&T's data request. Based on the customer location data, and detailed and granular information as to the existing demand for services, the Model then constructs a network to serve the identified demand.

After constructing the network, and determining the amount and capacity of each network component required, the Model estimates the investments required for each component using the best available data on forward-looking network component prices. It then estimates the costs associated with the investments, including capital carrying costs, the plant-specific costs of operating the components in question, plant-non-specific network costs, and general support and overhead costs. After assigning these costs to network elements according to their use of different network components, it then determines a cost per unit of each UNE. The unit costs are appropriate to the element in question. For loops, costs are expressed as a monthly cost for the loop and each of its sub-components. For local switching, costs are presented in an aggregate amount per line per month. Tandem switching costs are expressed on a per-minute-of-use basis. Interoffice facilities costs are expressed on a per-minute usage and/or per dedicated circuit basis.

The bottom-up approach used by HM 5.3 contrasts with what are often called "top down" models that attempt to decompose total costs or revenues of existing telephone companies into their constituent parts. It also differs from incumbent models that utilize cost and configuration statistics taken from the existing local exchange network, and which are often specific to a single component of the network, thereby potentially missing synergies between different parts of the network (e.g., the sharing of outside plant structures between the interoffice and feeder portions of the network) and inappropriately assigning joint and common costs.

Q. FOR WHAT VERIZON POTS UNES DOES THE HM 5.3 MODEL ESTIMATE

COSTS?

A. The Model estimates costs for the following UNEs and related network components associated with POTS. The equipment and facilities making up these UNEs are illustrated in Figures 1-3 in the Model Description.

- Loop – the connection between a customer's premises and the end office switch that serves the customer. The loop consists of three sub-loop elements:
  - Network Interface Device ("NID") – The equipment used to terminate a loop at a subscriber's premises, which appears as the device adjacent to the premises in Figure 1 of the Model Description. It contains connector blocks and over-voltage protection. The costs of this and each loop element are provided on a monthly per-line basis.
  - Loop Distribution – The individual two-wire analog communications channel between the NID and the serving area interface ("SAI"). This rate element includes the investments in the drop, terminal and splice, copper distribution cable, and structures (poles, trenching, conduit, etc.). Thus, this rate element includes all the components in Figure 1 of the Model Description between the NID and the customer side of the SAI.
  - Loop Feeder – The Loop Concentrator/Multiplexer, and the facilities on which POTS loops are carried from the Concentrator/Multiplexer to the customer side of the end office switch. For loops served by fiber feeder, the Loop Concentrator/Multiplexer includes the digital loop carrier ("DLC") remote terminal ("RT") at which individual subscriber traffic is

multiplexed and connected to loop distribution for termination at the customer's premises, as well as the adjacent SAI. For loops served by copper feeder, the Loop Concentrator/Multiplexer consists of the SAI only. In either case, all the physical enclosures, site preparation, and electronics associated with the RT and SAI as shown in Figure 1 of the Model Description are included. The facility connecting the Concentrator/Multiplexer to the local switch includes copper feeder or fiber feeder cable plus associated structure investments (poles, trenching, conduit, etc.), as shown in Figure 1 of the Model Description.

- <u>End Office Switching</u> – The system connecting lines to lines or lines to trunks. The end office represents the point of switching in the local exchange network that is closest to the customer. This rate element includes all the investment associated with the wire center location shown in Figure 1 of the Model Description, including the end office switch investments and associated wire center costs, distributing frames, power and land and building investments. As noted, AT&T's proposal is that the costs associated with the end office are presented as an aggregate switching cost per line per month. The Model also has the flexibility to also present the costs as a mix of a monthly amount per line and an amount per minute of local switch use.

- <u>Tandem Switching</u> – The switching system that provides the function of connecting trunks to trunks for the purpose of completing inter-switch calls, as shown in Figure 2 of the Model Description. The investments are similar to those included in the End Office Switching rate element, and thus include the switch itself and associated wire center, distributing frame, power and land and building investments. Given that tandem switches are typically located in wire center buildings that also contain local switches, and that in some cases the local and tandem switching functions may be provided by the same switch, the tandem switch investments reflect those situations. The tandem switching rate element cost is stated as a cost per minute of tandem switching use.

- Common Transport – Digital trunks between an end office and tandem switching system on which POTS traffic is commingled to include local exchange carrier traffic as well as traffic to and from multiple CLECs and/or IXCs. These trunks connect end offices to tandem switches, as depicted in Figure 2 of the Model Description.

- Shared Transport – Digital trunks between any two switching systems (either end offices or an end office and tandem) on which POTS traffic is commingled to include local exchange carrier traffic as well as traffic to and from multiple CLECs and/or IXCs, which replicates the manner in which the incumbent routes its own traffic. This is the form of transport associated with the UNE platform ("UNE-P").

