COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

Investigation by the Department of Telecommunications and Energy on its own Motion into the Appropriate Pricing, based upon Total Element Long-Run Incremental Costs, for Unbundled Network Elements and Combinations of Unbundled Network Elements, and the Appropriate Avoided Cost Discount for Verizon New England, Inc. d/b/a Verizon Massachusetts' Resale Services in the Commonwealth of Massachusetts	D.T.E. 01-20

DIRECT TESTIMONY OF STEVEN E. TURNER ON RECONSIDERATION

ON BEHALF OF AT&T AND WORLDCOM

PUBLIC VERSION

October 2, 2002

I. INTRODUCTION AND SUMMARY.

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

A. My name is Steven E. Turner. Currently, I head my own telecommunications and financial consulting firm, Kaleo Consulting. My business address is 2031 Gold Leaf Parkway, Canton, Georgia 30114.

Q. ARE YOU THE SAME STEVEN E. TURNER WHO FILED REBUTTAL AND SURREBUTTAL TESTIMONY IN THIS PROCEEDING?

A. Yes. I filed Rebuttal Testimony related to the issues of collocation and interoffice transport on July 18, 2001. My background and education were outlined in that testimony. I filed Surrebuttal Testimony related to these same issues on December 17, 2001. In addition, I was cross-examined at hearings on January 23-24, 2002.

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

A. My testimony will respond to the Department's request for additional testimony regarding the cabling distance to be used in developing the Power Distribution collocation element.[1] Specifically, I will address two issues.

First, I will discuss when this rate element should even apply. At present, my understanding is that there are no terms and conditions documented for the application of this rate element. As such, I have interpreted Verizon's cost development for this element to be for DC power cabling between the Battery Distribution Fuse Bay ("BDFB") and the

[1] Order Granting Verizon and AT&T Motions for Reconsideration, In Part, and Requesting Additional Evidence, at 14.

collocator's equipment. My testimony identifies why this is a reasonable assumption and defines situations where Verizon should not apply this rate element at all.

Second, the primary question raised by the Department is the distance that should be used for this element. My testimony will demonstrate that from an engineering perspective and from a nondiscriminatory cost perspective, the appropriate distance is 40 feet. To be conservative, I have restated Verizon's costs using a 55-foot distance. Nonetheless, Verizon's distances exceed any reasonable estimate of a nondiscriminatory distance and likely include cabling distance that should not even be incorporated in the development of this rate element.

II. APPLICATION OF THE POWER DISTRIBUTION RATE ELEMENT.

Q. DO TERMS AND CONDITIONS EXIST AT PRESENT FOR THIS RATE ELEMENT?

A. Based on my review of the collocation terms and conditions that presently exist in Verizon's collocation tariff, there is no language that defines the application of the Power Distribution rate element.[2] On September 26, 2002, AT&T asked in discovery for Verizon either to identify where these terms and conditions exist or provide the terms and conditions upon which it intends to apply this charge.[3] As of this writing, we have not received a response.

Q. DO COLLOCATORS PAY FOR THIS CHARGE TODAY?

A. No. My understanding from working with Verizon on issues related to DC power in other states as well as in discussions with AT&T and WorldCom personnel in Massachusetts is

[2] DTE MA No. 17, Part E and Part M-Section 5.

[3] ATT-VZ 30-1.

that CLECs do not pay for this rate element today. Instead, the cost for this element is likely recovered through nonrecurring charges paid by the CLEC at the time of the cage construction. However, even in this regard I can find no language in the existing collocation tariffs regarding the cost recovery for the DC power cables.

Q. DO YOU HAVE ANY FUNDAMENTAL PROBLEMS WITH VERIZON'S ATTEMPT TO RECOVER THIS COST VIA A RECURRING CHARGE?

A. In my experience across the country (which is extensive in that I have testified on collocation in approximately 30 states), the cost for DC power cables is always recovered through nonrecurring charges. I do not know of a circumstance other than Verizon's proposal here in Massachusetts where an ILEC has ever attempted to recover the cost for DC power cables via a recurring charge. It is reasonable that the DC power cabling costs would be nonrecurring costs because the cables themselves cannot be shared with any other provider in that they are dedicated to the power use of a particular collocator. Although the fact that the facilities are dedicated does not by itself compel a conclusion that costs should be recovered in a nonrecurring charge, there is another reason as well. The DC power cables for all practical purposes are not reusable by subsequent collocators in that they are sized for the specific power drain anticipated by the collocator that has them installed. Subsequent collocators may need more power, making the cables that are already in place useless. It is for these reasons that in the past I have recommended that the cost for DC power cabling be recovered as a nonrecurring charge.

