BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of the Review of Unbundled Loop and Switching Rates and Review of the Deaveraged Zone Rate Structure	))))	Docket No. UT-023003

REBUTTAL TESTIMONY OF

STEVEN E. TURNER

ON BEHALF OF

AT&T COMMUNICATIONS OF THE PACIFIC NORTHWEST, INC.

APRIL 20, 2004

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Steven E. Turner. My business address is Kaleo Consulting, 2031 Gold Leaf Parkway, Canton, Georgia 30114.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I own and direct my own telecommunications and financial consulting firm, Kaleo Consulting.

Q. PLEASE DESCRIBE YOUR EDUCATION BACKGROUND.

A. I hold a Bachelor of Science degree in Electrical Engineering from Auburn University in Auburn, Alabama. I also hold a Masters of Business Administration in Finance from Georgia State University in Atlanta, Georgia.

Q. PLEASE DESCRIBE YOUR WORK EXPERIENCE.

A. I began my engineering career with General Electric in 1986 in the capacity of Research Engineer in the Advanced Technologies Department where I was involved in the development of high-speed graphics simulators. I joined AT&T in 1987 and, during my tenure (through 1997), I held numerous positions of management in engineering planning as well as network operations and network deployment. Chief among these, and relevant for this proceeding, was the engineering planning and financial responsibilities associated with AT&T's outside plant infrastructure for local market entry in states comprising the company's Southwestern Region. With the passage of the Federal Telecommunications Act in 1996, I became AT&T's primary negotiator for establishing the Terms, Conditions, and Pricing for unbundled elements associated with SBC's Local Interconnection Agreements.

I founded Kaleo Consulting in 1997, and since that time have participated extensively in the market opening proceedings before thirty-one state utility commissions and the FCC. My primary focus in these proceedings has been the analysis of cost studies and/or models recommended by incumbent local exchange carriers to establish pricing using forward looking economic cost principles for loop and transport facilities. A copy of my resume is provided as Exhibit SET-1.

Q. PLEASE INDICATE IN WHAT STATES YOU HAVE PREVIOUSLY TESTIFIED OR FILED TESTIMONY.

A. I have testified or filed testimony before the commissions in the states of Alabama, Arkansas, California, Colorado, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Hampshire, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Washington, and Wisconsin. Additionally, I have filed testimony before the Federal Communications Commission ("FCC").

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. AT&T Communications of the Pacific Northwest, Inc. ("AT&T") has retained me to review, analyze, and where possible and/or appropriate, restate the rates for loop and transport unbundled network elements ("UNE") contained in the cost studies submitted by Verizon for its operating territory in Washington state. In doing so, I identify the infirmities of the cost models that Verizon has relied upon in Washington that cause its recommended costs for unbundled loops and transport to be overstated. As will become clear, Verizon's cost models contain fundamental flaws that cause them to systematically overstate costs and thus preclude them from

producing the TELRIC for unbundled loops and transport. Furthermore Verizon has ensured that certain parameters cannot be altered by the users of its models. Nonetheless, I will review the modifications that I was able to make to develop the costs for unbundled loops and transport that are necessary to bring the costs closer into compliance with TELRIC. It is impossible, however, to correct all of the significant errors in Verizon's cost models.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. Based on my detailed review of the Verizon Washington unbundled loop and transport cost studies, I conclude that these studies suffer a number of violations of TELRIC principles that taken together, produce grossly overstated UNE recurring rates. These TELRIC violations include, but are not limited to:

(a) Inappropriate investment inputs;

(b) Reliance on Verizon's embedded outside plant network;[1]

(c) Imprecise customer demand data that results in the failure to reflect scale economies; and

(d) Inefficient engineering input choices.

Moreover, Verizon's own so-called forward looking adjustments to the embedded network serve only to confound the results in that such adjustments result in the placement of unnecessary equipment and facilities, hence increased cost.

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[1] *See* 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, Panel
(continued)

In simple sum, Verizon's cost study merely purports to reproduce much of Verizon's embedded network, thus depriving potential entrants of the efficiencies, hence prices, available under properly developed forward-looking TELRIC costs as mandated by the Act and the FCC's rules that implement it. Additionally, Verizon's studies suffer a number of flaws in logic that, likewise, result in overstated UNE costs that will be summarized below and detailed in the testimony that follows. The Commission should, therefore, reject the Verizon model.

Q. HOW IS YOUR REBUTTALTESTIMONY ORGANIZED?

A. Following this introductory section my rebuttal testimony contains four more sections related to unbundled loops. In Section II, I address Verizon's cost development environment for unbundled loops. Here I provide the WUTC with an overview of the Verizon cost models replete with an explanation of how the web based format coupled with the operating environment preferred by Verizon, renders the models essentially inscrutable. That is, I demonstrate for the Commission that the Verizon's models are for the most part, unworkable, virtually impossible to review or modify, and inconsistent with this Commission's prior requirements on UNE cost models.

In Section III, I set forth modifications to the underlying material and placement cost inputs used in VzLoop and VzCost. Specifically, I address modifications to the underlying inputs for material and placement cost for cable, SAI, drop, NID, digital loop carrier, and other related components. Further, this section also explains the fundamental problems inherent in

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Testimony of Verizon Northwest Inc. on Recurring Costs, June 26, 2003, pp. 29, 36-39. (Hereafter referred to as "Verizon Panel Testimony.")

Verizon's use of the "Detailed Continuing Property Records" ("DCPR") database and the engineer, furnish, and install ("EF&I") factor derived from that database in the development of digital loop carrier installed costs in VzCost.

Section IV of my testimony addresses several network inputs employed by Verizon that render its model inconsistent with TELRIC. Specifically, I demonstrate that:

(a) Verizon's cost models have fundamentally failed to model a loop network configuration that is consistent with TELRIC principles;

(b) Verizon has introduced considerable problems in its SAI placement in its "costed" network;

(c) Verizon relies on inefficient and embedded cable routing to develop cable costs;

(d) Verizon utilizes illogical and inefficient overlapping distribution areas in its distribution cable architecture which leads to inefficient use of equipment in Verizon's network and clearly leads to overstated cabling distances;

(e) Owing to the logic used in identifying new or "modeled" digital loop carrier placements in the supposedly forward-looking network, Verizon's placement of digital loop carrier introduces significant inefficiencies into the modeling of this important component in the network; and

(f) Network demand issues and significant modifications thereto are required to develop the cost of NIDs and drops in Verizon's cost models.[2]

[2] I would point out that because of the significant problems with the VzLoop and VzCost modeling environments, I have not been able to make modifications to virtually any of these problems at this
(continued)

Section V addresses four significant engineering inputs and they are as follows:

(a) Distribution cable sizing factors: These factors are used to determine the minimum amount of space capacity that should be built into distribution cables. I address why Verizon's proposals are extraordinarily overstated and review the inputs that the FCC found to be reasonable in a cost-based environment in the *Virginia Arbitration Order* – an order that specifically addressed UNE cost inputs for Verizon's network in Virginia.

(b) Copper-fiber cutover point: As used in VzLoop, this is the point where Verizon requires that feeder in conjunction with digital loop electronics would be used in lieu of an all-copper loop. My testimony will review why this input selection is internally inconsistent with other tools in Verizon's cost model environment, inconsistent with engineering criteria, and generally inconsistent with VzLoop's alleged ability to identify the economic cross-over point between fiber and copper for each individual new DLC placement.

(c) IDLC versus UDLC: Along this same vein, I also address why it is appropriate in a forward-looking network to assume the use of integrated digital loop carrier ("IDLC") 100 percent of the time in lieu of using less efficient technology such as universal digital loop carrier ("UDLC"); and

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point with the exception of the NID and drop cost calculations. It is for this reason that I refer to these as "desired" network input modifications. However, because I have been unable to make these modifications, I would note for the Commission that the results that I ultimately produce are still higher than TELRIC.

(d) Structure sharing percentages: Verizon significantly understates the sharing that is available for aerial, buried, and underground structure investment. To underscore this point, I provide the findings that the FCC made in the *Virginia Arbitration Award* to show that Verizon's claimed sharing percentages that range as low as zero percent are unrealistic.

Q. DOES YOUR TESTIMONY ALSO ADDRESS VERIZON'S COSTS FOR UNBUNDLED DEDICATED TRANSPORT?

A. Yes. In Section VI, my testimony identifies two critical issues that this Commission should be aware of related to Verizon's interoffice dedicated transport cost study. *First*, my testimony will review an issue that has been raised with Verizon repeatedly regarding its insistence on including Digital Cross-connect System ("DCS") investment on the terminal ends of its interoffice transport circuits regardless of whether the CLEC orders such capability or is allowed to use the full capability of such functionality. My testimony explains why is it vital to separate out the cost for this expensive network component such that if the CLECs wish to enjoy its capability they can then also pay for DCS. *Second*, my testimony will also address the cost impact of Verizon's extremely low fill factor for interoffice fiber and will assess how this fill factor relates to recent determinations made by the FCC for fiber fill in transport cost studies.

Q. MR. TURNER, BEFORE YOU PROCEED FURTHER, PLEASE IDENTIFY FOR THE COMMISION THE TYPES OF LOOPS FOR WHICH VERIZON COMPUTES COSTS.

A. Certainly. Verizon uses VzCost and VzCost in conjunction with the other cost calculating modules to compute costs for several different types of loops, as described in the Verizon's testimony.[3] They are as follows:

- 2-Wire Analog Loop
- 4-Wire Analog Loop
- 2-Wire Customer Specified Signaling Loop
- 4-Wire Customer Specified Signaling Loop
- ISDN/BRI Digital Loop
- DS1/ISDN PRI Loop
- DS3 Loop
- xDSL Compatible Loop

Q. DOES YOUR ANALYSIS FOCUS ON ALL OF THE VARIOUS LOOP COSTS COMPUTED BY VERIZON?

A. My analysis focuses primarily on Verizon's calculations of its two-wire loop costs. In the process of making the modifications for the two-wire loop, these changes reduce the costs for other related loop elements as well. There are significant methodological issues that I will discuss in the following pages related to Verizon's development of the DSL related loops that prevent me from producing an appropriate restatement. Nonetheless, while I have also reviewed and restated certain of Verizon's advanced services loop and other proposed costs,

[3] Verizon Panel Testimony, pp 20-21.

because of the structural and methodological limitations in Verizon's VzCost and VzLoop models that I have discussed previously and will detail more fully in the following pages, my restatement falls short of producing the correct forward-looking costs of those elements. In other words, my restated costs for advanced loops are still overstated, although not as grossly as the costs initially presented by Verizon.

Q. COULD YOU GIVE THE COMMISSION SOME SENSE OF THE EXTENT OF THE OVERSTATEMENT IN VERIZON'S PROPOSED RATES FOR UNBUNDLED LOOPS IN THIS PROCEEDING?

A. Yes. The table below compares Verizon's proposed UNE rates for several important loops types compared to my restated results supported by this testimony and further compared to the rates sponsored by AT&T through the testimony of Dr. Robert Mercer. A complete summary of all of the AT&T restated recurring rates is included as Exhibit SET-2 to this testimony.[4]

[4] Work papers supporting my restatement of Verizon's recurring costs are being provided electronically on a CD filed with this testimony. The CD and the supporting work papers that it contains are included as Exhibit SET-3.

Summary of Restatement of Key Unbundled Loops

Element	Verizon	AT&T Restatement of Verizon Models	AT&T HM 5.3	% Verizon Overstatement Compared to Restatement
2-Wire Zone 1	$28.73	$6.85	$5.06	319%
2-Wire Zone 2	$80.73	$14.66	$8.44	451%
2-Wire Zone 3	$194.12	$36.50	$24.54	432%
2-Wire Statewide	$33.66	$7.99	$7.64	421%
DS1 Statewide	$189.23	$51.81	$49.26	265%

II. VERIZON COST MODEL OVERVIEW

Q. PLEASE BRIEFLY DESCRIBE VERIZON'S COST MODEL.

A. The Verizon model is actually multiple cost study models that loosely interrelate to one another to produce the rates for a wide variety of unbundled elements. With respect to unbundled loops, costs are processed through multiple applications that are used to develop the majority of the loop investments before they are ultimately converted into recurring costs and rates in yet another model (VzCost). A brief description of each module is set forth below.

Preprocessing: Prior to the main costing tools performing their analysis on Verizon's cost data, Verizon performs a series of preprocessing steps where the physical location of major network components such as distribution terminals, SAIs, and digital loop carrier are identified. Additionally, this preprocessing function attempts to replicate the embedded connections between distribution terminals, SAIs, and digital loop carriers and also to identify other network points (termed "Theoretical Points of Interconnection") which may later be turned into digital loop carrier points if deemed necessary by the VzLoop code. The key item produced from this preprocessing is a network table that contains the network data and

relationships of the network terminals in a format for input into VzLoop. The preprocessing function also produces the demand tables that are also used by VzLoop.

VzLoop: VzLoop is the primary tool used by Verizon to develop the investments for the unbundled loop categories. Specifically, VzLoop develops the investments for the Network Interface Device ("NID"), drops, distribution terminals, distribution facilities, serving area interfaces ("SAI"), digital loop carrier ("DLC") remote terminals and central office terminals, copper feeder facilities, fiber feeder facilities, including all aerial, buried, and underground structure related to these assets. The one area that is not included in this investment development are line cards that are used in DLC remote terminals and central office terminals. Further, VzLoop does not incorporate the engineer, furnish, and install ("EF&I") factor cost because this is applied later in VzCost. Nonetheless, with this exception, VzLoop takes a tremendous number of inputs for material costs, placement costs, engineering inputs, loop demand, the network configuration produced by SpanNet, and many other inputs as well and combines these inputs through various formulas contained within VzLoop to produce investments.[5] The difficulties and inflexibility of this portion of the Verizon cost study will be addressed in greater detail later.

VzCost: Once investments for unbundled loops (or any other recurring cost elements) are identified, these investments must be converted into recurring costs and ultimately, recurring

[5] Please note that this summary is extremely high level. Verizon produced documentation regarding this portion of the model that numbers 82 pages entitled the VzLoop Cost Manual Version 7.0. This document was provided as Attachment B to the Verizon Panel Testimony.

rates. This work is performed in VzCost. Specifically, VzCost applies the investment and cost factors that are developed within this model to the various assets classes for all unbundled network elements to develop recurring costs for the elements. Recurring costs are, in turn, multiplied by common cost factors to determine recurring rates for various unbundled network elements. Modifications to the factors contained in VzCost are addressed in the testimony of Scott Lundquist on behalf of AT&T. The restated UNE rates set forth in my testimony utilize the cost factor inputs recommended by Mr. Lundquist.