- Dedicated Transport – The full-period, bandwidth-specific interoffice transmission path between local exchange carrier switches and wire centers within a LATA, providing the ability to carry DS-0, DS-1, and DS-3 signals, as shown in Figure 2 of the Model Description.

- <u>Signaling Links</u> – DS-0 equivalent transmission facilities in a Signaling System No. 7 (“SS7”) network that carry all out-of-band signaling traffic between end office and tandem switches and Signal Transfer Points (“STPs”), between STPs, and between STPs and Service Control Points (“SCPs”), as depicted in Figure 3 of the Model Description.

- <u>Signal Transfer Point</u> – The system that provides the function of routing Transaction Capability User Part (“TCAP”) and ISDN User Part (“ISUP”) messages between network nodes (end offices, tandems and SCPs) in an SS7 network, as shown in Figure 3 of the Model Description.

- <u>Service Control Point</u> – The node in the SS7 network to which requests for service handling information (*e.g.*, translations for local number portability) are directed and processed, as depicted in Figure 3 of the Model Description. The SCP contains service logic and customer specific information required to process individual requests, which are often referred to as SS and database “dips.”

Q. HOW DOES THE MODEL TREAT NON-POTS LOOPS?

A. In answering this question, and in the remainder of my testimony, it will be useful to differentiate between “copper-based” and “fiber-based” loop network elements. The distinction has reference to the type of distribution cable used to deliver signals to the customers’ premises (copper wire pairs and fiber optics cable, respectively).[6] Many aspects of the Model’s calculations are significantly different for the two kinds of delivery. Copper-based loop elements include those associated with POTs, DS-0, DS-1, Integrated Services Digital Network ("ISDN"), and the family of Digital Subscriber Line services. Fiber-based loop network elements include DS-1 delivered over fiber, DS-3, and higher capacity circuits.

To the extent the necessary data on other loop types and locations are available, as they are for Verizon, HM 5.3 accounts for all of the identified loop types. HM 5.3 takes into account the following non-POTS loop types, and models investments and costs associated with the components listed for each.

- Non-POTS two-wire voice grade and DS-0 loops, such as alarm circuits, program audio circuits, digital data services and the like. The loop components are identical to POTS loops except some services require two copper pairs in the distribution plant.

- Four-wire analog and digital loops, involving the use of two wire pairs carrying signals in either an analog or digital format.

- ISDN loops and switch ports. Two types of ISDN are considered: Basic Rate Interface ("BRI") ISDN and Primary Rate Interface ("PRI") ISDN. BRI ISDN involves loop components identical to POTS, except that, in the case of fiber feeder, it requires a special BRI plug-in card in the DLC RT. PRI ISDN uses four-wire digital loops; again, in the case of fiber feeder, it requires a special PRI

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[6] "Copper-based" UNEs, as I have defined them here, may be provided over either copper or fiber feeder cable,
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plug-in card for the DLC RT. Both types of ISDN require a switch port that is different from the POTS switch port.

- Switched and non-switched DS-1s. The components are identical to the POTS loop except a DS-1 requires two wire pairs, and in the case of fiber feeder, a special plug-in card in the DLC remote terminal. At the present time, copper-based DS-1 loops are most commonly provided using the High Speed Digital Subscriber Line ("HDSL") technology.

- ADSL. Loops capable of simultaneously carrying voice signals and high-speed data signals in a composite frequency-multiplexed format. In most cases, at the end office, the voice signal is separated from the composite signal and sent to the end office switch for processing like any other POTS call, while the data is sent through a separate packet switching network.

- DS-3. Components consist of fiber cables (or additional strands on the fiber cables already present for POTS) in the feeder network, additional patch panel capacity in the SAI or digital loop carrier remote terminal, fiber distribution cables between the SAI/digital loop carrier and customers' premises, splices at the curb and on the customers' premises; fiber connecting cable from the street to the premises, fiber pigtails on the premises to connect the spliced fiber to the terminating equipment, fiber conversion and multiplexing equipment on the

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while "fiber-based" loops must be carried on fiber cables in both the feeder and distribution plant.

premises, and coaxial cable to connect the circuit terminating equipment to the customer's premises equipment.

- Other fiber-based loops, such as SONET OC-3 and OC-12 circuits.[7] The components are the same as for the DS-3, although the premises conversion and multiplexing equipment is different for each loop type (and different from the equipment on DS-3 loops) due to the different signal formats and data rates involved.

To the extent these correspond to UNEs that are at issue in this proceeding, the Model produces and displays costs for those UNEs. But in any case, it accounts for the demand for the services associated with these network elements, and provides sufficient network capacity to support all the loop types for which customer location information is included in the data provided by Verizon. Since the Model has accounted for the costs associated with all types of loops, it is also possible to calculate related UNEs, should the Commission so choose.