Q. WHY DID YOU NOT MAKE THIS PROPOSAL IN YOUR PREVIOUS TESTIMONY OR AT HEARINGS IN THIS DOCKET?

A. AT&T and WorldCom made a strategic decision to use the models filed by Verizon in Massachusetts. I was asked to limit my modifications to the inputs for the models to bring the costs produced by Verizon's collocation cost model into compliance with efficient, forward-looking costs. In my opinion, while it is unusual to recover the costs for DC power cables as a recurring charge, it did not necessarily make the costs inconsistent with efficient, forward-looking costs.

Q. DO YOU THEN BELIEVE IT IS APPROPRIATE FOR VERIZON UNILATERALLY TO BEGIN CHARGING THE POWER DISTRIBUTION RATE ELEMENT ONCE THIS DEPARTMENT MAKES ITS FINAL DETERMINATION OF THE COSTS FOR THIS ELEMENT?

A. No. If CLECs have already paid for the costs of the DC power distribution cables between their collocation arrangements and Verizon's power distribution points as a nonrecurring charge, it would be totally inappropriate for Verizon to now impose a recurring charge as well. Doing so would allow Verizon to over-recover the costs of DC power distribution cables. In short, Verizon should not be permitted to charge the Power Distribution element except for new collocation arrangements unless Verizon can demonstrate that it has not already recovered these costs for an existing collocation arrangement.

Q. GIVEN THAT THERE ARE NO EXISTING TERMS AND CONDITIONS FOR THE POWER DISTRIBUTION ELEMENT, WHAT ASSUMPTIONS HAVE YOU MADE IN DEVELOPING YOUR PROPOSED COST FOR THIS ELEMENT?

A. First, I believe it would be helpful to recall the basic construct of DC power costs. In virtually every state in the country, DC Power is comprised of two main elements: DC Power Distribution and DC Power Consumption. DC Power Distribution is the rate element

that recovers the costs for the DC power cabling that is extended from Verizon's BDFB to the collocation arrangements. This DC power cabling consists of pairs of copper cables in protective sheaths to complete a power circuit from the BDFB to the collocation arrangement – one part of this pair representing the "battery" or delivery of power and the other part of this pair representing the "ground" or return of the power. Moreover, this pair normally comes in matching pairs for redundancy where one pair will be referred to as the "A-side" power feed and the redundant pair referred to as the "B-side" power feed so that if one side fails, power will not be completely cut off to the telecommunications equipment. Finally, the BDFB is simply a large fuse bay or junction point where a large feed of DC power from the power plant is broken down into smaller increments of power. This piece of equipment is necessary because it allows for the cables from the BDFB to the collocation arrangement (or Verizon telecommunications equipment, for that matter) to be much smaller and therefore less expensive (which are many in number) as a tradeoff to large power cables from the power plant to the BDFB which are more expensive (but much fewer in number). The cost of cables from the BDFB to the collocation arrangement is captured in the DC Power Distribution element. The cost of the BDFB itself is recovered in DC Power Consumption discussed below.

DC Power Consumption gives the connotation that something is being used up, but for the vast majority of the DC Power Consumption cost, this is a misnomer. Virtually all of the cost for DC Power Consumption is recovering the cost of the equipment necessary to generate DC power. (In electricity regulation, this is the "capacity" component.) Virtually all telecommunications equipment operates on DC power (or direct current power), whereas

the power that can be purchased from the electric utility is AC power (or alternating current power). A whole series of equipment must be installed by Verizon to convert this AC power to DC power and provide for its redundancy: rectifiers (which actually convert the AC power to DC power); batteries (which stabilize the DC power and provide for short-term backup in the event of an AC power failure); controllers and power distribution service cabinets (for managing the DC power elements and distributing the power throughout the central office); and the emergency engine (for providing long-term backup in the event of a lengthy AC power failure). The cost recovery of these elements constitutes the vast majority of the cost in DC Power Consumption and none of these elements is actually "consumed." However, they are necessary to provide the DC power that is used by the telecommunications equipment.