Q. PLEASE PROVIDE AN OVERVIEW OF THE VERIZON DEVELOPMENT ENVIRONMENT FOR THE VZCOST, VZLOOP, AND RELATED MODULES.

A. VzCost and VzLoop in particular were developed by Verizon in Delphi and operate in conjunction with Oracle databases containing the information upon which they run. Delphi is a complex programming code that is compiled. This means that while analysts are able to review the code that Verizon has written, we do not have access to the same executable environment that Verizon has without having all of the compilers and related libraries that Verizon also has.[6] All of the logic that Verizon uses to develop investments in VzLoop and plug-in investments and comprehensive costs in VzCost are contained in this complex programming code in a manner that makes it virtually impossible to trace the logic of the model. It is customary when evaluating cost development in UNE proceedings that I have been involved with to be able trace the

[6] Theoretically, it would be possible for AT&T to obtain this additional information, but once again, it is extremely difficult to reproduce the same programming environment within AT&T that Verizon used to develop the model and all this is done for is to simply be able to trace the inner-workings of the model. It should not be this difficult to simply determine how investment calculations are made in a cost model as will be described below.

calculations of all of the investments elements for each UNE. In other words, it is very important to identify the inputs, engineering calculations, and the like that are used to develop the investments that are used in calculated the recurring costs for any UNE – especially unbundled loops where there are some many engineering considerations. The problem with Verizon's use of Delphi programming environment is that it is extremely difficult to see how the formulas operate in Delphi and actually observe how inputs are manipulated by the code in that all of this occurs when the code is run on the data. In my 10 years of developing and reviewing cost models, I have never seen a model as complicated to review as that developed by Verizon. In short, it has rendered the task of reviewing (and ultimately attempting to modify the calculations used by) the VzLoop and VzCost models almost impossible.

Q. VERIZON'S WITNESSES STATE IN THE VERIZON PANEL TESTIMONY THAT VZCOST IS "AN OPEN AND TRANSPARENT MODEL."[7] BASED ON YOUR STATEMENTS ABOVE, IT WOULD APPEAR THAT YOU DO NOT AGREE WITH THIS ASSERTION.

A. That is correct. Under any reasonable definition of open and transparent that would include the ability to view and modify the inputs and calculations used to compute the TELRIC cost, VzCost fails miserably. A cost model used in a TELRIC proceeding should allow all parties the ability to modify basic inputs and produce the associated results.

Furthermore, the core loop modeling component used by VzCost is completely closed. The loop element calculator, or VzLoop, is a compiled program that cannot be modified. It is extremely difficult if not impossible to understand the code, assuming one has programming

[7] Verizon Panel Testimony, p. 16.

background to understand it in the first instance. It is impossible to claim that VzCost is open and transparent when VzLoop is the loop modeling tool.

Furthermore, VzCost and VzLoop directly contradict this Commission's own requirements regarding what should constitute and open cost model. Specifically, this Commission made the following requirement for cost models used in Washington:

> We have on other occasions defined what we mean by an open cost model: … 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.[8]

As will be illustrated at many points through the testimony that follows, Verizon's model is effectively impossible to modify critical assumptions for how cost inputs are developed making it equally impossible to determine cost-based rates for unbundled elements.

Q. DOES VERIZON EVEN PERMIT YOU TO MODIFY THE CALCULATIONS USED IN VZLOOP IF YOU WERE TO DETERMINE THE NEED TO MAKE ANY MODIFICATIONS?

A. Absolutely not. Verizon has made it very clear in a workshop that it conducted on the VzCost and VzLoop models that it will not permit parties to modify the cost model code. The following are excerpts from the workshop where Verizon (through Mr. Harris) made this perfectly clear.

> Mr. Harris: You could not change the code, no. It's – unless you wanted to redo the model yourself. This is a copyrighted model. You can't change the code in it.

[8] Washington Utilities and Transportation Commission, Docket Nos. UT-960369, UT-960370, and UT-960371, *Eighth Supplemental Order*, May 11, 1998, p. 12, fn. 11.

> You can ask us to change the code, but you couldn't change the code.[9]
>
> Mr. Turner: If we wanted to make that type of change in your model … you're saying we are not allowed to do that; we'd have to – What would we have to give you to have you do it?
>
> Mr. Harris: You would have to ask us to change the code that actually exists within the model.
>
> See, there's input changes that can take place and you can make input changes to the model without any problem. But if you actually get into the Delphi code, you don't have the ability to get into the Delphi code and actually change that particular code.[10]
>
> I mean, this is a – this is a system that if you could get into and actually change code, you could damage the model as it exists today. So we have to maintain the security of the model. For code purposes, we'd bring it through the systems that we have to, to maintain the integrity of the code, make sure we understand what's being changed, what the new versions are, just like any other system we have.
>
> So you can't get into the code itself. You'd have to have us get into the code and make those changes.[11]

The bottom line is that Verizon has created a model where it is structurally set up in such a way that it is impossible for the parties to change the model independently. Moreover, given the complexity of the model, it is practically impossible to make investment calculation changes of

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[9] Public Utilities Commission of California, OANAD Rulemaking R.93-04-003, Verizon Unbundled Network Element Phase, Cost Model Workshops, January 13-15, 2004, p. 3394, ll. 7-10. The transcript is included in the "VzLoop Cost Workshop" directory of the work papers found on the CD as Exhibit SET-3. (Hereafter referred to as "VzLoop Cost Workshop.")

[10] VzLoop Cost Workshop, p. 3394, l. 21 to p. 3395, l. 5.

virtually any kind within the model. This severe limitation is reflected in the testimony that follows and will confirm that it is impossible to produce costs for unbundled loops that are consistent with TELRIC principles. These limitations notwithstanding, the modifications that I make bring the costs as close as possible to TELRIC.

Q. ARE THERE SPECIFIC MODIFICATIONS TO THE CODE FOR VZLOOP THAT YOU WANTED TO MAKE THAT YOU WERE UNABLE TO IMPLEMENT?

A. Yes. Two examples that I will discuss in more detail later in this testimony relate to the investments for DLC and structure within VzLoop. These needed changes will be discussed in more detail in the following testimony.

Q. CAN YOU PROVIDE A COMPARISON OF THE PROCESS OF MAKING AN INPUT CHANGE TO VZCOST COMPARED WITH A TRULY OPEN AND FLEXIBLE MODEL?

A. Yes. A good example of the type of input that is necessary to evaluate and modify in a TELRIC proceeding is the material price of Digital Loop Carrier (DLC) equipment. As the Commission would like surmise given the large percentage of loops served by DLC in a forward-looking network, the cost for DLC is a vital input component in an unbundled loop cost study.

First I will describe the process that must be used to modify the material price of a piece of DLC equipment using VzCost and producing a modified cost for the 2-wire analog loop cost study. The following steps are required:

1. Download the material file from VzCost.
2. Open the Material file in EXCEL and change the appropriate DLC material price.

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[11] VzLoop Cost Workshop, p. 3395, l. 21 to p. 3396, l. 2.

3. Download the EXCEL template for the material table from VzCost Data Management to verify the upload file format.
4. Modify the Material file to match the EXCEL template.
5. Remove the header row and save as a .csv file. This step is not noted anywhere in Verizon's documentation and was only discovered through trial and error.
6. Upload the Material file to VzCost.
7. Download the Placement file from VzCost.
8. Manually modify the Placement file provided by Verizon to remove the first set of records to create the input for the preliminary VzLoop run. This first run is performed to calculate the economic crossover point at which it is economical to install DLC equipment.
9. Download the EXCEL template for the Placement table from VzCost Data Management to verify the upload file format.
10. Modify the Placement file to match the EXCEL template.
11. Remove the header row and save as a .csv file.
12. Upload the modified Placement data table into VzCost.
13. Create and execute the preliminary VzLoop run. This run of VzLoop for Washington takes approximately 1.5 hours.
14. Go to Data Management and download the Elements and Inventory output tables produced by the preliminary run.
15. Import the Elements file into ACCESS or similar database tool.
16. Replicate the query noted in the "wA_ECF_ADJ_051203.xls" file to query the Elements file for use in the placement file. This requires the ability to translate the structured query language used by Oracle to the structured query language used by ACCESS or similar database tool.
17. Manually copy and paste the Elements query results into the "wA_ECF_ADJ_051203.xls" file
18. Import the Inventory file into ACCESS or similar database tool.
19. Replicate the query noted in the "wA_ECF_ADJ_051203.xls" file to query the Inventory file.
20. Manually copy and paste the Inventory query results into the "wA_ECF_ADJ_051203.xls" file.
21. Download the Loop SS Elements output from the preliminary VzLoop run from VzCost.
22. Manually copy and paste the "Loop SS Elements" data into the "wA_ECF_ADJ_051203.xls" file.
23. Create a new Placement file from the "wA_ECF_ADJ_051203.xls" file for use as an input the second VzLoop run.
24. Upload the new Placement file to VzCost.
25. Create and execute the second VzLoop run. This second run of VzLoop for Washington also takes approximately 1.5 hours.

26. Approve the VzLoop run.
27. Go to Data Management within VzCost and manually approve the six output tables from the VzLoop run.
28. Create and run the Loop Element loading.
29. Approve the results of the Loop element loading.
30. Make any and all changes to the Miscellaneous Material Data Table.
31. Create and run the 2-Wire Analog Loop BC run.
32. Approve the results of the 2-Wrie Analog Loop BC run.
33. Create and run the 2-Wire Analog Loop cost study.

This process requires numerous manual steps outside of the VzCost system itself. These steps require the use of a database tool (MS Access in the case above) to complete the steps described by Verizon. This contradicts Verizon's own testimony which states that no additional software is required.[12] This process takes approximately 6 hours to complete assuming that the user performing the steps has already been trained on the process.

By comparison, other cost models used in TELRIC proceedings would require literally a one step process. The process would be to enter the modified material price and then press a button to run the model.

Q. DO YOU BELIEVE THAT HAVING AN INTERNET-BASED COST MODEL IS A BENEFIT?

A. Absolutely not. There are many illustrations of the problems of using an internet-based cost model. *First*, because of the programming code that Verizon has used, which is in part required by it operating in an internet-based environment, Verizon has largely precluded users from having the opportunity to modify the logic for computing investments within the model. I will address multiple examples of this throughout the testimony that follows. However, at a

[12] Verizon Panel Testimony, p. 17.

fundamental level, Verizon's programmers have made determinations regarding how investments are combined together or where investment components (such as digital loop carrier) will be placed that are either inconsistent with TELRIC or simply in error. Verizon's internet-based environment makes it virtually impossible to make corrections in these areas.

Second, the internet-based environment has proven to be incredibly slow to make changes. I have provided an illustration above of how long it takes to actually incorporate a material change into Verizon's model. However, virtually any change that is made requires painstaking steps of uploading files, accepting those files for use, setting off a run of the model, and then waiting a significant amount of time before the process is complete.

Third, the parties in this proceeding are consistently at the whim of Verizon's programmers as to the capabilities that we have. One weekend before our filing was initially due, Verizon made a change to the VzCost tool and took the tool out of service for a weekend. Because of the workload intensity of these cost filings, weekends are often used to perform work and Verizon took the model away from the parties in this proceeding the weekend prior to the original date of our filing. That said, a worse problem is that when the model was restored for our use, Verizon had changed how parties would be permitted to download files. Verizon has now inserted a restriction that files that have more than 65,000 lines in them cannot be downloaded. There are several files that have greater than this number of lines such as the inventory file, which is required to download by Verizon's own process to create the constants and placements files that are then ultimately used in VzLoop. This programming change on Verizon's part has left the parties in this proceeding in a situation of having to beg Verizon to

work with us on how to download files that we absolutely must have just to run Verizon's model. In fact, late on Friday, April 16, 2004, Verizon modified the user ID for an AT&T consultant so that AT&T could at least download the files that it would need for this project. That said, the week before our filing in Washington, AT&T's team working with VzCost was literally having to find "work arounds" to this change on Verizon's part and imploring them to make some sort of exception for us (which Verizon ultimate made) simply so that we could have access to files greater than the 65,000 line limit immediately before a filing. This is unconscionable to create a model that is this difficult to use and then to make it harder immediately before a filing deadline.

Fourth, because VzLoop and VzCost operate in an internet-based environment, connectivity to these systems for the purposes of downloading and uploading files is extremely slow. AT&T's consultants have found it to be extremely difficult to upload the large files that are necessary to produce a run of VzLoop. One of the files that was modified as part of its work in this project was the loop demand file.[13] This file is extremely large and after its modification must be uploaded back into Verizon's internet-based environment for processing. It took approximately three attempts to get this one file loaded into VzLoop through the internet. In the two attempts that failed, the amount of time that the connection worked was approximately an hour. However, this was not long enough to actually allow the file to fully upload thereby requiring the additional attempts that took equally as long or longer. Verizon has

[13] The reasons for these modifications will be detailed later in testimony.

addressed this problem by creating a new process that parties can use whereby the parties can burn a CD of the files that they want to upload, overnight these files to Verizon, and have Verizon upload them locally the next day. In other words, instead of having several failed upload attempts and waiting hours for the upload to take place, Verizon's solution is to overnight the file and wait at least one day. This is clearly not a solution and only indicates yet again the significant limitations of working with VzLoop and VzCost in an internet-based environment.

There are *many* other examples that I could provide of why Verizon's use of an internet-based environment for its cost study has not only had no benefit, but been a great detriment to developing costs in this proceeding. The reality, however, is that the internet-based environment has proven to provide nothing but difficulties.

Q. VERIZON STATES THAT VZCOST HAS THE CAPABILITY TO PERFORM SENSITIVITY ANALYSES. HAVE YOU FOUND THESE TOOLS USEFUL?

A. Absolutely not. Given the illustrated problems and time involved above just to make a materials price change on DLC equipment, the Verizon model is hopelessly complicated to make any meaningful sensitivity runs with it.

Q. VERIZON STATES THAT VZCOST "ALLOWS USERS TO MODIFY ALL OF THE FORMULAE THAT VZCOST APPLIES TO THE INITIAL INVESTMENT ELEMENTS TO DEVELOP FINAL COSTS."[14] DO YOU AGREE WITH THIS STATEMENT?