Q. PLEASE PROVIDE A ROADMAP FOR THE ATTACHMENTS TO THIS TESTIMONY THAT PROVIDE DETAILS OF THE MODEL'S CALCULATION OF LOOP INVESTMENTS.

[7] SONET, or Synchronous Optical Network, is a standards-based family of digital transmission formats and bit rates. Its international equivalent is Synchronous Digital Hierarchy, or SDH. The OC-1 signal format ("OC" stands for Optical Carrier) has a bit rate of 51.84 megabits per second ("Mbps"). The OC-n member of the family operates at n times the OC-1 rate. In principle, n can be any integer up to at least 192, but commonly utilized family members and their approximate bit rates are OC-3 (155 Mbps), OC-12 (620 Mbps), OC-48 (2.5 gigabits per second – Gbps), and OC-192 (10 Gbps).

A. Section B of Attachment RAM-3 summarizes the methodology for developing loop investments, while Sections 7 through 9 of the Model Description in RAM-4 describe the methodology in considerable detail. An important new facet of HM 5.3 is the treatment of loops for services other than POTS. Of particular importance are the Model's ability to 1) properly size both the copper and fiber cables, using the appropriate configuration for each of the loop types, rather than provisioning based on "VGE" requirements; 2) capture the investment in all loop components, including loops associated with high capacity services; and 3) reflect the appropriate amount of structure sharing between all the plant modeled. The treatment of all-fiber loops is discussed more particularly Sections 8.8 and 9.4 of the Model Description.

The loop investment process requires the prior identification of appropriate serving areas and their associated attributes. The processes for locating and clustering customers to form such serving areas for HM 5.3 represent state-of-the-art modeling technology developments that have profoundly improved the accuracy of both HM 5.3. These processes are summarized in Section C of Attachment RAM-3, and described in detail in Section 5 of the Model Description.

Q. FOR COPPER-BASED LOOPS, HOW DOES HM 5.3 SELECT BETWEEN COPPER AND FIBER FEEDER?

A. HM 5.3 produces an economic mix of copper and fiber feeder cable for POTS and other copper-based loops, subject to a user-adjustable maximum copper feeder distance. For feeder routes longer than this distance, the Model automatically selects fiber feeder. For feeder route lengths less than the maximum distance, the Model makes the most economic choice between copper feeder cable or fiber feeder cable; in the latter case, it assumes the use of a DLC system running over the cable. The Model makes this selection on a cluster-by-cluster basis.

Q. HOW DOES HM 5.3 PRESENT THE LOOP COST RESULTS PRODUCED BY THE MODEL?

A. HM 5.3 presents the costs of POTS loop and sub-loop UNEs, as well as other narrowband and broadband loops, for Verizon as a whole. It also disaggregates the loop results by line density range, by individual wire center, and by wire center "zones." The portrayal of results for areas of different line density is useful for understanding how loop costs vary from rural to suburban to urban areas. On the other hand, UNE prices based on wire centers, or wire center "zones," are likely to be more practical to implement. The user of the Model is able to select whether to portray results by density zone or by wire center, and the Model correspondingly invoked either the density zone expense module or the wire center expense module. the wire center expense module contains a worksheet that portrays results according to the wire center zones defined by the user. AT&T proposes loop UNE prices disaggregated into wire center zones, and non-loop UNEs for the whole study area, and I have structured the results accordingly. For completeness, I also present key results by individual wire center.

Q. PLEASE PROVIDE A ROADMAP TO THE LOCAL AND TANDEM SWITCHING INVESTMENT CALCULATIONS PERFORMED BY HM 5.3, AND SUMMARIZE THOSE CALCULATIONS.

A. Section D of Attachment RAM-3 summarizes the process of estimating POTS switching costs, while Section 10 of Attachment RAM-4 describes the process in more detail. Specifically, Section 10.3.1 deals with local switching, and Section 10.3.3 deals with tandem switching.

HM 5.3 equips each of the incumbent's existing wire center that serves POTS customers with at least one local switch, and more than one switch if the line count, traffic capacity, or call processing capacity requirements of that wire center exceed the capability of one switch. Similarly, the Model determines the number of tandem switches required to serve the via-tandem traffic calculated by the Model, and deploys those tandems at the incumbent's existing tandem locations. The Model assumes a user-adjustable fraction of the tandem switch functionality is provided by joint local-tandem switches. The Model calculates the wire centers investment in main distributing frames, power, land, and buildings associated with local and tandem switches.