Q. WHERE ARE DC POWER CABLES PLACED?

There are at most two places where DC power cables can be placed. *First*, DC power cables can be placed between the Verizon DC power plant and the Verizon BDFB. According to Verizon's own cost study, these cable costs would have to be included in the DC Power Consumption rate element. Moreover, Verizon assumes that *****BEGIN VZ CONFIDENTIAL** XXX **END VZ CONFIDENTIAL***** percent of the time, the CLEC uses the Verizon BDFB.[4] The other *****BEGIN VZ CONFIDENTIAL** XXXX **END VZ CONFIDENTIAL***** percent of the time, the CLEC actually cables directly back to the

[4] *See* Mass Part CA – Physical (05-04-01) Workbook, WP 5.0, PG-1 DC POWER PER AMP Worksheet, Cells D63 and D76. You must look at the formulas in the cells to see that weighting that I describe. Cell D63 shows the weighting where no BDFB and no cabling cost is included. Cell D76 shows the weighting where BDFB and cabling cost is included.

Verizon power distribution panel bypassing the Verizon BDFB. Verizon's development of its proposed DC Power Consumption cost uses the weightings above to compute a cost for DC Power Consumption that therefore includes the cable costs between the Verizon DC power plant and the Verizon BDFB *****BEGIN VZ CONFIDENTIAL** XXX **END VZ CONFIDENTIAL***** percent of the time.

Second, DC power cables can be placed between the Verizon BDFB and the collocation arrangement. There is no explicit place in the Verizon cost study other than the Power Distribution rate element for the recovery of this cost. Moreover, given that Verizon assumes that *****BEGIN VZ CONFIDENTIAL** XXX **END VZ CONFIDENTIAL***** percent of all collocation arrangements will take the power from the Verizon BDFB, it only seemed logical to assume that the Power Distribution rate element recovered Verizon's costs from its BDFB to the collocation arrangement. As such, the following testimony will make this assumption and will base the cabling distances on the premise that the Power Distribution rate element recovers cost for cabling distribution between the Verizon BDFB and the collocator's equipment.

III. CABLING DISTANCE FOR POWER DISTRIBUTION ELEMENT.

Q. WHAT IS THE PRIMARY ISSUE THAT THE DEPARTMENT SHOULD CONSIDER IN DEVELOPING THE COST FOR DC POWER DISTRIBUTION?

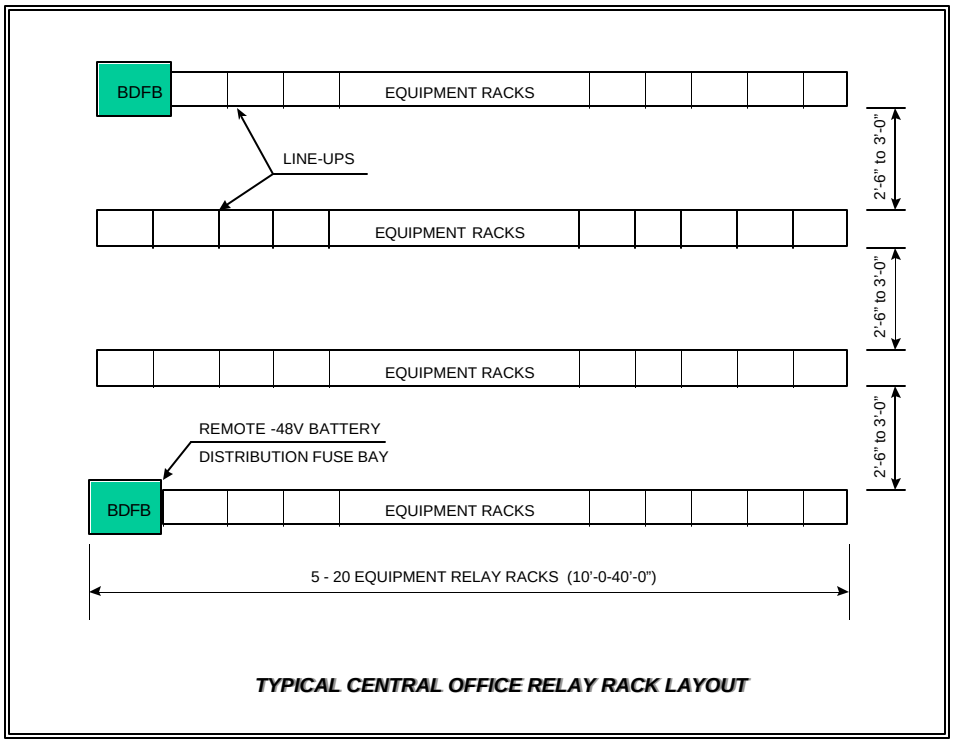
A. Based on the discussion above, the DC Power Delivery element recovers the costs associated with the cabling between the BDFB and the collocation arrangement. In general, central office engineering guidelines require that BDFBs be placed centrally to the equipment they serve. The reason for this is that DC power cables get geometrically more expensive

the longer they are. As such, good engineering practice is to keep the cables from the BDFB to the telecommunications equipment as short as possible so that the cost of these cables is minimized.