A. This statement is extremely misleading. Technically, a user can see how the "initial investments" are used to calculate final costs. The key here is to understand that the initial investments being

[14] Verizon Panel Testimony, p. 16.

talked about here are actually the output of the main loop modeling tool VzLoop. The inputs and assumptions that are most important to understand, and possibly modify, are actually upstream to the "initial investments" to which Verizon's witnesses refer. Therefore, the benefit spoken of by Verizon's witnesses is hollow as it provided no insight whatsoever into how the initial investments were determined in the first place.

Q. WHAT IS YOUR RECOMMENDATION FOR THIS COMMISSION WITH REGARD TO THE USEFULNESS OF VZCOST IN A TELRIC PROCEEDING?

A. VzCost in its current form is not useful as a tool for modeling TELRIC costs of a telecommunications network. The fatal flaw with the model is black box loop modeling program VzLoop. While the process to use VzCost is frustrating and cumbersome as described above, these weaknesses can be overcome with some additional manual effort and a few system modifications. It is impossible, however, to understand or change the loop model that is the heart of the cost model itself. Until VzLoop is open and transparent, VzCost should not be used in a TELRIC proceeding.

III. MODIFICATION OF INVESTMENT INPUTS

A. MATERIAL AND PLACEMENT COST INPUTS

Q. HAVE YOU REVIEWED THE UNIT COSTS FOR MATERIAL AND PLACEMENT IN THE FILING THAT VERIZON MADE IN THIS PROCEEDING?

A. Yes, and I have found them generally to be significantly overstated. AT&T in its direct case has developed material and placement costs for the entire array of network elements that are necessary to provide unbundled loops. I conducted a comparison of the material prices for all of the loop investment elements. Particularly with respect to copper cable and drops, the material prices that were provided by Verizon are substantially overstated when compared to

those found in HM 5.3. The differences were relatively minor for smaller cable counts (up to 200 pairs) but were quite large for larger cable counts.

Q. DO YOU HAVE ANY EXPLANATION FOR WHY VERIZON'S COST FOR THE LARGER CABLE COUNTS ARE DRAMATICALLY HIGHER THAN WHAT WAS USED IN HM 5.3?

A. The most likely explanation is that Verizon has assumed the use of 24-gauge cable for all of the material inputs used in its cost filing. Verizon has used this gauge cable even through there is no engineering basis for this gauge cable given its maximum copper length assumption of 12,000 feet. In reality, from an engineering standpoint, all of the copper cable in the loop plant could be installed as 26-gauge cable, which would have a smaller cost. The only time that it would be reasonable to use a 24-gauge cable (and the only instance where this is done in HM 5.3) is with cable sizes of 200-pairs and less. This is done to give more strength to the wires given that these smaller cables are near the end of distribution runs and will have more manual work performed on them in distribution terminals and pedestals. For cables that are 400-pairs and larger, splices are normally enclosed in splice cases and are not subject to wire handling problems that would necessitate the large gauge copper. I therefore have used the material prices in the HM 5.3 model in my restatement of Verizon's loop costs using the Verizon models.

Q. HAVE YOU TAKEN THE SAME APPROACH WITH THE PLACEMENT COSTS?

A. Yes. There are detailed explanations for the placement costs contained in the testimony and supporting work papers for the HM 5.3 filing. I have relied on these placement inputs for cable to restate the inputs for the Verizon models except for those inputs that did not vary significantly from the existing Verizon inputs.

B. DLC INVESTMENT INPUTS

Q. HOW HAS VERIZON DEVELOPED THE INSTALLED COST FOR DIGITAL LOOP CARRIER?

A. Verizon has developed the installed cost for digital loop carrier ("DLC") equipment in its cost models by employing a series of "linear loading factors" to estimate the non-material portion of the total investment for DLC. These linear loading factors are sometimes referred to as engineer, furnish, and install ("EF&I"), design & install or in-place factors. In simple terms, through VzLoop and VzCost, Verizon applies these factors to the material price for particular pieces of DLC equipment to calculate the construction cost of the asset.

Verizon's use of linear loading factors in VzLoop and VzCost substantially departs from the way costs are realistically incurred and from how Verizon derived the installed cost for every other loop element in the cost study. More notably, Verizon's study also ignores the manner in which Verizon itself estimates the costs of its future projects.

Q. CAN YOU SUMMARIZE WHY VERIZON'S USE OF EMBEDDED LINEAR LOADING FACTORS IN ITS COST STUDIES IS WRONG?

A. There are at least eight problems caused by Verizon's reliance on linear loading factors to develop UNE costs:

- ***Linear loading factors are a "black box."*** The use of linear loading factors violates the FCC's requirement that cost studies be open and verifiable[15] and makes it impossible to achieve anything close to information parity among the parties in this

[15] The FCC's First Report and Order in the Universal Service Proceeding states: "The cost study or model and all underlying data, formulae, computations, and software associated with the model must be available to all interested parties for review and comment. All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible." *See, In the Matter of Federal-State Joint Board On Universal Service,* First Report and Order, CC Docket No. 96-45, (rel. May 8, 1997) ¶ 108.

proceeding.[16] Certainly openness and verifiability are essential to any decision-making entity.

- ***Linear loading factors reflect embedded data.*** The FCC explicitly prohibits the use of embedded data in developing forward-looking costs.[17] Linear loading factors rely entirely on Verizon's embedded network and activities.

- ***Linear loading factors fail to reflect appropriate economies of scale.*** Verizon's embedded loading factors reflect smaller projects associated with piece-meal expansions of the network rather than the much larger projects customarily and appropriately associated with a properly performed TELRIC study in which one assumes the entire network is reconstructed and reconfigured to employ the most efficient, forward-looking technology.

- ***Linear loading factors are based largely on non-TELRIC activities***. Many of the capital expenditures included in Verizon's linear loading factors include investments associated with replacements and augments instead of new installations.

- ***The use of linear loading factors is inherently inaccurate.*** Verizon relies on two years of data from 1999 and 2000 to develop its linear loading factors. This methodology can cause significant errors if there is a mismatch in timing between when labor hours are incurred and when the equipment is actually purchased. Further, linear loading factors capture short-term relationships between embedded installation and material costs, thereby developing ratios that are not appropriate to apply in a forward-looking network.

- ***Linear loading factors distort de-averaged UNE costs.*** Linear loading factors overstate the cost of installation activities in higher density zones because they assume that installation costs are a function of the material costs. Thus, they assume that denser regions will utilize larger, more expensive equipment. Although larger

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[16] "Given the likely asymmetry of information regarding network costs, we conclude that, in the arbitration process, incumbent LECs shall have the burden to prove the specific nature and magnitude of these forward-looking common costs." *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, CC Docket No. 96-98 (rel. August 8, 1996), ¶ 695 ("*Local Competition Order*").

[17] The FCC's First Report and Order states, "We therefore decline to adopt embedded costs as the appropriate basis of setting prices for the interconnection and access to unbundled elements. Rather, we reiterate that the prices for the interconnection and network elements critical to the development of a competitive local exchange should be based on the pro-competition, forward-looking, economic costs of those elements, which may be higher or lower that historical embedded costs." *See Local Competition Order*, ¶ 705.

pieces of equipment cost more than smaller pieces of equipment, installation costs are not proportionately larger for large pieces of equipment. The use of linear loading factors therefore significantly overstates installation costs for larger equipment (*e.g.*, it costs about the same to place a 2016-line DLC remote terminal as it does to place a 672-line DLC remote terminal).

- ***Linear loading factors distort the costs of various UNEs.*** Linear loading factors overstate the costs of installation activities for more expensive pieces of equipment, often associated with higher-capacity services. The problem, of course, is that the use of linear loading factors incorrectly assumes in all cases that installation costs increase at the same rate as material costs. This is simply not true. Unfortunately, it has the highly disturbing and distorting effect of significantly overstating installation costs for those more expensive pieces of equipment. For example, the cost of a POTS plug-in card is *****CONFIDENTIAL END CONFIDENTIAL***** per line and the cost of an extended POTS line card is *****CONFIDENTIAL END CONFIDENTIAL*****.[18] This results in installation costs for an extended POTS line card that is more than *****CONFIDENTIAL END CONFIDENTIAL***** percent higher[19] than the installation costs for a regular POTS plug-in card, despite the fact that both cards require virtually identical installation times.

- ***Linear loading factors produce obviously illogical results.*** With respect to the objective of this proceeding – to develop the forward-looking costs of UNEs in Washington – the most significant problem with Verizon's use of linear loading factors is that they produce such incongruous results. Overall, the use of these loading factors in VzLoop results in total investments that are almost half the cost of material.

Q. WHAT IS A LINEAR LOADING FACTOR?

A. A linear loading factor is a multiplier that is applied to cost data to calculate total installed costs based on the assumption that there is a linear, or straight line, relationship between material investment costs and installation costs. That is, as the amount of material investment costs increases, the installation costs also increase proportionately. Verizon loads these multipliers on

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[18] *See* Verizon Loop Cost Study, "wa_material_121503.csv," Cells E154 and E141.

[19] *****CONFIDENTIAL END CONFIDENTIAL*****

top of the material investments in a linear fashion – assuming, without supporting evidence, that installation costs are directly proportional to material costs. This methodology builds installation costs from the "top-down" by starting, at the top, with total investment and dividing out the material portion to establish a fixed ratio.

This approach results in UNE rates that are riddled with incorrect assumptions and myriad errors – errors that are wholly unnecessary because Verizon should have ready access to information that would enable it to estimate the costs to install its equipment. Verizon's engineers would properly build installation costs from the "bottom-up" by estimating the labor time and costs of installation rather than applying confusing "factors" to material expenditures. Verizon would do this for its DLC equipment just as it has done for the other elements in this same proceeding.

Q. ARE THERE OTHER REASONS TO BE CONCERNED ABOUT THE USE OF LINEAR LOADING FACTORS?

A. Yes. Verizon's loading factors are developed using data from Verizon's Detailed Continuing Property Record ("DCPR") system, which is a system that tracks Verizon's embedded investments. A process that relies exclusively on historical installation relationships of an embedded network does not reflect the forward-looking technology and network architecture mandated by a properly performed TELRIC study.

In addition, the material cost in DCPR does not include all of the material cost that Verizon pays to its vendor for the equipment that is placed in the central office or at the remote terminal. When Verizon purchases DLC equipment from a vendor, there is a part number that represents a collection of smaller part numbers and it will have a corresponding price. While

Verizon will pay the vendor for the cost of this "macro" part number, Verizon records information regarding this purchase in DCPR at a greater level of detail. Specifically, the "macro" part number will be broken down into codes with sub-prices for each of these material components. One "macro" part number thus may be broken down into six or eight different sub-part numbers, each with a CPR designation that will be recorded in the DCPR system. The entirety of the "macro" part number cost, however, generally will not be mapped to CPR codes. Instead, a portion of the cost for the "macro" part will be designated as "minor" or as "miscellaneous" materials.

When Verizon develops its linear loading or "In-Place" factor, the only cost included in the denominator of the factor calculation is the major material cost for which CPR codes have been assigned. The minor material cost will be included in the numerator along with the major material, installation, and engineering cost for the network component. The in-place factor cost development equation would look like that below:

$$In-PlaceFactor = \frac{MajorMaterial + MinorMaterial + EngineeringCost + InstallationCost}{MajorMaterial}$$

Verizon applies the factor not to just the major material cost from its equipment vendor, but to both the major material and minor material components (that are all combined into one cost for the "macro" part number). When a factor that is developed assuming that it will only apply to the major material cost is applied to both the major and minor material cost, the total installed cost for DLC equipment will clearly be overstated.

Q. DO YOU HAVE ANY SENSE FOR HOW MUCH OF AN OVERSTATEMENT CAN OCCUR?

A. Yes. SBC recently acknowledged in Texas, Illinois, and Michigan that this systematic overstatement occurs when using in-place factors derived from DCPR data, resulting in overstatement in the installation cost for hardwired equipment of 80 percent.[20] As an example, if the DCPR-based factor for hardwired equipment was 2.5, but was then applied to the total material cost for the component from SBC's vendor (including both major and minor material), SBC found that a more appropriate factor to use in this situation was 1.3.[21]

Q. CAN YOU MAKE EXACTLY THIS SAME TYPE OF ADJUSTMENT TO THE DCPR-DERIVED FACTOR IN WASHINGTON?

A. No. Verizon has combined in its factor both the hardwired installation factor and the plug-in installation factor. The adjustment that SBC acknowledged only applies to the hardwired installation cost. However, I have been able to approximate the impact of this adjustment in Washington and have found that the revised in-place factor in Washington would be 1.1144.[22] I

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[20] Before the Illinois Commerce Commission, *In the Matter of: ILLINOIS BELL TELEPHONE COMPANY Filing to Increase Unbundled Loop and Nonrecurring Rates*, Docket No. 02-0864, March 16, 2004 Hearing, pp. 717-718, which is included in the directory titled "Illinois Hearing Transcript" as part of Exhibit SET-3.

[21] The 2.5 factor includes both the material and installation cost. Of the 2.5 factor, 1.5 of the factor is installation and 1.0 of the factor is material. SBC acknowledged that the installation portion of the factor was overstated by 80 percent. The 20 percent that remains would be 0.3 (1.5 * 20%). Adding this back to the 1.0 for the material portion would arrive at a resulting factor of 1.3.

[22] Please note that the revised factor is only based on the Verizon-East DCPR data in that this is the only data that is broken out by hardwired and plug-in categories. The Verizon-West data actually provides a lower starting point for the in-place factor, but it only aggregates all hardwired and plug-in investment into a single value thereby not allowing for the adjustment SBC acknowledged in its own DCPR data. The development of this alternative EF&I factor based on Verizon's DCPR data is found in the directory "DLC EF&I Factor Development" as part of Exhibit SET-3.

nevertheless strongly recommend against using any factor and encourage the Commission to use the bottom-up inputs that I have taken from the HM 5.3 documentation.

Q. HAVE OTHER STATE COMMISSIONS RECENTLY REJECTED THE USE OF LINEAR LOADING FACTORS?

A. Yes. BellSouth's new cost proxy model, the BellSouth Telecommunications Loop Model ("BSTLM") can be used with either linear loading factors or with bottom-up inputs. In the two most recent state commission decisions, the Florida and Georgia commissions (representing the two largest states in BellSouth's territory) recently rejected BellSouth's reliance on linear loading factors and instead adopted the bottom-up inputs advocated by CLECs.