At the user's option, HM 5.3 is able to separately model host, remote, and stand-alone local switches. However, this adds a considerable degree of complexity to the calculation of interoffice transport investments without providing a significant increase in accuracy over the treatment utilized in producing the results presented herein. This is because the Model provides for SONET rings linking each host switch with its subordinate remote switches separately from the rings that link host, stand-alone, and tandem switches. As opposed to treating the switch types separately, the Model run for Verizon has utilized blended average switch price inputs based on the switching prices adopted by the FCC in its Inputs Order for the FCC Synthesis Model.[8]

Q. PLEASE PROVIDE A ROADMAP TO THE DOCUMENTATION OF THE INTEROFFICE TRANSPORT AND SIGNALING INVESTMENT CALCULATIONS PERFORMED BY HM 5.3, AND BRIEFLY SUMMARIZE THOSE CALCULATIONS.

A. The calculations are described in Section 10.3.2 of the HM 5.3 Model Description. HM 5.3 assumes all interoffice circuits, both switched and dedicated, are carried on SONET OC-48 four-fiber bi-directional line switched fiber rings. The Model constructs a set of interconnected fiber rings, each of which connects a number of wire centers to each other Over a given physical ring, there may be multiple logical rings, each connecting a subset of the wire centers on the physical ring. The Model provides enough multiplexers, digital cross-connects, and redundant inter-ring connections to interconnect the logical rings on a given physical ring, the different physical rings that connect offices homing on a given tandem switch (the ring design process proceeds on a tandem-by tandem basis), and the different ring systems associated with different tandem switches.

As described in Section 10.3.4 of the HM 5.3 Model Description, the Model constructs an SS7 interoffice signaling network following normal SS7 design practices, with redundant connections from each switch to different STPs, redundant STP switches, and redundant connections between different STPs. The circuits required in the SS7 network are

[8] See Federal-State Joint Board on Universal Service, CC Docket No. 96-45 and Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket No. 97-160, FCC 99-304, November 2, 1999 ("Tenth

(continued)

assumed to run over the interoffice rings, and the ring capacities are adjusted to include these signaling circuits.

Q. PLEASE PROVIDE A ROADMAP TO THE EXPENSE CALCULATIONS PERFORMED BY HM 5.3, AND BRIEFLY SUMMARIZE THOSE CALCULATIONS.

A. Once HM 5.3 has calculated the investments associated with each component of the network, the expense module of the Model converts the investments into per-unit costs for individual UNEs. This process is described in detail in Section 11 of the HM 5.3 Model Description. In a nutshell, the expense module considers three categories of costs: (1) capital carrying costs, (2) network-related expenses, and (3) non-network-related expenses. Capital carrying costs include debt costs, return on equity, and depreciation costs, taking appropriate account of state and federal income taxes and other operating taxes. Network-related expenses are those associated with operating the various components of the local exchange network. Non-network-related expenses include customer operations and variable overhead costs.

The cost categories contained in the FCC's USOA are used as the point of departure for estimating the operating expenses associated with providing UNEs, basic universal service, and carrier access and interconnection. The major expense categories in the USOA are Plant Specific Operations Expense, Plant Non-Specific Operations Expense,

(continued)
Report and Order")

Customer Operations Expense and Corporate Operations Expense. The first two are network-related; the latter two are not.

Q. HOW ARE THE PLANT-SPECIFIC OPERATIONS EXPENSES CALCULATED?

A. The two major categories under which network-related expenses are reported by the ILECs are plant-specific operations expenses and non-plant-specific operations expenses. The plant-specific expenses are primarily maintenance expenses. Certain expenses, particularly those for network maintenance, are functions of their associated capital investments. These expense ratios are applied to the investments developed by the Distribution, Feeder, and Switching and Interoffice Modules to derive associated operating expense amounts. Section E of Attachment RAM-3, which in turn references Attachment RAM-6, explains how the ratios are input to the Model in the "Actuals" worksheet of the Expense Module. The ratios can be changed after a model run is completed, and the Model's expense outputs recalculated without doing a new run of the Model. These plant-specific expenses are associated with network elements based on the amount of various categories of network investment associated with those network elements.

The Model considers two other categories of network-related expenses: those associated with general support equipment and those associated with network operations. General support equipment includes motor vehicles, garages and other work equipment, buildings (other than wire centers, whose investments and expenses the Model specifically calculates in connection with local and tandem switching), general purpose computers, and the like. Parts of the general support investments are associated with customer and corporate operations; the remainder, with the network.

Section 11.3 of the Model Description describes the treatment of general support expenses in detail. Briefly, the Model determines the ratio of the investment in each general support category to the company's total network investment, based on ARMIS data. For a given general support category, it then multiplies this ratio by the investment generated by the Model to determine an amount of forward-looking investments for that general support category. The recurring costs – capital carrying costs and operating expenses – of these items are then calculated from the investments in the same fashion as the recurring costs for other network components. A portion of general support costs is assigned to customer operations and corporate operations according to the proportion of operating expense in these categories to total operating expense reported in the ARMIS data. The remainder of costs is then classified as network support and assigned directly to network elements.

