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BEFORE THE ARIZONA CORPORATION COMMISSION

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IN THE MATTER OF THE COMPLAINT OF MCLEODUSA TELECOMMUNICATIONS SERVICES, INC. AGAINST QWEST CORPORATION.

67A
DOCKET NO. T-03276A-06-0105
DOCKET NO. T-01051B-06-0105

NOTICE OF FILING

Please take notice that McLeodUSA Telecommunications Services, Inc. is filing the Public Version of the Direct Testimony of Michael Starkey, Sidney L. Morrison and Tami J. Spocogee, a copy of which is attached. A Confidential Version of the testimony of Sidney L. Morrison and Tami J. Spocogee will be provided to those parties who have signed a protective agreement in this docket.

RESPECTFULLY SUBMITTED this 12th day of May 2006.

ROSHKA DEWULF & PATTEN, PLC

By _____

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BEFORE THE ARIZONA CORPORATION COMMISSION

IN THE MATTER OF:	)	Docket No. T-03267A-06-0105
	)	Docket No. T-01051B-06-0105
McLEODUSA	)	
TELECOMMUNICATIONS	)	
SERVICES, INC.,	)	
Complainant,	)	
v.	)	
QWEST CORPORATION,	)	
Respondent.	)	

DIRECT TESTIMONY

OF

MICHAEL STARKEY

On behalf of

McLeodUSA Telecommunications Services, Inc.

May 12, 2006

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS FOR THE RECORD.

A. My name is Michael Starkey. My business address is QSI Consulting, Inc., 243 Dardenne Farms Drive, Cottleville, Missouri 63304.

Q. WHAT IS QSI CONSULTING, INC. AND WHAT IS YOUR POSITION WITH THE FIRM?

A. QSI Consulting, Inc. ("QSI") is a consulting firm specializing in regulated industries, econometric analysis and computer-aided modeling. I currently serve as the firm's President.

Q. PLEASE PROVIDE A SYNOPSIS OF YOUR EDUCATIONAL BACKGROUND AND RELEVANT WORK EXPERIENCE.

A. Included with this testimony as Exhibit MS – 1 is a thorough description of my educational background and relevant work experience. In brief, I have been a consultant to telecommunications providers, equipment manufacturers, government agencies and other private parties since 1996. Previous to my consulting experience, I served as the Director of Telecommunications for the Maryland Public Service Commission ("PSC") and prior to that, as the Office of Policy and Planning's Senior Policy Analyst for the Illinois Commerce Commission. I began my career as a Senior Economist at the Missouri PSC. Throughout my career I have spent a great deal of time studying telecommunications networks, including substantial time and effort aimed at developing rationale, efficient means by which competing communications carriers can interconnect their respective facilities. I have likewise analyzed the underlying economic

characteristics of communications networks and have on numerous occasions provided expert testimony regarding the costs of providing various services. Finally, I am very familiar with the negotiation, mediation and arbitration processes envisioned by Section 252 of the Telecommunications Act of 1996 and I have, since 1996, participated in dozens of negotiations and arbitrations on behalf of some of the largest, and smallest, carriers in the nation.

Q. DO YOU HAVE EXPERIENCE DIRECTLY RELEVANT TO THE ISSUES IN THIS PROCEEDING?

A. Yes, I do. Issues surrounding proper billing for power delivered to Competitive Local Exchange Carrier ("CLEC") collocation arrangements have become important to numerous QSI clients across the country over the past two years. During that time period, I have headed an internal QSI team to identify potential problems related to billing for power and address those problems via interconnection agreement ("ICA") negotiations, arbitrations and/or complaints (such as this one). In addition, I have personally negotiated ICA language relative to the issue of collocation power and have testified before state commissions as to the reasonableness of that proposed language when agreement between the parties could not be reached.

In the course of such testimony and analysis, I have reviewed numerous cost studies and other cost-related documentation related to collocation power and traced the cost-causation and rate structure that is most properly applied to cost-recovery for an incumbent local exchange carrier's ("ILEC's") investment in collocation power infrastructure. The abovementioned collocation-specific cost analysis is combined with approximately 15 years of near-continuous experience reviewing cost studies and

proposed rates of ILECs including Qwest and every other major ILEC in the nation. Finally, with Mr. Morrison, I am currently involved on behalf of McLeodUSA in complaints similar to this one filed in Colorado, Iowa, Minnesota, Utah, and Washington.