The Florida Public Service Commission addressed this issue in a BellSouth Florida cost proceeding. The BSTLM, as proposed for use by BellSouth in Florida, used linear loading factors to develop certain cost model inputs. The BSTLM linear loading factors are similar in concept to the linear loading factors employed in Verizon-Washington's VzLoop and VzCost models for DLC equipment. The Florida Commission stated that it was "troubled by BellSouth's use of linear in-plant factors" which "distort costs between rural and urban areas."[23] The Florida Public Service Commission also noted that "BellSouth could not provide any evidence demonstrating that installation costs are directly proportional to material prices."[24] Because of this, the Florida Public Service Commission ordered BellSouth to re-file the model

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[23] Before the Florida Public Service Commission, In re: Investigation into pricing of unbundled network elements, Docket No. 990649-TP, Order No. PSC-01-1181-FOF-TP ("*FL UNE Order*"), Issued May 25, 2001, p. 238, which is included in the directory titled "Cost Orders" as part of Exhibit SET-3.

[24] *Id*.

using a bottom-up approach. The new models were to "explicitly" model "all cable and associated supporting structure engineering and installation placements" as opposed to utilizing factors to develop engineered, furnished and installed costs ("EF&I") as was done in BellSouth's initial application of the BSTLM in Florida.[25] After evaluating BellSouth's bottom-up BSTLM, the Florida Public Service Commission now has adopted rates based on the bottom-up inputs into the BSTLM rather than relying on the loading factor approach.[26] In short, the Florida Commission determined, as summarized below, that BellSouth's linear loading factor methodology could distort costs, particularly when developing deaveraged rates – a flaw that is also exhibited in Verizon Washington's cost studies:

> We find that BellSouth's use of linear loading factors, while easy for BellSouth to apply, can generate questionable results, especially in light of deaveraged rates. For example, as shown in the "Copper Cable 26 Gauge Buried" Table above, for 26 gauge buried copper cable, actual material cost as a percentage of total cost stays constant at about 14.6 percent no matter whether the cable is 12 pair or 4200 pair. Thus, the total cost of this cable is always about seven times the actual material cost. No economies of scale for exempt material, engineering, or labor, occur. However, it is very unlikely that there are no economies generated as cable sizes grow larger.[27]

More recently, the Georgia Public Utility Commission concluded that UNE rates should be determined using bottom-up inputs in lieu of BellSouth's linear loading factors:

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[25] *Id*.

[26] Order No. PSC-02-1311-FOF-TP, *In re: Investigation into Pricing of Unbundled Network Elements BellSouth Track Before the Florida Public Service Commission*, Docket No. 990649A-TP (September 27, 2002).

> Linear loading factors, on the other hand, distort the investments for equipment as the size of the equipment increases. The FCC has specifically rejected use of embedded costs – accounting data – to determine TELRIC based UNE rates. 47 C.F.R. §51.505(d)(1). In stating that embedded costs shall not be included in the determination of TELRIC based UNE rates, the FCC defined embedded costs as "the costs that the incumbent LEC incurred in the past and that are recorded in the incumbent LEC's books of accounts." Id. Lastly, use of linear loading factors, as some CLECs in this proceeding have argued, results in distorted deaveraged UNE rates. This distortion results from the loading factors overstating the costs for equipment in higher density areas and developing "average costs."[28]

Q. DOES THE FCC SUPPORT A BOTTOM-UP APPROACH TO DEVELOPING INSTALLATION COSTS?

A. Yes. It is also notable that after a multi-year review of cost models and cost model inputs with filed comments from across the industry, the FCC adopted a bottom-up methodology for use in the USF Synthesis Model. Specifically, the FCC adopted an approach that identifies the total installed cost for each piece of equipment. This bottom-up approach uses an appropriate methodology for separately developing total installed cost (both material and installation) for each piece of equipment, taking into consideration the specific size, material and installation costs. Moreover, a modified form of the USF Synthesis Model (known as the "Modified Synthesis Model") was also selected by the FCC in its arbitration of UNE rates in Virginia for the setting of unbundled loop rates. The Modified Synthesis Model also developed its installed

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[27] Florida Public Service Commission Order, Investigation into pricing of unbundled network elements, ORDER NO. PSC-01-1181-FOF-TP, May 25, 2001, at 187, is included in the directory titled "Cost Orders" as part of Exhibit SET-3.

[28] Georgia Public Service Commission Order, Review of Cost Studies, Methodologies, Pricing Policies, and Cost Based Rates for Interconnection and Unbundling of BellSouth Telecommunications, Inc.'s Services, Commission Order, Docket No. 14361-U, March 18, 2003, at 13, is included in the directory titled "Cost Orders" as part of Exhibit SET-3.

costs for each network component using a bottom-up approach. In that decision, the FCC Wireline Competition Bureau has indicated its strong opposition to the use of linear loading factors:

> Our concerns stem from the fact that the EF&I factor for a specific piece of equipment is derived by applying to the equipment an unsupported pro rata share of the cost of installing all equipment associated with that account. As a result, the relationship between the actual installation costs associated with particular pieces of equipment and the installation estimates used to determine the EF&I factor is unclear. The actual costs may be less than or greater than the pro rata allocation. Verizon's claim that the lack of accuracy of the individual in-place costs is not relevant because the factor is calculated on an aggregate basis may not resolve this issue because the pro rata allocation appears to bear no relationship to the EF&I costs associated with any particular type of equipment within an account.[29]

Further, the FCC determined that:

> "whenever any factors are used to estimate costs, such as maintenance or labor costs, the basis for those factors shall be described … Factors shall be based upon historical costs only to the extent that it can be demonstrated that those historical costs are relevant to the study of forward-looking costs …"[30]

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[29] In the Matter of Petition of WorldCom, Inc. Pursuant to Section 252(e)(5) of the Communications Act for Preemption of the Jurisdiction of the Virginia State Corporation Commission Regarding Interconnection Disputes with Verizon Virginia Inc., and for Expedited Arbitration ; In the Matter of Petition of AT&T Communications of Virginia Inc., Pursuant to Section 252(e)(5) of the Communications Act for Preemption of the Jurisdiction of the Virginia Corporation Commission Regarding Interconnection Disputes With Verizon Virginia Inc. (CC Docket Nos. 00-218, 00-25), Memorandum Opinion and Order (rel. August 28, 2003) at ¶ 523 ("*Virginia Arbitration Order*"). For ease of reference, the *Virginia Arbitration Order* has been provided in the directory entitled as "Virginia Arbitration Order" on the CD as part of Exhibit SET-3.

[30] *Id.*, p. 10.

In other words, the FCC has already made it clear that factors should not be used unless there is no way to develop the inputs directly, much less factors based entirely on historical costs with no supporting evidence that those factors are appropriate for a forward-looking cost study.

IV. MODIFICATION NEEDED TO NETWORK INPUTS

A. UNREASONABLE SAI PLACEMENT

Q. IS VERIZON'S COST STUDY GROUNDED IN APPROPRIATE FORWARD-LOOKING ASSUMPTIONS FOR OUTSIDE PLANT INVESTMENT?

A. No. The fundamental issue with Verizon's VzLoop model is that is allegedly based on the network configuration of distribution and feeder routes in Verizon's embedded network. Specifically, Mr. Tucek, Verizon's loop and interoffice transport witness, notes the following regarding VzLoop:

> But the first topic might raise some questions, physical characteristics of real network. You all read our testimony. You probably realize that our model differs from any model that we've filed in this state or anywhere else … and probably almost any model filed in any other state. It starts with the physical characteristics of the real network.[31]

Because they are based on the embedded plant construct, the Verizon "forward-looking" costs are not forward-looking at all. Rather, by relying on existing feeder and distribution routes and its embedded assignment of customers to existing distribution areas, Verizon has failed to recognize any meaningful efficiencies that would be available to a new entrant under the scorched-node environment contemplated by TELRIC. Simply put, relying on an embedded network configuration overstates costs.

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[31] VzLoop Cost Workshop, p. 3245, ll. 18-24.

Q. DOES VERIZON EVEN ACCURATELY CAPTURE THE COSTS OF ITS EMBEDDED PLANT?

A. Probably not. Attached as Exhibit SET-4 is a diagram of several distribution areas within the BOTHWAXB wire center. In specific, this map illustrates that there are five SAIs serving four distribution areas. They are identified by the following codes: DDW, DEI, DKJ, DKK, and DKQ. These SAIs are all physically shown in Verizon's modeled network as being in the same exact physical location. This is highly unlikely. It is much more likely that these SAIs are physically placed within the distribution areas that they serve and that they are not all sitting on the same location. This reality was confirmed regarding a very similar situation during the California VzLoop Cost Workshop. Verizon explained that at certain instances within its network information, the equipment is not really placed where it is shown in its planning systems used for calculating costs in VzLoop.

> ALJ Duda: I have a question about that because I thought I understood Mr. Tucek this morning saying that the model assumed continued use of existing SAI locations.
>
> Mr. Tucek: I did say that. But I think, as Mr. Patton is trying to point out, the planners, for monitoring purposes, only needs to know the plant out to the SAI.
>
> At least, Randy, correct me if I'm wrong. These are coded in our database, the SAI's all at one location because it's the end – end of the feeder route, edge of the wire center.
>
> So there are SAIs that are out in the field, but as far as the data goes for this example at the edge of this wire center, the SAIs are coded as being in one location even though they may not be.[32]

[32] VzLoop Cost Workshop, p. 3310, l. 15 – p. 3311, l. 1.

In other words, Verizon readily knows that there are situations in its network planning data which it relied upon in developing the locations of its points in the loop network where the actual placement of the equipment in the actual network is not where it is shown in the planning systems.

Q. WHAT IS THE PRACTICAL IMPACT OF THIS TYPE OF DISCREPANCY IN VERIZON'S COST DEVELOPMENT?

A. In the illustration shown as Exhibit SET-4 there are several ramifications. *First*, because Verizon has not placed the SAIs where they actually occur within the network – out in close proximity to the distribution terminals that the SAIs actually serve – the distribution cable distance is systematically overstated within the model in that the distribution terminals within a distribution area must be connected together and then artificially extended back to the misplaced SAI still using distribution cable. This extension back to the SAI using distribution cable (as opposed to using feeder cable if the SAI was where it was supposed to be) overstates the cost of the cable in this instance both because it makes the distribution cable distance longer than it needs to be and because it substitutes distribution cable (which typically has a higher unit cost) for feeder cable in Verizon's modeled network.

Q. IS THERE A SOLUTION TO THIS PROBLEM?

A. I have not yet found a way to correct these systematic errors in Verizon's network in that Verizon has simply placed equipment in the wrong location in developing the cost for its network. The more fundamental issue, however, is that basing a loop cost study on embedded base network information (regardless of whether it is accurate or not) violates TELRIC principles and does not result in a least-cost network configuration that an efficient, competitive

company would build today. Accordingly, the most efficient distribution and feeder network design should be used to serve the demand that exists out at the customer locations.

B. INEFFICIENT AND EMBEDDED CABLE ROUTING

Q. CAN YOU GIVE ANOTHER ILLUSTRATION AS TO WHY IT IS VITAL TO USE AN EFFICIENT, FORWARD-LOOKING MODELED NETWORK RATHER THAN EMBEDDED ROUTING IN VERIZON'S COST SYSTEMS?

A. Yes. As another example, engineers typically construct underground conduit systems along no-cost public rights-of-way adjacent to or within roadway rights-of-way. If a large tract of land was undeveloped 25 years ago, when Verizon engineered its feeder route, it might have placed conduit around the perimeter of the tract. Today, roadways lace that tract of land, and an efficient company would place conduit using a shorter distance – along the roadways that cross the tract. Verizon has not offered any proof that the loop lengths and amount of outside plant that underlie its cost study reflect an efficient, forward-looking network. Instead, there are myriad examples as illustrated above and on Exhibit SET-4 that demonstrate that Verizon's modeled network is neither efficient nor does it even conform to its embedded network design – the alleged approach taken by Verizon in developing its cost.

Q. HAVE YOU ADJUSTED VERIZON'S LOOP COSTS AS A RESULT OF ITS RELIANCE ON ITS EXISTING ROUTE CONFIGURATION?

A. No. Because I have not yet found a way to quantify the extent to which Verizon has overstated costs as a result of its reliance on its existing route configuration, I have not included any such adjustment in my restatement of loop costs – even though a downward adjustment is almost certainly warranted. Of course, the impossibility of properly adjusting Verizon's cost model to

account for its reliance on its existing route configuration is one reason that the Commission should not rely on that model but instead should reject Verizon's cost model entirely.

C. OVERLAPPING DISTRIBUTION AREAS

Q. ARE THERE ANY OTHER WAYS IN WHICH VERIZON'S USE OF ITS EMBEDDED NETWORK LIKELY OVERSTATES LOOP COSTS?

A. Yes. Verizon's approach with VzLoop and preprocessing that is done allegedly utilizes the existing correlation of distribution terminals and the demand that these distribution terminals represent to the embedded distribution areas to which these distribution terminals are mapped. In other words, the existing relationships that are in Verizon's embedded network between its distribution terminals back to the SAIs (notwithstanding the data errors illustrated earlier) are used in developing the cost for unbundled loops regardless of whether these relationships are efficient or not.

Q. IS THERE ANY INDICATION THAT THE USE OF EXISTING DISTRIBUTION AREA ASSIGNMENTS INTRODUCES ANY INEFFICIENCIES INTO THE VERIZON COST STUDY?

A. Yes. If the Commission will review Exhibit SET-4 once again the Commission will note what I would refer to as "Overlapping Distribution Areas." There are several examples of this problem in just this one diagram. First note that the distribution terminals that are mapped to a specific distribution area are color coded in this diagram as red, purple, blue, and green terminals representing the four distribution areas being served in this area of the BOTHWAXB wire center. Next, please note that the purple terminals that represent one of the distribution areas literally sit right in the midst of the red distribution terminals. Because these are two separate distribution areas in Verizon's embedded network, Verizon will assign a separate SAI to each of these distribution areas. By doing so, the scale economies of each of the smaller

overlapping distribution areas fail to achieve those that are available if the overlapping distribution areas were combined. Specifically, one SAI could easily serve both distribution areas (effectively combining them into one distribution area) much more efficiently than using two less utilized SAIs.