Q. PLEASE DESCRIBE HOW THE PLANT-NON-SPECIFIC EXPENSES ARE CALCULATED.

A. Network operations expenses are plant-non-specific expenses that are incurred in operating the network. Network operations expenses are not fixed, but vary directly with the size of the network. These expenses, classified in ARMIS accounts 6512 and 6531 through 6531, are associated with various administrative, testing, and engineering functions, and with providing electric power to the network. HM 5.3 assigns ARMIS network operations costs to each network element (POTS, DS-1, ISDN, etc.) by 1) multiplying the forward-looking investment for that network element by the ratio of regulated network operations expenses to regulated Total Plant in Service (TPIS) investment calculated from ARMIS data; 2) multiplying the resultant network operations expense by a user-adjustable efficiency factor to arrive at the final network operations expense to be assigned to the network element; and 3) dividing the total network operations expense by the number of such network elements to arrive at a per-unit network operations cost. The efficiency factor can be set to a value that reflects expected gains in network operations efficiency. It is currently set to 1.0, although there are many examples of new operations technology and other productivity factors that are coming into play that will presumably continue to cause network operations expenses to decrease.

Q. TURNING NOW TO THE NON-NETWORK-RELATED EXPENSES, HOW ARE THEY CALCULATED BY HM 5.3?

A. The Expense Module assigns non-network related expenses to each density range or wire center (depending on the unit of analysis chosen) based on the proportion of direct expenses (network expenses and capital carrying costs) for that unit of analysis to total expenses of each type. Each of these expense calculations is described below:

- Variable Support – The Model, as a long-run cost model, recognizes that there are General and Administrative ("G&A") expenses that vary with the size of the firm. For example, if an ILEC did not provide loops, it would be a much smaller company, and would therefore have lower G&A costs. Also large firms have greater variable support expenses than smaller firms. Therefore, the Model includes a forward-looking estimate of G&A or "variable support" costs (including common, fixed overhead) in the cost estimates for each network element. These variable support expenses may be described as "economic overhead" associated with production of the modeled network elements and services. HM 5.3 calculates variable support costs as a factor applied to total costs (plant-specific operations plus network operations plus capital carrying costs [cost of capital + depreciation + taxes] that are calculated for a network element.

- <u>Uncollectible Revenues</u> – Revenues are used to calculate the uncollectibles factor. This factor is a ratio of uncollectibles expense to adjusted net revenue . The Module computes both retail and wholesale uncollectibles factors, with the retail factor being applied to basic local telephone service monthly costs for USF purposes and the wholesale factor being used in the calculation of UNE costs. The factor is applied as a markup to the other expenses calculated by the Model.

Q. PLEASE EXPLAIN THE NATURE OF THE USER INPUTS TO HM 5.3.

A. HM 5.3 provides the user with the ability to specify more than 2,100 inputs through a set of graphical user interface screens. These inputs represent, for instance:

- "On-off" switches that allow the user to invoke certain alternative model algorithms;

- The appropriately discounted prices of network components;

- Certain attributes of the local exchange network under study, such as the designation of which switches are hosts, remotes and stand-alone units and the amount of different types of outside plant by line density zone;

- The amount of structure sharing between copper-based and fiber-based services, between distribution and feeder plant, and between feeder and interoffice plant; and

- Parameters related to capital carrying costs, such as the percentages and cost of debt and equity, depreciation lives and net salvage values, and tax rates.

The inputs allow the user to reflect specific local conditions and circumstances, and/or to perform sensitivity analyses. Default values are set for each of these inputs that reflect industry practices, suitably adjusted to be consistent with the forward-looking orientation of the Model.

Q. WHAT IS THE PURPOSE OF THE HM 5.3 INPUTS PORTFOLIO PROVIDED AS ATTACHMENT RAM-5 TO THIS TESTIMONY?

A. The HM 5.3 Inputs Portfolio ("HIP") identifies the full set of HM 5.3 inputs, shows the values used for Verizon, and provides the rationale for those values.

IV. ADVANTAGES OF USING HM 5.3 TO ESTIMATE VERIZON'S UNE COSTS

Q. WHY DO YOU BELIEVE THIS COMMISSION SHOULD ADOPT HM 5.3 FOR ESTIMATING VERIZON'S UNE COSTS IN WASHINGTON?

A. There are a number of facets of HM 5.3 that make it the appropriate model to be adopted for estimating Verizon's UNE costs. First, HM 5.3 is a highly sophisticated costing tool that uses state-of-the-art modeling techniques. It provides a reliable and accurate estimation of Verizon's economic costs for the entire set of UNEs AT&T has proposed in this proceeding. It also includes the demand, and therefore the network capacity, associated with other network elements, such as SONET OC-n loops, that are not part of AT&T's proposal. Even though prices for all of these network elements are not currently under consideration, and the subsequent presentation of model results will focus only on those UNEs that are at issue, a key asset of the Model is therefore that it deals with the local exchange network as a whole. This is essential to properly recognize the relationships and synergies between the different components and costs of the local exchange network. For example, the Model provides for:

- An appropriate degree of outside plant structure sharing between different UNEs on a given feeder or distribution route, between feeder and distribution routes, and between feeder and interoffice routes;

- Construction of a set of interconnected interoffice fiber rings with sufficient capacity to support all of the switched and non-switched interoffice circuits, as opposed to modeling each individual circuit type on a single-service, piece-part basis that ignores the joint use of those piece-parts (or using statistical data from the embedded network to reflect such joint use); and

- The assignment of general support and some non-plant-specific expenses to individual network elements in appropriate amounts.

Second, HM 5.3 fully complies with the forward-looking TELRIC costing principles mandated by the FCC. For instance, the FCC emphasized that TELRIC should not consider the embedded network beyond using existing wire center locations. HM 5.3 appropriately reconstructs the loop and interoffice network without consideration of the existing facilities, and appropriately sizes all elements of the network to meet the current total demand, with appropriate allowance for near-term growth. The costs estimated by the Model, if adopted by the Commission, will simultaneously provide Verizon with a reasonable profit and allow the UNEs at issue in this proceeding to be priced at a level where competition for local service in Verizon's territory can continue to develop.

Third, the HAI Model has evolved through a series of releases. Each release has been subject to extensive scrutiny by both regulators and often-hostile incumbents. The model developers themselves, and their clients, have continued to analyze the Model's operations and the results it produces. The Model has also benefited from the extensive consideration of forward-looking modeling and input parameter issues by the FCC-state Joint Board on universal service. As a result of all these activities, the 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.

Finally, the Model and its inputs are extensively documented, and the Model is straightforward to use – see Attachments RAM-3, RAM-4, and RAM-5 to this testimony. Over the years, the developers have added a user-friendly graphical user interface that consists of a number of logically organized screens, and facilitates changing inputs to the Model, selecting its mode of operation, and organizing the results produced by the

Model. The Model documentation includes a complete User's Guide, which is included as part of Attachment RAM-4. Perhaps most importantly, the Model is installed on the user's own computer, where its methodology, code, and operation can be examined in as much detail as the user desires.

Q. SUMMARIZING THESE POINTS, WHAT SHOULD THE COMMISSION LOOK FOR IN COMPARING HM 5.3 WITH OTHER MODELS THAT MIGHT BE PUT FORTH IN THIS PROCEEDING?

A. I believe the Commission should consider 1) the degree to which the models comply with the FCC's TELRIC principles, particularly with respect to the FCC requirements that all costs should be treated as avoidable and that embedded costs should be excluded; 2) whether or not the models' calculations of the costs of different UNE are appropriately coordinated to ensure forward looking costs are accounted for once and only once; 3) the duration and depth of scrutiny to which the models have been subject, and how the results of that scrutiny have been translated into meaningful changes to the models when appropriate; and 3) whether the models lend themselves to this sort of critical, exhaustive, hands-on scrutiny.

V. USE OF HM 5.3 TO ESTIMATE VERIZON'S UNE COSTS

Q. WHAT INPUTS SPECIFIC TO VERIZON'S OPERATIONS IN WASHINGTON HAVE BEEN USED IN YOUR MODEL RUNS?

A. Three kinds of inputs need to be set in the Model. First, the Model requires company-specific customer location data, geological information (soil type, bedrock depth and hardness, water table depth), and identities and locations of the wire centers where local and tandem switches are located. The Model uses Verizon-specific inputs for these data. Second, values have been assigned to the 2,100 user-adjustable inputs. Finally, the Model has set the expense to investment (E/I) ratios for various plant categories.

Q. HOW HAVE USER INPUTS BEEN SET IN THE RUNS OF HM 5.3 USED TO ESTIMATE VERIZON'S UNE COSTS?

A. The Verizon values of these inputs are identified in the HIP, included as Attachment RAM-5, which also provides the rationale for these values. The Model provided with my testimony has these values already set as the default values in the user interface. Therefore, a user can reproduce the Verizon results without making any changes to the Model's inputs. On the other hand, the user can adjust any or all of the inputs in order to conduct sensitivity analyses of the effect of certain input changes on the cost outputs of the Model. The HM 5.3 User Guide, part of Attachment RAM-4, describes how this is done.

Q. PLEASE INDICATE THE USER INPUTS THAT ARE SPECIFIC TO VERIZON

A. The Model utilizes the following Verizon-specific inputs:

- <u>Structure fractions</u>: several input values relating to plant structure placement fractions are based on Verizon-specific information, as discussed in the Direct Testimony of AT&T witness John C. Donovan filed in this proceeding on June 23, 2003.