The electrical engineering rules behind the principle summarized above are somewhat complex. However, I will attempt to summarize them here. Whenever electricity passes through a conductor such as a copper cable, the copper cable has some measurable resistance to the current passing through the cable. This resistance causes a voltage drop to occur between the batteries and rectifiers providing power to the power plant and the equipment that draws on the DC power. There are specific telecommunications engineering guidelines that define how much voltage drop is permissible between the battery and rectifiers and the telecommunications equipment. Generally this drop is one amp from the batteries to the equipment or a total of two amps round-trip (meaning back to the batteries). There are several variables that change the amount of resistance in the cables and the voltage drop that can occur. The primary variables are the diameter of the power cable and the length of the power cable. The way this works from an engineering perspective is that the longer the power cable is made the more resistance it will cause and the greater the voltage drop will be. Now resistance in the power cable can be offset by making the cable fatter. In other words, if you need to move current a long way, one way to do this is to make the cable fatter to offset the resistance of the long cable by giving the electrical current more room to pass through the cable.

Now, copper cables get exponentially more costly the larger the diameter that they are. As such, any prudent telecommunications company will minimize long-fat power cable

runs to the extent possible. This is done not only because of the cost issues with the cables, but also because it is difficult to run large numbers of fat power cables in the overhead racks between the DC power plant and the telecommunications equipment. The equipment that allows this efficiency to be implemented is the BDFB. BDFBs are placed strategically throughout the ILECs' central offices so that a few large power cable runs can be made to the BDFBs to minimize the cost of the *many* DC power cable runs that are made to telecommunications equipment. In my engineering experience informed by being in numerous telecommunications central offices, including those of BellSouth, Southwestern Bell, Ameritech, Pacific Bell, Verizon, and AT&T, BDFBs normally are placed near columns at the end of telecommunications equipment rows and are placed approximately every three rows throughout the central office. The equipment layout may look much like that below.



TYPICAL CENTRAL OFFICE RELAY RACK LAYOUT

Based on the diagram which I prepared above and which is typical of what I have seen in all ILEC central offices, the distance from the BDFB to the nearest telecommunications equipment is zero feet – it is immediately adjacent to telecommunications equipment. However, cables have to be extended from the BDFB up into the overhead cable racks and then down again to the telecommunications equipment and this distance would likely be approximately 15 feet. The distance to the furthest telecommunications equipment using the maximum distance identified above is approximately 50 feet.[5] Again, adding the 15 feet to extend cable up into the rack at the BDFB and then back down again at the telecommunications equipment yields a maximum distance of approximately 65 feet. The average of these two yields an average of 40 feet.

My view is that CLECs should not be treated in a discriminatory manner to how incumbents treat themselves from a cost standpoint. In other words, if Verizon places BDFBs throughout the central office to minimize the cabling distance between the BDFB and its equipment, it should treat CLECs in the same way. Verizon should not be permitted to utilize extremely long cabling distances for CLECs simply because it can pass the cost of these cabling distances on to CLECs.

Q. HOW SIGNIFICANTLY DO VERIZON'S CABLING DISTANCES DEPART FROM THE ENGINEERING PRINCIPLES YOU HAVE DESCRIBED ABOVE?

A. Verizon has deviated from this practice in that the cabling distances that it uses to develop the DC Power Distribution cost are significantly greater than what good engineering practice

[5] 50 Feet is calculated as follows: six feet to traverse two aisle ways (worst case scenario) plus approximately two feet for the depth of the equipment plus 40 feet to extend to the end of the row. This yields a distance of 48 feet. I have rounded this up to 50 feet.

requires. Verizon has regularly used distances that exceed the 40 foot distance documented above in its DC Power Distribution cost study. In the Metro zone, Verizon uses an average cabling distance of 121 feet. In the Rural zone, Verizon uses an average cabling distance of 80 feet. In the Suburban zone, Verizon uses an average cabling distance of 102 feet. Finally, in the Urban zone, Verizon uses an average cabling distance of 112 feet. In all cases, Verizon's cabling distance is significantly longer than that which is typical in efficiently engineered power cabling arrangements.

Q. HAVE YOU HAD THE OPPORTUNITY TO REVIEW VERIZON'S ENGINEERING PRACTICE IN THIS SAME AREA TO CONFIRM THAT IT IS THE SAME AS IN YOUR OTHER EXPERIENCE?