Of course, this is only one of the two overlapping distribution areas in just this one area of one wire center in the Verizon cost study. Given the close proximity of the blue distribution terminals to the red and purple distribution terminals, and the limited number of these terminals, there is simply no reasonable explanation for requiring that the blue distribution terminals require yet another SAI. Rather, the red, purple, and blue distribution areas should be combined into a single distribution area employing only one SAI, greatly improving the efficiency of the SAI usage. Fundamentally, the issue here is that Verizon's existing distribution area arrangements are inefficient in that there are clear situations where terminals that should map to one distribution area that is much more close by are mapped across the distribution area boundary to a more distance SAI. This inefficiency exists throughout the Verizon data.

Q. HAVE YOU MADE ANY ADJUSTMENT FOR THIS ISSUE IN VERIZON'S DATA?

A. No. The appropriate method for dealing with this issue is to create efficient distribution areas that would then utilize an efficiently placed SAI. As such, the restatement provided for with this filing is conservatively high and does not represent a TELRIC rate for unbundled loops. Once again, the Commission should ultimately reject the Verizon model on the basis of these systemic issues with Verizon's network configuration in that it clearly does not utilize the most efficient network design required with TELRIC.

D. INEFFICIENT USE AND PLACEMENT OF DLC EQUIPMENT

1. Inefficient Use of DLC Equipment

Q. ARE THERE ANY OTHER ISSUES ASSOCIATED WITH VERIZON RETAINING ITS EMBEDDED AND INEFFICIENT DISTRIBUTION AREA LAYOUTS?

A. Yes. When distribution areas are sized inefficiently and routed inefficiently as described above, the opportunities for scale economies with DLC remote terminals is diminished. Specifically, the approach that Verizon has used with VzLoop is to identify the size of a remote terminal that is required at any given point based on the demand behind that point. As such, if a disproportionate number of remote terminals are sized to utilize small DLC systems, the scale economies afforded to Verizon (or by extension to the CLEC) by using larger DLCs consistent with larger distribution areas is lost.

Q. COULD THIS BE AVOIDED IN A FORWARD-LOOKING NETWORK?

A. Yes. A more efficient approach would be to regroup distribution areas based on actual customer locations in order to achieve higher utilization of expensive DLC equipment, thereby reducing overall UNE costs. Unfortunately, the cost studies presented by Verizon do not allow for such consolidation. The line counts by distribution terminal are an input to the model and the grouping of those terminals into distribution areas are fixed within the model such that altering them is extremely difficult. As a general matter, these inefficiencies are built into the model and are carried forward in my restatement of Verizon's loop costs. As a result, despite other adjustments and corrections I propose, Verizon's models cannot be made TELRIC compliant.

2. Inefficient Placement of DLC Equipment

Q. COULD YOU EXPLAIN THE APPROACH THAT VERIZON'S MODELS USE IN DETERMINING THE PLACEMENT OF DLC?

A. Yes. At an initial level, Verizon's models identify locations in Verizon's embedded network that are already identified as being a DLC location. In the network file, these locations are identified as a capital "F" and cannot be removed from the modeled cost network.

There are also numerous locations in the network file that are identified a "Theoretical Points of Interconnection" ("TPOI"). These locations are identified as a "T." According to Verizon's VzLoop Documentation, a TPOI "is a distribution terminal or control point which, under the second network design, is treated as a cross-connect location and may also be a DLC location as described above."[33] Verizon takes these TPOIs and evaluates within the logic of VzLoop whether the location should be converted to DLC or not. My evaluation of VzLoop has shown that large numbers of these TPOIs are converted to DLC by VzLoop.

Q. HAVE YOU FOUND THERE TO BE ANY DIFFICULTIES WITH THE LOGIC MAKING THIS CONVERSION OF TPOIS TO DLC?

A. Yes. I have attached another wire center diagram for the ACMEWAXA wire center as Exhibit SET-5. This diagram provides an illustration of the entire wire center with the focus here being on the placement of DLC in the wire center. In this wire center there are 13 terminals that are DLC remote terminals (664, 1131P, 899P, 5757I, 1330C, 5749I, 5746I, 5745I, 5744I, 5747I, 5743I, 5740I, and 5739I). Four of these wire centers are existing DLC locations and nine are TPOIs that were converted to DLC by the VzLoop model code. It is this conversion

[33] Attachment B (VzLoop Manual), p. 14.

of TPOIs that is particularly troublesome. Please note terminal 5739I which is a TPOI that was converted to a DLC. This terminal is difficult to identify because it is placed almost immediately on top of the wire center (the orange box). Specifically, this DLC is actually only 213 feet from the central office.

A new DLC is placed for one of three primary purposes. *First*, it may be placed in the network because the total copper length of the facility has gotten so long that it will not provide working telephony service without the use of excessive load coils – the application of which Verizon agrees is inappropriate in a TELRIC network. *Second*, the DLC may be placed in the network simply because it is more cost efficient to place than the use of copper feeder facilities back to the central office. *Third*, DLCs may be placed for fiber-to-the-building applications where a terminal placed within the building may have sufficient lines that it is economically justified to place a DLC.[34]

The problem with terminal 5739I is that it is only 213 feet from the central office. There is simply no possible way that 213 feet of copper feeder would justify the use of fiber feeder and DLC electronics. As such, there are only two other possible reasons that are left from Verizon's VzLoop model to convert this TPOI to DLC. One, as noted above, is if there was demand at a distribution terminal that was sufficient to justify the deployment of a DLC. In

[34] VzLoop, with this third option, apparently does not perform an economic evaluation, but instead simply notes where there is sufficient demand behind a single distribution terminal (a value larger than the variable NUM_LP_TERM) such that VzLoop simply places a DLC at that terminal location. The value for NUM_LP_TERM in VzLoop is *****CONFIDENTIAL END CONFIDENTIAL***** lines.

VzLoop, this demand at a terminal is set at *****CONFIDENTIAL END CONFIDENTIAL***** lines. However, there is only a *total* demand of *****CONFIDENTIAL END CONFIDENTIAL***** lines behind all of the distribution terminals connected to terminal 5739I. As such, there is certainly no justification for a large terminal location to justify this deployment of DLC. Finally, the last possibility is that the distribution lengths behind the DLC are longer than Verizon's selection of 12,000 feet of total copper length. The problem here, however, is that Verizon's distribution terminals behind terminal 5739I are clearly much shorter than 12,000 feet.[35] Specifically, the longest cable length behind terminal 5739I is 286 feet. In other words, there is neither an engineering basis for this TPOI to be converted to DLC nor an efficient argument for this TPOI to be converted to DLC. No discernible justification exists for making this conversion to DLC, which only leads to artificially higher costs.

Q. HAVE YOU BEEN ABLE TO MAKE ADJUSTMENTS TO REMOVE THIS INEFFICIENT DLC FROM VERIZON'S NETWORK?

A. No. I have not been able to identify a systematic manner to remove this investment from Verizon's network at present. As such, the cost restatement that I have provided the Commission using the VzLoop and VzCost models is higher than TELRIC.

[35] This can be estimated from reviewing the scale on Exhibit SET-5 and comparing it to the length of distribution terminals behind terminal 5739I. It can also be precisely calculated from the information provided by Verizon in the network table.

Q. IS THIS THE ONLY TYPE OF INEFFICIENT DLC PLACEMENT THAT YOU HAVE SEEN IN VERIZON'S VZLOOP COST DEVELOPMENT?

A. No. This same diagram (Exhibit SET-5) also illustrates another class of inefficiency in Verizon's cost development. Please note the close proximity of terminals 664, 5757I, 1131P, and 5745I.[36] These three DLC remote terminals in Verizon's cost analysis that have demand and are therefore meaningful to this discussion are approximately 2,500 feet apart from one another. VzLoop develops the investment for the remote terminal by taking the demand terminating at that terminal and determining the appropriate sized remote terminal to serve that location. Verizon does not use a sizing factor for the DLC equipment. As such, to the extent that demand is aggregated, the opportunity to achieve significant scale economies exists very much within the DLC cost calculations.

In this particular situation, terminal 664 has 62 DS0 equivalents worth of demand, terminal 5757I has 54 DS0 equivalents, and terminal 1131I has 138 DS0 equivalents. By having three separate DLC systems, VzLoop will include a 96-line remote terminal for terminal 664, a 96-line remote terminal for terminal 5757I, and a 192-line remote terminal for terminal 1131I. The total material investment for these three terminals using Verizon's material costs is $93,198.87. This material cost would then be multiplied by the various in-place and power factors. However, the comparisons I want to illustrate can be accomplished just using the material cost differences.

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[36] Please note that terminal 5745I does not have any demand terminating at this DLC system. As such, while it has been mapped, it does not contribute any investment in the VzLoop cost model (continued)

If the demand for these three terminals were to be combined into one DLC, a consolidation that has no engineering impediments, the cumulative demand would be 254 DS0 equivalents. This demand could be served by a single 448-line remote terminal with an investment of $35,678.29. This single system requires 62 percent less investment than the three separate systems. In short, Verizon's modeling algorithms for DLC equipment are greatly inhibiting the calculation of efficient DLC investment and are systematically precluding the calculation of the scale economies that should be available with DLC equipment.

Q. HAVE YOU BEEN ABLE TO MAKE ADJUSTMENTS TO IMPLEMENT THIS MORE EFFICIENT DLC AGGREGATION IN VERIZON'S MODEL?

A. No. The only way that this could be accomplished would be by changing Verizon's VzLoop code. I have not been able to determine precisely how this code change would be effected simply because of the complexity of the model that Verizon has filed in his proceeding. Nonetheless, this is a clear error in Verizon's model that must be rectified to develop costs consistent with TELRIC.

E. NETWORK DEMAND ISSUES

Q. ARE THERE ANY ISSUES WITH THE DEMAND THAT VERIZON HAS USED IN ITS MODEL?

A. Yes. Verizon acknowledges that it is not able to geo-code all of the distribution terminals for which it has demand data. However, the only distribution terminal locations (and consequently the only demand) that Verizon incorporates directly into its investment development are those

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because it does not have any demand terminating at its location. As such, only the first three terminals listed will be discussed further.

locations that are geo-coded.[37] Verizon does not ignore the other data. Instead, Verizon takes the investment that it develops to serve the residential and business lines and multiplies this residential and business-specific investment by an adjustment factor. The adjustment factor is developed by wire center based on the number of business lines in the total demand divided by the number of business lines behind distribution terminals that were geo-coded. This adjustment factor is also developed for the residential lines. In general, the adjustment factor for business lines is much greater than for residential lines meaning that generally Verizon found it difficult to geo-code the business lines in Washington. Based on the analysis that I did, the weighted average adjustment factor for business lines in Washington is *****CONFIDENTIAL END CONFIDENTIAL***** percent whereas the weighted average adjustment factor for residential lines is 7.92 percent.

Q. HOW PRECISELY DOES VERIZON INCORPORATE THE ADJUSTMENT FACTOR?

A. Verizon incorporates the adjustment factor by increasing the investment by the adjustment factor percentage. It also increases the line count by the same percentage. At a simplistic level, the application of the adjustment factor would look as follows:

$$InvestmentperUnit = \frac{Investment(BasedonGeo - CodedData) * AdjustmentFactor}{Demand(BasedonGeo - CodedData) * AdjustmentFactor}$$

The problem with this approach is that it affectively negates the use of the adjustment factor because Verizon has assumed that the same linear increase in line counts that it applies will equally apply to the investment. In other words, Verizon has assumed that there are no scale

[37] The discussion regarding the gross-up of demand that follows does not apply to drops and NIDs.

economies associated with the additional lines. This is absolutely wrong. First of all, the additional lines might simply permit Verizon to actually use spare pairs within an existing cable size (consistent with the cable sizing factors which will be discussed in more detail later) without having to add any incremental investment at all. For example, a cable may require 50 lines and based on the sizing factors used, a 100-pair cable might be employed. If the adjustment factor was 20 percent, an additional 10 lines would be required, which would easily fit within the 50 spare pairs within the 100-pair cable. No incremental cable investment would be required. However, Verizon would increase the investment by 20 percent and the line count by 20 percent eliminating any benefit that would accrue to the CLEC due to scale economies in Verizon's outside plant. This is a significant error in Verizon's modeling approach. However, once again, this is systemically built into the VzLoop code and is therefore contained within an area of VzLoop that parties are not permitted to alter.

Q. ARE THERE ANY OTHER PROBLEMS ASSOCIATED WITH THIS MISSING DEMAND THAT YOU HAVE IDENTIFIED?

A. Yes. As noted above, the adjustment factors for business lines are much greater than for residential lines. Business lines are typically less costly simply because they are normally closer to the central office and are therefore part of larger cables, larger SAIs, and larger DLC systems to the extent that they are used. As a result, the potential for scale economies in these larger pieces of equipment are actually greater for the business lines than even for the residential lines. As a result, with adjustment factors for business lines that range from *****CONFIDENTIAL END CONFIDENTIAL***** percent all the way up to *****CONFIDENTIAL END CONFIDENTIAL***** percent, this failure to reflect the

scale economies in business lines actually has a greater effect because it is not only a larger percentage but it is missing the scale economies on lines that are generally less costly to begin with.[38]

Q. ARE YOU ABLE TO ADJUST THE LINE COUNTS IN THE VERIZON COST STUDY TO MORE ACCURATELY CALCULATE THE ECONOMIES OF SCALE?

A. No. First of all, it is not possible to know precisely where the missing lines should go. Specifically, it is not possible to know which distribution terminals should reflect the increase in demand or whether there should be entirely new distribution terminals added. As such, at this time I have not incorporated a modification for the missing lines to more clearly develop the cost for the network using the appropriate scale economies that would be achieved if Verizon had geo-coded more of its demand. Verizon's approach of grossing up the line count and investment by the same factor, however, is clearly wrong and represents yet one more reason for rejecting the Verizon model for developing loop costs.