- <u>Switching investments</u>: prices for host and remote switches are those adopted by the FCC in the Inputs Order. The amalgamated switch price input reflects

Verizon's specific mix of host and remote switches. As determined by the FCC, the switch prices include the cost of all features commonly associated with local switches.

- Labor factor: 0.92.

- Cost of capital parameters: values as ordered in prior cost dockets, as listed in the following table:

Cost of Capital	
Debt fraction	0.4440
Cost of debt	0.0790
Cost of equity	0.1125
Weighted average Cost of capital	0.0976

- Depreciation lives and net salvage: Commission-prescribed values as listed in the following table:

Plant Type	Economic Life	Net Salvage %
Motor vehicles	9.3	20.0
Garage work equipment	18.0	5.0
other work equipment	15.0	10.0
buildings	43.0	0.0
furniture	20.0	10.0
office support equipment	15.0	10.0
company comm. equipment	8.0	2.0
general purpose computers	8.0	5.0
digital electronic switching	16.5	3.0
operator systems	12.0	-2.0
digital circuit equipment	12.0	4.0
public telephone term. Equipment	8.0	10.0
poles	28.0	-75.0
aerial cable, metallic	21.0	-27.0
aerial cable, non metallic	30.0	-5.0
underground cable, metallic	26.0	-15.0
underground cable, non metallic	30.0	-5.0
buried cable, metallic	23.0	-5.0
buried cable, non metallic	30.0	-5.0
intrabuilding cable, metallic	20.0	-30.0
intrabuilding cable, non metallic	20.0	-30.0
conduit systems	50.0	-5.0

The depreciation rate for the NID, Drop and SAI is assumed to be the average of the Aerial – Non-Metallic and Buried – Non-Metallic accounts.

- <u>Income tax rate</u>: 35.0%.
- <u>Other tax factor</u>: 4.65%

Q. HOW HAVE THE EXPENSE TO INVESTMENT (E/I) RATIOS FOR VARIOUS PLANT CATEGORIES NEEDED BY THE EXPENSE MODULES BEEN SET IN THE MODEL RUNS?

A. Section E of Attachment RAM-3 discusses the process by which the E/I ratios may be modified by the user. The Model has pre-set these ratios to the values the FCC has determined to be appropriate for each plant category. These can be seen in the expense module "Actuals" worksheet shown in Attachment RAM-6.

Q. HOW HAVE THE WIRE CENTERS BEEN GROUPED INTO "ZONES" FOR THE PURPOSE OF DISAGGREGATING LOOP COSTS AS REQURED BY THE FCC AND THIS COMMISSION?

A. AT&T has proposed a set of three wire center zones to which the individual wire centers are assigned in order to group wire centers with similar costs. AT&T believes that with these assignments, the deaveraged rates reasonably represent the underlying wire center costs.

To facilitate this process, AT&T has developed a deaveraging program that searches for the set of wire center zone assignments that minimizes the total deviation of costs within zones. Attachment RAM-7 describes how the deaveraging program operates. The zone assignments output by the optimizer are entered into the "Manual Zone Code" column of the WC Weights worksheet in the wire center expense module output workbook. If the user then follows the instructions appearing in the Zone Summary worksheet, Excel recalculates the deaveraged zone rates. This is done after the Model runs, and does not require the Model itself to be rerun. I have also used the five-zone deaveraging zones previously adopted by this Commission, and present those results as well.

Q. GENERALLY, HOW ARE THE MODEL'S RESULTS DISPLAYED?

A. The outputs of the Model appear in a set of spreadsheets produced by the expense module selected for a particular run by the user. These appear on the user's screen when the model completes a run, and are thus available to the user for examination (see further details in the HM 5.3 User Guide, part of Attachment RAM-4). There are different expense modules depending on whether the user selects to display results by density zone (which also displays the statewide averages) or wire center. When the wire center display is selected, the Zone Summary worksheet within that display also shows the wire center results by wire center zone, defined as described above, once the zones are properly entered into the WCWeights worksheet and the pivot tables in the Zone Summary worksheet are updated as per the instructions found on that worksheet. In addition to presenting the primary results of the Model run, the Model outputs contain many intermediate results of the HM 5.3 calculations, as well as portraying various inputs to the Model. These appear in the work file produced during by a run, which is automatically saved in the workfiles subdirectory under the main model directory in the user's computer.

The density zone and wire center expense module outputs for the Model runs I have made are included along with the model setup executable on the CD being submitted with this testimony.