A. No. I tried to obtain this information via discovery in ATT-VZ 5-9 earlier in this same proceeding. However, Verizon did not provide the documents requested in this information request.[6] I have obtained this type of documentation in other parts of the country and know that it is normal for incumbents such as Verizon to have a "Bell System Practice" that documents how DC power distribution is done generally in their network. However, Verizon has not provided this information.

I have also not had the opportunity to tour Verizon central offices on the East Coast. I have, however, toured Verizon central offices in California as well as many other central offices as described above. Based on my experience in touring other central offices including Verizon central offices, and based on my experience that Bell System Practices have always

[6] AT&T Information Request No. 5-9. Verizon's response to this information request directed AT&T to Verizon's response to AT&T Information Request No. 5-21. Since this information request did not exist, I reviewed Verizon's response to AT&T Information Request No. 5-12. Here again, Verizon did not provide "the engineering guideline (Bell System Practice or similar document) that outlines how Verizon is to engineer the

been very much standardized across the telecommunications industry, I do not anticipate that Massachusetts would be an exception. As such, I would expect that a distance of approximately 40 feet would be appropriate for these cabling distances.[7]

Q. HAVE ANY COMMISSIONS MADE A DEFINITIVE DECISION ON THIS ISSUE THAT YOU ARE AWARE OF?

A. I recognize that the Department has said that it will not rely on decisions from other state commissions to reach a conclusion in this case. I offer evidence of other state decisions here only as a reasonableness check on my independent analysis and conclusions set forth above.

So, returning to the question, the answer is "yes." The Texas Public Utility Commission ("Texas PUC") evaluated precisely this issue in determining what the distance should be between the incumbent BDFB and the collocation arrangement. The Texas PUC determined that the cabling distance should be 55 feet.[8] Interestingly, Southwestern Bell only asked for 75 feet statewide.

The FCC in the Texas Section 271 Order recognized the Texas PUC as a commission that has thoroughly evaluated collocation costs and is a model for other states to review.[9] As such, I compared the rates that were developed in Texas (based on the 55-foot cable distance) against those proposed in Massachusetts for similar amperages. For

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deployment of BDFBs in its central offices," but instead, simply provided a spreadsheet of the distances that it implemented. This information was not responsive to the information request.

[7] Even though reasonable engineering practices would yield an average distance of 40 feet, my restatement of Verizon's Power Distribution costs used a conservatively longer 55-foot distance consistent with the review done by the Texas PUC and discussed later in this testimony.

[8] Revised Arbitration Award, Docket No. 21333, *Proceeding to Establish Permanent Rates for Southwestern Bell Telephone Company's Revised Physical and Virtual Collocation Tariffs*, p. 70.

[9] *See generally* Texas 271 Order at ¶¶ 73-74.

example, in Texas, 2-20 Amp DC Power Distribution Feeds (fused at 30 amps) have a nonrecurring cost of $369.03 and a recurring cost of $0.00. The same arrangement in Massachusetts as proposed by Verizon has a nonrecurring cost of $0.00 and a recurring cost of $15.16 per month. While the two cost structures are totally different, clearly after two years, Verizon will be recovering costs that are in excess of what the Texas PUC determined to be cost based. Much of this difference is because of the excessive distances assumed in Verizon's Massachusetts cost study. I will give just one other example to show that this problem actually gets more severe as the amperage increases (which is consistent with the geometric aspect of power cabling cost I discussed earlier). In Texas, 2-50 Amp DC Power Distribution Feeds (fused at 75 amps) have a nonrecurring cost of $643.12 and a recurring cost of $0.00. A similar arrangement in Massachusetts (fused at 70 amps) has a nonrecurring cost of $0.00 and a recurring cost of $60.94 per month. In this case, after only 10 months, Verizon will be recovering costs that are in excess of what the Texas PUC determined to be cost based. In short, Verizon's excessive distances contribute to its costs being significantly above TELRIC based costs.

Q. HAVE YOU BEEN ABLE TO CORRECT THIS ERROR IN VERIZON'S COST STUDY?

A. To a certain extent I have been able to correct for this problem in my restatement of Verizon's cost study. In making this correction, I have been conservative by using the 55-foot distance for cabling identified by the Texas PUC. Consequently, my results are based on a slightly overstated cabling distance. However, I have maintained the cost recovery

mechanism proposed by Verizon to avoid the complications of truing up to a completely different rate structure.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.