F. NID AND DROP MODIFICATIONS

Q. DID YOU FIND ANY ISSUES WITH THE WAY THAT VZLOOP CALCULATES COSTS FOR THE NID AND DROP LOOP ELEMENTS?

A. Yes. There are several significant issues regarding the manner in which Verizon developed the cost for NID and Drops. As already addressed earlier in this testimony, the material and placement costs were an issue that I addressed by truing up the costs to those found in HM 5.3

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[38] Please note that while the main adjustment factor problem relates to business lines, Verizon also has huge adjustment factors for residential lines that range as high as *****CONFIDENTIAL END CONFIDENTIAL***** percent. The issue, however, is that virtually all of the wire centers have a significant problem with the adjustment factor for business demand. The work papers (continued)

for which there is considerable documentation supporting the validity of the inputs. Later in this testimony, I will address the loop length assumptions that Verizon made when I address engineering inputs generally in a later section of this testimony. However, there is a fundamental modeling issue with the manner in which Verizon developed its NID and drop costs that must be addressed to more closely align the outputs of VzLoop and VzCost with TELRIC principles.

Q. PLEASE EXPLAIN THIS FUNDAMENTAL MODELING ISSUE.

A. VzLoop has as part of its processing an algorithm that looks through the demand data for Washington and identifies a drop as corresponding to each "Living Unit ID" or "LUID" in the database. A LUID typically is the address of the customer. As such, when the model works properly, each unique address in the database is identified as a unique LUID and the model then identifies that a drop must be placed for that specific LUID and sizes that drop based on the demand at that LUID.

The problem arises in that there are certain customer lines for which Verizon has not identified a proper LUID. The vast majority of these customer lines for which this problem occurs are identified as Non Switched Private Lines. Specifically, there are *****CONFIDENTIAL END CONFIDENTIAL***** Non Switched Private Lines in the state of Washington. These lines are coded in the database with a "NSW" designation. Verizon, however, has not identified an appropriate "Living Unit ID" or address for these lines that is meaningful to VzLoop. Instead, for these lines, each NSW line is given what appears to

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developing these percentages are included in the directory titled "Demand Adjustment Factors" as part of Exhibit SET-3.

be an electronically generated LUID that starts at "1NSW" and goes through to *****CONFIDENTIAL END CONFIDENTIAL***** where the demand at each of these electronically generated LUIDs is one line.

Q. WHAT MAKES YOU SAY THAT THESE LUIDS ARE ELECTRONICALLY GENERATED?

A. *First*, the LUIDs for the NSW lines are assigned from "1NSW" to *****CONFIDENTIAL END CONFIDENTIAL***** exactly corresponding to the number of NSW lines that there are in the database. Further, the sequence of these electronically generated LUIDs follows the alphabetical order of the wire centers and the distribution terminals to which the NSWs terminate from. There are virtually no exceptions to this assignment and ordering of NSW lines. *Second*, there is nothing meaningful about the address information such as "16987NSW" other than to indicate that it is the 16987th Non Switched Private Line identified in the demand database. It is not a legitimate address. It is only an indexing of the NSW lines.

Q. WHY IS THIS IMPORTANT?

A. Because of the way that VzLoop developed NID and drop investment. VzLoop includes a NID and a drop for every unique LUID in the demand database. Given that Verizon has electronically generated a different LUID for every Non Switched Private Line in the database, this approach ensures that there will be *****CONFIDENTIAL END CONFIDENTIAL***** NIDs and *****CONFIDENTIAL END CONFIDENTIAL***** drops for the *****CONFIDENTIAL END CONFIDENTIAL***** Non Switched Private Lines in Washington.

This is simply an unreasonable assumption and one that would certainly not bear out if Verizon were to actually include a real address in the LUID field rather than the electronically generated LUID. All of the *****CONFIDENTIAL END CONFIDENTIAL***** Non Switch Private Lines in Washington are identified as being business lines, which is reasonable. It is only reasonable to assume that business customers that purchase Non Switch Private Lines would purchase more than one per business location in Washington. In fact, in my experience with Non Switch Private Lines working at AT&T, customers typically purchase many more than just one line.

Q. WERE YOU ABLE TO CORRECT THIS PROBLEM?

A. I have made an adjustment to Verizon's demand database to rectify this problem to the extent possible. I do not have the real physical addresses for where these NSW lines terminate, but I do have information regarding the distribution terminal at which the NSW lines terminate. Generally, there would be very few end user customers terminating off of a distribution terminal. The assumption that I have made in this instance is that the NSW lines behind a distribution terminal all go to a single customer location. To implement this assumption, I renamed those NSW lines behind the same distribution terminal with the same LUID so that VzLoop would then only place one drop and one NID properly sized for all of the lines to that customer location. On average, this adjustment placed four NSW lines terminating at each customer location, which is quite reasonable.

Q. DID THIS RESOLVE ALL OF THE PROBLEMS FOR THE NON SWITCHED PRIVATE LINES?

A. No. It turns out that in many cases, 31,717 to be exact, Verizon actually did not have a "real" distribution terminal name either. Specifically, instead of identifying a distribution terminal, Verizon simply inserted the same LUID code such as "4654NSW" into both the LUID field and into the TERM field for the distribution terminal identifier. In this way, Verizon not only overstates the number of NIDs and drops that are necessary for these 31,717 NSW lines, but Verizon also includes a distribution terminal for each of these 31,717 NSW lines as well. All of this is incredibly inefficient and does not represent how these NSW customers would interconnect into the loop network in reality.

Q. HOW DID YOU RESOLVE THE PROBLEM WITH THESE 31,717 REMAINING NSW LINES?

A. I took the information for those NSW lines for which I had legitimate distribution terminal identifiers and used the relationship between these NSW lines and those legitimate terminals to estimate the relationship between the manufactured terminal identifiers for these 31,717 NSW lines. In so doing, I used the average relationship for four NSW lines per distribution terminal and correspondingly spread the 31,717 NSW lines across 7,961 consolidated terminals. This likely still overstates the cost in that it is quite likely that these NSW lines would be able to share already existing terminals. Given the information that was available, however, I made the best modification possible.

V. MODIFICATION OF ENGINEERING INPUTS

A. DISTRIBUTION CABLE SIZING FACTORS

Q. IS A CABLE SIZING FACTOR THE SAME THING AS A FILL FACTOR?

A. No. In fact, even Verizon notes in its Verizon Panel Testimony that it does not use fill factors as inputs into VzLoop, but rather fill factors are outputs that "result from the sizing calculations" described further within their testimony.[39] Specifically, sizing factors are used to ensure that there is sufficient capacity for breakage, line administration, and some amount of growth. For example, if the sizing factor that is used is 1.3333 for distribution and there are 90 working pairs in the cable then 120 pairs would be required. Given that the smallest standard cable size that would be required to serve these 120 pairs is a 200-pair cable, the actual fill for this cable would be 40 percent (80 working pairs divided by the 200 available pairs).

Q. WHAT DISTRIBUTION CABLE SIZING FACTOR DOES VERIZON RECOMMEND?

A. Verizon recommends the use of a *****CONFIDENTIAL END CONFIDENTIAL***** distribution cable sizing factor in combination with a *****CONFIDENTIAL END CONFIDENTIAL***** administrative fill sizing factor. The combined sizing factor that Verizon recommends is effectively the product of these two values or 2.2338. This distribution cable sizing factor produces an incredibly low effective utilization rate of 44.77 percent even if cables could be constructed to be perfectly sized for the number of pairs required, which is impossible. In the previous example of 90 working pairs, Verizon's calculations would require that 202 pairs be provided. Again, given that the smallest standard cable size that would be required to

[39] Verizon Panel Testimony, p. 39.

serve these 202 pairs is a 300-pair cable, the actual utilization for this cable would be 30 percent (90 working pairs divided by the 300 available pairs).

Q. WHAT CABLE SIZING FACTOR WOULD YOU RECOMMEND THAT THE COMMISSION CONSIDER AS AN ALTERNATIVE?

A. AT&T has proposed a reasonable cable sizing factor of 1.3333 in HM 5.3, which I would recommend. Alternatively, the Commission should consider the distribution cable sizing factors that the FCC ordered in the Virginia Arbitration. Specifically, the FCC ordered the use of cable sizing factors by the density according to the following table.

Density	Cable Sizing Factor
0	50.0%
5	55.0%
100	55.0%
200	60.0%
650	70.0%
850	75.0%
2550	75.0%
5000	75.0%
10000	75.0%

The Verizon cost model does not have the ability to utilize difference cable sizing factors based on density. As such, if one were to apply the FCC cable sizing factors, the VzLoop model would require that a single weighted-average factor be developed. Based on the line density in Washington, the appropriate cable sizing factor that should be used for distribution is 66.02 percent or 1.5147 pairs per working pair.

Q. IS THIS THE ONLY CONSIDERATION THAT THE FCC MADE IN DETERMINING THE FILL FACTOR THAT SHOULD BE USED IN SIZING FACILITIES IN THE VIRGINIA ARBITRATION?

A. No. The FCC further noted the following in its selection of the proposed fill factors in the AT&T/WorldCom cost filing:

> We agree with AT&T/WorldCom and will use their proposed loop distribution fill factors. In the *Inputs Order*, the Commission expressly rejected using ultimate demand, as Verizon proposed then and proposes now again, in factor of using current demand to calculate fill factors. There, the Commission found forecasting ultimate demand too speculative. Here, Verizon fails to respond to this concern and provide a method of reliably forecasting ultimate demand, particularly in light of rapidly changing technological developments. Just as the Commission found it inappropriate to include in universal service support the costs of building outside plant designed to meet uncertain ten- or twenty-year demand projections, it is inappropriate for AT&T/WorldCom to bear the cost today of building plant for uncertain ultimate demand. Verizon, moreover, continues to misinterpret current demand. As AT&T/WorldCom explain, the Commission previously found that current demand, *by definition*, includes capacity for growth. Further, Verizon's assertion that AT&T/WorldCom's proposed fill factors are too high is belied by the information in GTE's engineering guidelines.[40]

Q. DOES VERIZON'S CURRENT FILING IN WASHINGTON CONTINUE TO SUFFER FROM THE USE OF ULTIMATE DEMAND IN THE DEVELOPMENT OF ITS FILL FACTORS OR CABLE SIZING FACTORS?

A. Yes. *****CONFIDENTIAL**

CONFIDENTIAL***.[41] This use of ultimate sizing guidelines for distribution ensures that current customers bear all of the cost for future "uncertain ultimate demand" in direct contradiction to the recommendations of the FCC. In short, the Commission should reject Verizon's use of the 2.2338 distribution cable sizing factor in lieu of either factor recommended

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[40] *Virginia Arbitration Order*, ¶ 254.

[41] Verizon Panel Testimony, pp. 40-41.

in HM 5.3 of 1.3333 or that which would be derived from the FCC's recommendations in the Virginia Arbitration of 1.5147.

Q. WHAT DISTRIBUTION SIZING FACTOR DID YOU USE IN YOUR RESTATEMENT OF VERIZON'S COST STUDY?

A. I have used the most conservative distribution cable sizing factor of 1.5147, which is based on the *Virginia Arbitration Order*. This factor is all the more conservative because the FCC made an additional adjustment to explicitly account for growth in the line count for which the sizing factor was assigned. Accordingly, the FCC used demand that was two years into the future to develop the average cost per loop presently. This is not possible to do in VzLoop or VzCost. As such, the distribution cable sizing factor that I have used will produce lower average fills than what would have been achieved with the approach used by the FCC. Nonetheless, I have used this distribution cable sizing fill as a very conservative proxy for what would be consistent with TELRIC principles.

B. 12,000 FEET VERSUS 18,000 FEET MAXIMUM COPPER LOOP LENGTH

Q. WHEN VERIZON WRITES ABOUT THE 12,000-FOOT MAXIMUM COPPER LOOP LENGTH, IT SEEMS TO INDICATE THAT THIS ENSURES THAT THE COPPER PORTION OF LOOPS IN ITS COSTING NETWORK ARE NEVER LONGER THAN 12,000 FEET. IS THIS TRUE?

A. No. Verizon's approach tries to minimize the proportion of time that the copper portion of loops exceeds 12,000 feet in its network. However, the algorithms that Verizon's employees for developing the network layout in SpanNet still permit copper loop lengths up to 18,000 feet.

Moreover, Verizon even acknowledges in a footnote in its testimony that loops may exceed the 12,000 foot length in some circumstances.[42]

Q. GIVEN THAT VERIZON EVEN ALLOWS FOR LOOPS TO BE LONGER THAN 12,000 FEET, BUT NOT LONGER THAN 18,000 FEET, CAN YOU EXPLAIN WHY THE 18,000-FOOT LIMIT IS SIGNIFICANT?

A. Yes. This information comes from Telcordia's *Notes on the Network* – an extensive industry source for information on the telecommunications network. Specifically, the following engineering principles are invoked in this document:

> To help achieve acceptable transmission in the distribution network, design rules are used to control loop transmission performance. Loops are designed to guarantee that loop transmission loss is statistically distributed and that no single loop in the distribution network exceeds the signaling range of the central office. … Revised Resistance Design (RRD) guidelines recommend that loops 18 kft in length or less, including bridged-tap, should be nonloaded and have loop resistances of 1300 Ohms or less; loops 18 kft to 24 kft in length (including bridged-tap) should be loaded and have loop resistances less than or equal to 1500 Ohms; loops longer than 24 kft should be implemented using Digital Loop Carrier (DLC).

The reason for the 18,000-foot cut-off on copper distribution length is that beyond this distance requires the use of load coils. The use of load coils prevents DSL service from being provided and is generally considered to be inconsistent with efficient, forward-looking engineering practice. However, there is nothing that effectively prohibits copper loop lengths from being between the 12,000-foot and 18,000-foot lengths.

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[42] Verizon Panel Testimony, p. 45, fn. 22.

Q. WHAT THEN DO YOU RECOMMEND AS THE MAXIMUM COPPER LOOP LENGTH TO USE IN YOUR RESTATEMENT OF VERIZON'S COST MODELS?

A. I recommend that the Commission utilize a value of 18,000 feet. This limitation in conjunction with the way the SpanNet operates will ensure that no loops have copper lengths longer than 18,000 feet – a requirement to have functioning loops assuming efficient, forward-looking technology. However, this value will also allow VzLoop to perform what it is designed to do – select the most efficient alternative between all copper loops and fiber-fed DLC loops below this engineering cut-off level. In other words, it is quite possible that given the demand characteristics within a particular area of Verizon's network, that it will be more efficient to deploy DLC rather than copper even though the total loop length may still permit the use of all copper facilities. In this instance, the choice of 18,000 feet for the copper fiber cross over will still permit VzLoop to make the most economical choice. However, setting the copper fiber cross over at 12,000 feet as Verizon has done will not permit VzLoop to make the most economical choice between 12,000 feet and 18,000 feet in the Verizon's run of the model forces the model to place DLC where copper lengths exceed 12,000 feet except in limited circumstances.