Q. WHAT SPECIFIC RESULTS HAVE YOU INCLUDED IN ATTACHMENT RAM-8 TO THIS TESTIMONY?

A. Attachment RAM-8 contains four worksheets of particular importance that I have used in preparing this testimony. I will refer to them by the names that appear on the Excel "tab" at the bottom of each sheet. Incidentally, there are two other expense module output worksheets that play an important role in tracking model inputs. The first, titled "Scenario Inputs," appears in both the density zone and wire center expense module outputs. It shows the entire list of changes to the user inputs, if any, that have been made by the user for the run in question. Since, however, I have run the model using the pre-set input values coded in the model that appear in Attachment RAM-5, this sheet for my model runs shows no changes, and thus I have not included that sheet in Attachment RAM-8. The second, titled "User Adjustable Inputs," also appears in both the density zone and wire center expense module outputs. It gives the values of the complete set of all 2,100-plus user inputs, whether they have been changed from their pre-set values or not (the worksheet displays both the default value and user-adjusted value for each parameter). This worksheet is useful for reviewing the entire set of input values set in a given model run, in case, for instance, the user does not have a copy of the HIP that identifies each input and its default value. Again, since I have not made any changes to the input values, and have included the HIP as Attachment RAM-5 to this testimony, I have not included this worksheet in Attachment RAM-8.

The four sheets, or partial sheets, in Attachment RAM-8 are as follows:

- <u>Unit Cost</u>, from the density zone expense module output. This worksheet, appearing in Attachment RAM-8a, shows the statewide cost of the UNEs proposed by AT&T.

- <u>Unit Cost1</u> and <u>Unit Cost2</u>, from the Wire Center Expense Module output. These worksheets shows model results by individual wire center. Attachment RAM-8b shows selected columns from the complete worksheets filed in the CD with my testimony (I have done some minor reformatting to increase the legibility of RAM-8b). The correspondence between the columns in RAM-8b and the columns in the wire center expense module output is as follows.

- Columns A, which identifies the wire centers using their industry-standard "CLLI codes," is Column A of the Unit Cost output worksheet;
- Columns B – H, which give switched and non-switched voicegrade/DS-0 lines and household counts, are Columns A-H of the Unit Cost output worksheet;
- Column I, the total switched and non-switched DS-1 line count, is the sum of Columns DV and DW of the Investment Input output worksheet;
- Column J, the DS-3 line count, is column DG of the Investment Input output worksheet;
- Column K, the total loop unit cost, is the sum of Columns Y to AB of the Unit Cost II output worksheet;
- Columns L to Y, showing the non-loop UNE unit costs, are Columns AC to AP of the Unit Cost II output worksheet;
- Column Z, the total DS-1 loop unit cost, is Column AY of the Unit Cost II output worksheet; and

- Column AA, the total DS-3 loop unit cost, is Column AU of the Unit Cost II output worksheet.

- <u>WCWeights (VZ)</u>, from the Wire Center Expense Module output. This worksheet, the first four columns of which appear in Attachment RAM-8c for the AT&T three-zone deaveraging proposal, shows (in Column B, titled "Manual Zone Code") the wire center zones to which each of the Verizon wire centers has been assigned based on the Deaveraging Optimizer output. As I mentioned before, if a user desires to change the zone assignments of individual wire centers, this is where the changes should be made in the wire center expense module output, after which the user should recalculate the deaveraged results as described in the Zone Summary worksheet.

- <u>Zone Summary (VZ)</u>, from the Wire Center Expense Module output. This worksheet, appearing in Attachment RAM-8d, shows the Model results deaveraged by AT&T's proposed three wire center zones (I have reformatted the worksheet and highlighted the key results). I have separately deaveraged the DS-1 and DS-3 loops costs by calculating the weighted averages of the respective costs in each wire center zone using the same set of zone assignments.

The UNE cost results shown in Attachment RAM-2 have been extracted from these four worksheets.

VI. TESTIMONY SUMMARY

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. I recommend the Commission use HM 5.3 to determine costs and set the prices of the Verizon UNEs proposed by AT&T. HM 5.3 is a state-of-the-art cost model that is in the forefront of cost models applicable to the local exchange network. It is fully consistent with the FCC's TELRIC costing principles. It deals with the local exchange network as a whole, not one or a few components of the network, thereby ensuring a consistent and appropriate assignment of all of Verizon's recurring costs to individual UNEs. It has been under development for ten years, during which time it has been subject to thorough scrutiny. The extent and depth of that scrutiny, and the sheer numbers of parties involved in the review, far exceed any similar analysis of an incumbent's model, particularly one that, if my understanding is correct, Verizon will be introducing nearly for the first time in this proceeding. To the extent that scrutiny, as well as ongoing internal review by the Model's developers and clients, has identified bona fide concerns with certain aspects of the Model, it has been changed to resolve those concerns. The Model is publicly available, straightforward to install and run on the users own computer, and flexible in its provision of a myriad of inputs that users can modify.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.