C. IDLC VERSUS UDLC

Q. WHAT ASSUMPTIONS DOES THE VERIZON STUDY MAKE REGARDING DIGITAL LOOP CARRIER INTERFACE?

A. Verizon's two-wire loop costs include a subjective fiber-copper breakpoint above which loops are provisioned with fiber feeder and digital loop carrier technology. Verizon's cost study assumes that *****CONFIDENTIAL END CONFIDENTIAL***** percent of loops will use DLC, with *****CONFIDENTIAL END CONFIDENTIAL***** percent of those

loops provisioned with an integrated interface and the remaining *****CONFIDENTIAL END CONFIDENTIAL***** percent provisioned with older and less efficient universal interface.[43]

Q. IS VERIZON'S DLC ASSUMPTION REGARDING THE PERCENTAGE OF UNIVERSAL INTERFACES THE APPROPRIATE FORWARD-LOOKING CONSTRUCT?

A. No. TELRIC requires that Verizon's forward-looking economic costs provide UNEs based upon a least cost, forward-looking network. In this case, least cost, forward-looking technology means an integrated DLC ("IDLC") interface at the DS1 level for those loops exceeding the fiber/copper threshold and provisioned with fiber feeder. It does not mean deploying less efficient analog Universal DLC ("UDLC") interfaces and penalizing CLECs for connecting to Verizon's outdated embedded infrastructure.

Q. WHAT ARE THE DIFFERENCES BETWEEN UDLC AND IDLC?

A. In a UDLC system, analog signals originating from a customer's telephone are converted into a digital signal at a Remote Terminal ("RT") and transported by the digital carrier system to the Central Office Terminal ("COT"). At the COT, the signal is converted from digital to analog and is then terminated on the Main Distribution Frame ("MDF"). Since virtually all switches deployed today are digital, the analog signal from the MDF must be cabled to the Analog Port of the switch, where the signal is converted once again into digital format so that it can be processed by the digital switch. The UDLC system is a less-than-efficient technology for several reasons. The back-to-back digital/analog conversions are inefficient, cumbersome and

[43] Verizon Cost Study, "Loop IOF HiCap Constants 040109wa" Workbook, Cells D8, D12, and D15.

degrade transmission quality; and this impairment to the channel will increase as advanced modem technology challenges the capability of the network. In addition, the multiple signal conversions require additional line cards and other equipment. Further, there is an increased risk of equipment failure caused by the MDF cross-connect activity.

In stark contrast, in an IDLC system, the analog signal generated at the customer's telephone is converted to digital form at the RT. The digital signal is transported by the digital carrier system to the Central Office and terminated directly to the switch without any need for further conversion. The integration of digital switching and digital transmission facilities in an IDLC System generates substantial operational and equipment savings, including:

- the elimination of digital/analog conversion at the COT;
- the elimination of costs for the extra sets of equipment used in UDLC signal conversion;
- the elimination of labor costs associated with terminating and cabling the MDF;
- reduced risk of potential equipment failure resulting from cross-wiring activity on the MDF; and
- improvement in the overall transmission quality.

Given the efficiencies of the IDLC system, it is ludicrous for Verizon to maintain that a forward-looking network would use the less-than-efficient technology mix of UDLC and IDLC that it proposes.

Q. IS VERIZON JUSTIFIED IN MAKING ITS ASSUMPTION OF UDLC USAGE?

A. No. Verizon bases its percentage on the assumption that it is required to provision non-switched services and also for unbundling.[44] Neither is correct. In fact, the FCC in the Virginia Arbitration Order found that with GR303 DLC, that providing CLECs with access to unbundled loops and providing non switched private line service could be accomplished.[45]

Incumbents such as Verizon frequently claim that it is impossible to unbundle loops on integrated remote terminals, claiming instead that integrated digital loop carrier systems are connected directly into the digital switch. As I have described above, this is not the case. The COT equipment associated with the integrated use of the RT does not simply stick fiber cable into a digital switch. An integrated NGDLC system has a COT consisting of bay-mounted equipment; the systems are de-multiplexed down to DS1 signals and sent to the digital switch over DS1 cable that is cross connected at the DSX-1 frame before being routed to Verizon's switch. However, and this is a key point, the DS1 connection can also be made available at the COT for delivery to a collocation arrangement within the central office for ultimate delivery to a CLEC's own switch.

Exhibit SET-7 is an excerpt from Telcordia's *Notes on the Network* – an extensive industry source for information on the telecommunications network. There is an extremely important note made on unbundling integrated digital loop carrier found on page 12-53 of this document that is shrouded in technical language and therefore might be missed. Specifically,

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[44] Verizon Panel Testimony, p. 46.

[45] *Virginia Arbitration Order*, ¶¶ 315-318.

Telcordia's *Notes on the Network* states: "Also, some RDTs are capable of supporting multiple GR-303 Interface Groups, thereby permitting a single RDT to connect to multiple switches." The acronym RDT is for "remote digital terminal" and is a reference to what I have been calling an RT throughout this discussion. GR-303 is the specific protocol that defines an integrated connection between the remote terminal into the switch. However, the important part of this statement is the reference to "Interface Groups." Modern NGDLC such as the Alcatel Litespan 2000 that Verizon has apparently deployed has the ability to provision multiple groups of DS1s at the COT that can be remotely provisioned such that individual loops at the RT can be assigned to a specific group of DS1s at the COT. For example, if a CLEC wanted to access unbundled loops behind an RT, it could procure a DS1 interface at the COT and become an "Interface Group" at that COT. Verizon could then electronically provision or assign the loop that the CLEC has won at the remote terminal back to the particular DS1 assigned to that CLEC instead of the "Interface Group" that Verizon is using for its own services into its own switch. Please note that Telcordia's *Notes on the Network* provides an illustration of this arrangement for providing unbundling to multiple switch-based CLECs over integrated DLC in Figure 12-35.

It is clear from this document that unbundling Integrated DLC systems is readily available technology utilizing NGDLC multi-hosting capabilities. These capabilities exist today in the DLC systems that Verizon has deployed throughout its network. The beauty of NGDLC, operating under GR-303, is that traffic can be pre-designated by an incoming line at the DLC Remote Terminal, and directed onto a specific DS-1 circuit in the central office. This feature

enables CLEC circuits to be groomed onto DS-1s going to the CLEC collocation arrangement.

I would also remind the Commission of what the FCC found in the Virginia Arbitration proceeding. Specifically, the FCC noted the following in its order:

> We find that the record demonstrates that it is technically feasible to unbundled NGDLC loops, and that this technology is currently available. Although both sides introduced voluminous record evidence in the cost portion of the arbitration, the evidence is conflicting and ultimately unsatisfying. The most revealing information on this issue comes from Verizon's testimony in the non-cost portion of the arbitration. There, a Verizon witness admitted that Verizon has had the technical ability to provide unbundled NGDLC loops for *four to five years* but chose not to implement a standard offering because competitive carriers had not sufficiently pursued such an offering. Further, the same witness admitted that migrating from an NGDLC loop to a UDLC loop within the Litespan NGDLC system can occur automatically. Indeed, in analyzing this testimony in the *Non-Cost Arbitration Order*, the Bureau found that "Verizon's expert testified that the assignment process, by which Verizon would assign an IDLC loop to either a UDLC or copper loop, *can be mechanized*."

Q. IS THERE SIMILAR CLEAR LANGUAGE IN THE VIRGINIA ARBITRATION ORDER REGARDING PROVISIONING NON SWITCHED PRIVATE LINE SERVICE ON IDLC?

A. Yes. The FCC found the following with regard to the provision of non switched private line service over IDLC:

> As noted above, Verizon contends that the existence of certain non-switched special access services, such as private lines, requires that almost 25 percent of the outside plant traverse UDLC systems. AT&T/WorldCom disagree, claiming that Verizon's won planning guidelines show that UDLC is not necessary to provision special access services.
>
> We agree with AT&T/WorldCom. Verizon may need to continue to deploy UDLC systems in its embedded network in Virginia because certain special access lines cannot be provided using TR-008 IDLC systems without incurring significant expenses. According to Verizon's own internal documents, however, these limitations do not restrict

> network design decisions in Verizon West (former GTE territory). Thus, Verizon's own network implementation in its western territories supports the finding that UDLC systems are no longer necessary to provide non-switched special services.[46]

Even Verizon is not assuming that a forward-looking network would include any TR-008 in its Washington filing. As such, if all of the DLC is GR-303 capable, the FCC found in its considerable review of the testimony and discovery materials submitted that "Verizon's own network implementation in its western territories supports the finding that UDLC systems are no longer necessary to provide non-switched special services." In short, there is no engineering basis to utilize anything other than IDLC for the provision of loops in the VzLoop and VzCost filing.

D. VERIZON DRAMATICALLY UNDERSTATES SHARING ASSUMPTIONS REGARDING STRUCTURE

Q. DO YOU HAVE ANY CONCERNS WITH THE STRUCTURE SHARING ASSUMPTIONS CONTAINED IN VERIZON'S VZLOOP MODEL?

A. Yes. Verizon has dramatically understated the sharing that is available for poles, trenches, and conduits in its network. For example, in the cases of trenches for buried cable installation, Verizon has assumed absolutely no sharing is available.[47] Verizon has likewise assumed that virtually no sharing is available for conduit (underground cable applications) either.[48]

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[46] *Virginia Arbitration Order*, ¶¶ 316-317.

[47] Verizon Cost Study, "wa_options_f_112503" Workbook, Cell X2.

[48] Verizon Cost Study, "wa_options_f_112503" Workbook, Cell Y2.

Q. WHY ARE THESE LOWSHARING VALUES UNREASONABLE IN A TELRIC COST PROCEEDING?

A. In a competitive environment, Verizon would seek out ways to share the structure required to provide local phone service with other companies and with other Verizon services to the maximum extent possible. Pole attachments can be used to share structure with cable companies and electric utilities; similarly, trenching for underground (and buried) structure can often be shared with cable and electric utility companies.

Q. DO YOU HAVE ANY OTHER SOURCES FOR THE SHARING PERCENTAGES THAT ARE AVAILABLE WITH POLES, TRENCHING, AND CONDUIT?

A. Yes. AT&T has proposed sharing percentages in the HM 5.3 model. In addition, the FCC in the Virginia Arbitration Order has provided detailed sharing assumptions by density that can be applied in Washington to develop weighted average sharing percentages for aerial, buried, and underground structure. The percentages in the table below represent the percentage of cost that Verizon would incur in each of the zones and for each of the types of structure identified.[49]

Density Zone	Structure Type		
	Underground	Buried	Aerial
-	100.00%	33.00%	50.00%
5	97.00%	33.00%	50.00%
100	97.00%	33.00%	50.00%
200	50.00%	33.00%	50.00%
650	50.00%	33.00%	50.00%
850	50.00%	33.00%	50.00%
2,550	50.00%	33.00%	50.00%
5,000	50.00%	33.00%	50.00%
10,000	50.00%	33.00%	50.00%

[49] These percentages are the opposite of how the values are used in VzLoop. Specifically, VzLoop requires the percentage of cost that is borne by parties other than Verizon. This table from the FCC is the percentage of cost borne by Verizon.

Q. DOES THE VERIZON MODEL ALLOW FOR THE DENSITY ZONE SPECIFIC STRUCTURE SHARING PERCENTAGES?

A. No. As with several other inputs discussed previously, the sharing percentages contained in Verizon's model are a single value by structure type that apply across all density zones.

Q. WHEN YOU APPLY THIS TABLE TO THE LINE COUNTS IN VERIZON'S COST STUDY, WHAT SHARING PERCENTAGES DO YOU ARRIVE AT?

A. Of course for buried, the sharing percentage that would be loaded into VzLoop would be 67 percent. The sharing percentage that would be loaded into VzLoop for aerial would be 50 percent. Using the wire center line counts for the weighting purposes, the weighted average sharing percentage for underground would be 43 percent. These percentages are much more representative of what the FCC has found to be consistent with TELRIC that the percentages used by Verizon which assume absolutely no sharing is possible on buried trenching and virtually no sharing is possible on conduit.

VI. VERIZON INTEROFFICE TRANSPORT COST STUDY

A. INTRODUCTION AND PURPOSE OF TESTIMONY

Q. PLEASE DESCRIBE THE PURPOSE OF THIS PORTION OF YOUR TESTIMONY AND PROVIDE A SUMMARY OF ITS CONCLUSIONS.

A. This testimony reviews Verizon's claimed interoffice transport and common (also known as shared) transport costs as presented in Verizon's Panel Testimony. This testimony identifies and explains the errors that Verizon made with regard to both and recalculates the interoffice transport and common transport costs to correct these errors.

Verizon VA has significantly overstated its forward-looking economic costs for dedicated interoffice transport and common transport. In particular, Verizon made the following errors:

- Verizon's cost study improperly includes Digital Cross-connect System ("DCS") on virtually dedicated transport circuits even though the competitive local exchange carrier ("CLEC") may not want this element. Consistent with the FCC's Advanced Services Order and with the terms of the Verizon/AT&T interconnection agreements, DCS should be treated as a separate unbundled element, which a CLEC has the option to purchase based on cost and network considerations.
- Verizon has significantly understated the fill factor for the fiber used between its offices for the purposes of calculating TELRIC interoffice transport costs. Specifically, Verizon has relied on its embedded fill factor instead of using the guidance the FCC has provided in determining fill in forward-looking cost studies.
- Verizon has also significantly overstated the costs for common transport. Verizon has based the cost for common transport on its dedicated transport cost study. Thus, errors described in my testimony relating to dedicated transport must also be corrected with regard to common transport costs.

Q. HOW DOES VERIZON MODEL ITS TRANSPORT NETWORK TO OBTAIN THE COST OF TRANSPORT UNES?

A. Verizon does not actually model the transport network. Instead, it uses what it calls a capacity costing approach. In this approach, it ostensibly determines the cost per unit of capacity of typical network configurations used to provide the UNEs, as opposed to actually developing a model of the interoffice network and determining the costs associated with that network.

Q. DO YOU BELIEVE THIS IS AN APPROPRIATE WAY TO MODEL THE TELRIC OF INTEROFFICE UNES?

A. No. I have two primary criticisms with this approach. First, since individual circuits are modeled in isolation, not as part of an overall IOF network, there is no way to determine the total investment or costs of the network that ostensibly supports the UNEs. Nor, for that matter, can one observe the overall configuration of the network. Thus neither costs nor configurations can be analyzed in terms of what one might expect in a properly-crafted TELRIC model. Second, the parameters required to do the capacity cost calculations are taken from the embedded Verizon IOF network. Of necessity, this means the costs tend to replicate the costs of the embedded network, and since there is no overall network model, there is no way to be sure those costs are consistent with a TELRIC construct.

Q. WHAT ARE SOME EXAMPLES OF PARAMETERS USED IN THE CAPACITY COST STUDIES THAT ARE TAKEN FROM VERIZON'S EMBEDDED NETWORK?

A. Among other parameters, the capacity cost studies assume 1) the equipment configurations used to provide corresponding circuit types today, specified according to 2) the type of wire center in which those circuits are implemented; 3) the number of nodes on a given ring, and the resulting number of interconnections required between rings; 4) the existing mix of equipment vendors;

and 5) fiber fill factors. Verizon provides no evidence that the circuit arrangements it thus specifies are efficient and forward-looking.

B. VERIZON'S CLAIMED INTEROFFICE DEDICATED TRANSPORT COSTS

1. Correction to Permit the Election of DCS

Q. WHAT IS DCS?

A. DCS is an acronym for "Digital Cross-connection System." DCS allows for telecommunications providers to electronically cross connect different speeds of dedicated transport. For example, this piece of equipment allows the telecommunications carrier to take multiple DS1 dedicated transport circuits, entrance facilities, or loops and place them onto a DS3 circuit that can then be carried to another location. This is also referred to as "grooming." Other technology (*e.g.*, ATM switching) is able to perform many of the same functions as DCS with a much lower level of investment. As such, DCS is normally and economically used when the electronic capability available with DCS can best be put to use (*e.g.*, when many changes are expected in the circuits connecting two locations or when the ability to re-provision circuits across different high speed transport is important). ILECs choose when and where to use DCS in dedicated transport circuits based on cost and performance trade-offs. CLECs should have the same opportunity to make this choice through unbundling.

Q. HOW HAS VERIZON COSTED AND PRICED DCS?

A. Verizon has averaged the cost of DCS into its prices for interoffice transport.

Q. IS THIS APPROPRIATE?

A. No. ILECs choose when and where to use DCS in dedicated transport circuits based on cost and performance trade-offs. With unbundling, CLECs should have the same opportunity to decide when and where to use DCS in dedicated transport circuits.

Q. DID THE FCC FIRST REPORT AND ORDER PROVIDE THAT ILECS SHOULD OFFER DEDICATED TRANSPORT AND DCS SEPARATELY?

A. Yes. The FCC in its *First Report and Order* specifically refers to the unbundling of DCS from dedicated transport:

> Accordingly, we conclude that the section 251(d)(2)(B) requires incumbent LECs to provide access to shared interoffice facilities and dedicated interoffice facilities between the above-identified points in incumbent LECs' networks, including facilities between incumbent LECs' end offices, new entrant's switching offices and LEC switching offices, and DCSs. We believe that access to these interoffice facilities will improve competitors' ability to design efficient network architecture, and in particular, to combine their own switching functionality with the incumbent LEC's unbundled loops.[50]

The FCC required that the new entrant be permitted to have access to DCS. Simply giving the CLEC access to the DCS equipment does not allow the ILEC to make its use mandatory and include it as an element in its cost study. The CLEC is free to elect not to purchase this element, as other technology affords other alternatives for accomplishing the same functionality as DCS, in a much less costly manner (*e.g.*, ATM switching).

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[50] *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, CC Docket No. 96-98, FCC *First Report and Order*, FCC Docket No. 96-325, Released August 8, 1996, ¶ 447.

Q. DOES VERIZON PROVIDE ACCESS TO DCS ON A SEPARATE BASIS ALREADY?

A. Yes. Verizon has a Special Access Tariff (Tariff No. 1) that provides access to DCS functionality known as IntelliMux (see § 7.2.12). This service permits "allows point-to-point rerouting of customer…facilities."[51] Moreover, this tariff states that the price for this DCS functionality is based on the type of port that is acquired – Voice Grade, DS1, or DS3.[52] As such, if the customer wants to connect DS3 Special Access Service to the DCS, the customer must purchase a DS3 network access port at the DCS. In short, this is the appropriate approach to establish costs for interoffice dedicated transport for unbundling. Moreover, the FCC explicitly requires that the incumbents make DCS available in the same manner for unbundling that it makes it available for special access.[53]

Q. DOES THE NETWORK CONFIGURATION THAT VERIZON IS USING PERMIT IT TO SEPARATE DCS FROM THE DEDICATED TRANSPORT?

A. Yes. Based on the diagrams provided by Verizon with its cost study, Verizon has DSX cross-connect points available within its offices and, in fact, uses these DSX cross-connect points in the provisioning of its circuits. For example, Verizon's facility design for a DS3 Interoffice DS3 Transport circuit goes from the OC-48 to a Light Guide Cross-connect at an OC12 rate and then to the 3/3 Broadband DCS.[54] From this Broadband DCS, the connection is made to the

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[51] Verizon Special Access Tariff FCC No. 1, § 7.2.12(E). For ease of reference, the tariff is included in the directory titled "Vz Special Access Tariff" as part of Exhibit SET-3.

[52] Verizon Special Access Tariff FCC No. 1, § 7.2.12(F).

[53] FCC *First Report and Order*, FCC Docket No. 96-325, ¶ 444.

[54] Verizon Cost Study, Exhibit RP-20C, IOF-Designs PowerPoint Presentation, Slide 6.

manual cross-connect point on the DSX at a DS3 rate.[55] The OC-48 is not limited to just providing an OC-12 interface (that must then go to the Light Guide Cross-connect. Instead, OC-48 systems are readily capable of providing an interface at a DS3 level. If such an interface were use, it could then be cabled directed to the DSX for hand-off to the CLEC customer without the inclusion of the terminal 3/3 Broadband DCS. As such, the dedicated transport, which appears at the DSX, can be readily separated from the DCS, which also appears at the DSX, so that the CLEC can either purchase dedicated transport with DCS (if DCS is available) or without DCS.

Q. IN THE *VIRGINIA ARBITRATION ORDER*, DID THE FCC MAKE ANY RECOMMENDATION ON THIS ISSUE?

A. Yes it did. The FCC clearly required that Dedicated Transport be established separately for dedicated transport that includes DCS and also excludes it if the CLEC orders it so.

> We find that dedicated transport rates should be established separately for dedicated transport that includes both DCS and multiplexing, that includes each individually, and that includes neither. We decline to establish separate stand-alone rates for DCS or multiplexing.
>
> We base these findings on our determinations in the *Non-Cost Arbitration Order*. There, we found that Verizon is not required to make available DCS or transport multiplexing as a stand-alone UNEs, but that Verizon must make available dedicated transport both with and without DCS and/or multiplexing. Consistent with this determination, we require that Verizon, in its compliance filing, establish rates for dedicated transport (at each capacity level (*e.g.* DS-1, DS-3, STS-1, OCn)) in the following manner: (1) including DCS and multiplexing; (2)

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55 *Id*.

including DCS only; (3) including multiplexing only; and (4) including neither DCS nor multiplexing.[56]

This was not the perfect recommendation in that I had requested that the FCC separately price DCS and multiplexing apart from the transport element so that CLECs could then put the elements back together in a manner that suited the network architecture for the service the CLEC was providing. The FCC declined this request in that it observed in the non-cost portion of the proceeding, that DCS and multiplexing would not be ordered separately, but only in conjunction with interoffice dedicated transport. It turns out that the recommendation that the FCC made can work as long as Verizon implements the order by primarily calculating dedicated transport without the inclusion of the terminating DCS and then with the terminating DCS.

Q. HAVE YOU RECALCULATED VERIZON'S COST STUDY TO CORRECT THIS ERROR?

A. No. In the Verizon model that was used with the FCC in the Virginia Arbitration, it was quite doable to modify the circuit architectures and thereby remove the DCS from the investment calculation. However, in the case of the model in this proceeding, I have not found a straightforward manner in which to modify the architectures of the circuit to eliminate DCS from the underlying architecture.

Q. ARE YOU SEEKING TO REMOVE ALL DCS FROM THE VERIZON INTEROFFICE TRANSPORT ARCHITECTURE?

A. No. It is only the DCS that is on the terminating ends of the interoffice transport circuit that I believe the CLEC should have the alternative of whether it is provisioned or not. Sometimes,

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[56] *Virginia Arbitration Order*, ¶¶ 510-511.

multiple SONET rings are required to provide the connection between two different central offices. For example, a DS3 circuit may be required between Office A and Office Z. Office A may not be on a single SONET ring that connects to Office Z. However, Office A may be on a SONET ring with an Office M which might also be on a separate SONET ring that connects with Office Z. In this case, Verizon may require the use of DCS for providing the interconnection between different SONET rings – the one that Office A and M are both on with the one that Office M and Z are both on. I do not recommend that this DCS be removed from Verizon's model that is used for providing office interconnection. However, the DCS at the ends of the circuit should be included in the circuit only if the CLEC wishes to pay for this additional cost and if the CLEC also is allowed access to the grooming and other testing capabilities available with DCS.

2. Interoffice Fiber Fill Factor

Q. WHAT INTEROFFICE FIBER FILL FACTOR HAS VERIZON RECOMMENDED IN THIS PROCEEDING?

A. Verizon has recommended that the Commission utilize its embedded fiber fill factor of *****CONFIDENTIAL END CONFIDENTIAL***** percent.[57] However, after the application of the SONET terminal equipment fill factor of *****CONFIDENTIAL END CONFIDENTIAL***** percent it results in an overall fiber utilization of *****CONFIDENTIAL END CONFIDENTIAL***** percent.[58]

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[57] Verizon Cost Study, "IOF CONSTANT VALUES 030529" Table.

[58] *Id*.

Q. ARE THESE REASONABLE FILL FACTORS TO USE IN A TELRIC COST STUDY?

A. Absolutely not. The fill factor for fiber should not be based on the embedded placement and utilization of fiber. Fiber could have been placed historically for any number of reasons which may or may not have materialized as yet. Moreover, fiber has many uses for which the incumbent LEC may have installed much more capacity that presently needed to serve current demand. The fact that the incumbent may have chosen to install a great deal more fiber than is needed does not mean that the current base of customers should bear all of this excess cost.

The FCC also found in its *Inputs Order* in the federal universal service proceeding that determining the fill in the forward-looking network should be modeled based on the assumption of four fibers per DLC at an even higher "100 percent" fill, producing an effective fill of no more than 50 percent. Before reviewing the specific quote, it is important to understand the technology associated with SONET based remote terminals. My understanding of Verizon's cost study is that Verizon has included four fibers per remote terminal system. However, the reality is that only two of these fibers are "used" in that the other two fibers are equipped so that if there is a failure on the primary pair of fibers the backup fibers can continue to provide connectivity between the remote terminal and the central office terminal. As such, if a 100 percent fill factor is assumed for fiber feeder, the effective fill from a costing standpoint is really 50 percent since four fibers (two working and two spare) are included in the cost development. With this background, the following quote supports the high level of fill that I am recommending in this proceeding:

> Fiber Fill Factors. Finally, we affirm our tentative conclusion that the input value for fiber fill in the federal mechanism should be 100 percent.

> The majority of commenters addressing this specific issue agree with our tentative conclusion. AT&T and MCI contend that fiber feeder fill factors of 100 percent are appropriate because the allocation of four fibers per integrated DLC site equates to an actual fill of 50 percent, since a redundant transmit and a redundant receive fiber are included in the four fibers per site. AT&T and MCI explain that, because fiber capacity can easily be upgraded, 100 percent fill factors applied to four fibers per site are sufficient to meet unexpected increases in demand, to accommodate customer churn, and, to handle maintenance issues. Similarly, SBC asserts that fiber fill factors of 100 percent can be obtained because they are not currently subject to daily service order volatility and are more easily administered. In contrast, BellSouth advocates that we employ projected fills estimated by BellSouth engineers. As noted above, these estimates are unsupported and we reject them accordingly. In sum, we find that the record demonstrates that it is appropriate to use 100 percent as the input value for fiber fill in the federal mechanism.[59]

Q. WHAT RECOMMENDATION DO YOU MAKE?

A. There are two fill factors related to interoffice transport that I modify. The first relates to the lit versus unlit percentage of fibers in the cost study. For this fill factor, I would recommend that the Commission utilize a value of 100 percent consistent with the discussion above. However, there is then a separate fiber utilization percentage that takes into account the utilization percentage assumed on the SONET terminals. As noted earlier, Verizon has assumed a utilization percentage of *****CONFIDENTIAL END CONFIDENTIAL***** percent. The product of this terminal utilization percentage and the lit versus unlit factor is what Verizon ultimately uses for the fiber utilization percentage. In this case, I would encourage the

[59] In the Matter of Federal-State Joint Board on Universal Service, CC Docket 96-45, and Forward Looking Mechanism for High Cost Support for Non-rural LECs, CC Docket 97-160, Tenth Report and Order, Released November 2, 1999.

Commission to use the resulting product of *****CONFIDENTIAL END CONFIDENTIAL***** percent.

Q. DO YOUR RESTATED INTEROFFICE TRANSPORT COST STUDIES ACCOUNT FOR THIS ADJUSTMENT?

A. Yes, they do.

C. VERIZON'S CLAIMED COMMON TRANSPORT COSTS

Q. WHAT IS THE RELATIONSHIP BETWEEN THE COST FOR COMMON TRANSPORT AND INTEROFFICE DEDICATED TRANSPORT?

A. Common transport is closely linked to the costs for interoffice dedicated transport. The trunks that are used to carry common transport are provisioned on the same facilities that are used to provide dedicated transport circuits. As such, the underlying cost for dedicated transport directly relates to the costs that would be incorporated into the calculations for common transport. Of course, other issues also come into play with common transport in that the cost recovery for this element is not based on circuits, but on minutes.

Q. WHAT CONCERN DO YOU HAVE WITH VERIZON'S COMMON TRANSPORT COST STUDY?

A. Verizon used as the underlying cost element for common transport the costs from the dedicated transport cost study. Verizon's cost study for common transport costs thus must be corrected to account for the same errors as in the dedicated transport cost study.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.