Q. ON WHOSE BEHALF WAS THIS TESTIMONY PREPARED?

A. This testimony was prepared on behalf of McLeodUSA Telecommunications Services, Inc. (hereafter "McLeodUSA").

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony will describe the *DC Power Measuring Amendment*[1] upon which this Complaint is based and provide the rationale supporting McLeodUSA's interpretation of the *Amendment*. I will describe how McLeodUSA's interpretation is logical given the plain language of the *Amendment*, as well as why Qwest's interpretation is inconsistent with proper cost-recovery principles required in setting collocation rates. I will also briefly address a number of arguments Qwest is likely to make in support of its position and explain why Qwest is incorrect.

II. POWER MEASURING AMENDMENT

Q. PLEASE DESCRIBE THE *DC POWER MEASURING AMENDMENT.*

A. On August 18, 2004, Qwest Corporation ("Qwest") and McLeodUSA signed an amendment revising the method by which Qwest would bill McLeodUSA for charges related to Direct Current ("DC") power that electrifies the telecommunications equipment

[1] *DC Power Measuring Amendment to the Interconnection Agreement between Qwest Corporation and McLeodUSA Telecommunications Services, Inc.*, signed August 18, 2004, included with the Complaint as Exhibit A (hereafter "*Power Measuring Amendment*" or "*Amendment*").

placed in McLeodUSA collocation areas. Attachment 1 to the *Power Measuring Amendment (*entitled *"DC Power Measuring")*, provides the substantive detail related to the parties' agreement. Attachment 1 includes only five (5) paragraphs and is broken into two primary parts: *Part 1 – Monitoring* and *Part 2 – Rate Elements – All Collocation.* Paragraph 1.1 provides the technical background on which the agreement is based, *i.e.*, that orders for DC power distribution cables exceeding 60 amperes in size are generally terminated on a Power Board, rather than the Battery Distribution Fuse Board ("BDFB") used to terminate smaller cables (60 amps and below). These pieces of equipment are described in detail by Mr. Morrison in his direct testimony.

Paragraph 1.2 then details the primary purpose of the amendment in the following three sentences:

> Qwest will perform a maximum of four (4) readings per year on a particular collocation site. Based on these readings, if CLEC is utilizing less than the ordered amount of power, Qwest will reduce the monthly usage rate to CLEC's actual use. If CLEC is utilizing more than the ordered amount, Qwest will increase the monthly usage rate to the CLEC's actual use.

Paragraphs 2.1 through 2.3 then identify the collocation rate elements to which the agreement will apply, or, in other words, the rate elements which will be reduced to levels reflecting their "actual use":

> 2.1 -48 Volt DC Power Usage and AC Usage Charges. Provide -48 volt DC power to CLEC collocated equipment and [sic] is fused at one hundred twenty-five percent (125%) of request. The DC Power Usage Charge is for the capacity of the power plant available for CLEC's use. The AC Usage charge is for the power used by the CLEC. Both the DC Power Usage Charge and the AC Usage Charge are applied on a per ampere basis.
>
> 2.2 The -48 Volt DC Power Usage Charge is specified in Exhibit A of the Agreement and applies to the quantity of -48 Volt Capacity specified by the CLEC in its order.
>
> 2.2.1 -48 Volt DC Power Usage Charge – Applies on a per amp basis to all orders of greater than sixty (60) amps. Qwest will initially apply the -48 Volt DC Power Usage Charge from Exhibit A of the Agreement

to the quantity of power ordered by the CLEC. Qwest will determine the actual usage at the power board as described in Section 1.2. There is a one (1) amp minimum charge for -48 Volt DC Power Usage.

The final paragraph (2.3) merely requires that the parties have in place an existing ICA containing collocation rates before the *Power Measuring Amendment* can be effectuated.

Q. WHAT IS THE SOURCE OF DEBATE BETWEEN QWEST AND MCLEODUSA RELATED TO THE AMENDMENT?

A. Note that paragraphs 2.2 and 2.2.1 identify within the *Amendment* the rate elements that are to be impacted by the *Amendment*. Both paragraphs identify those rate elements as "*-48 Volt DC Power Usage*" and paragraph 2.2 points the reader to Exhibit A of the parties' ICA (the pricing addendum) as the source for those rates. Section 8.1.4 of Exhibit A to the parties' ICA is entitled *"Power Usage"* and contains Section 8.1.4.1, which is entitled "*-48 Volt DC Power Usage.*" This rate category, *-48 Volt DC Power Usage*, includes five individual rate elements as indicated below:

		Recurring Charge	Non-Recurring Charge
8.1.4	**Power Usage**		
8.1.4.1	**-48 Volt DC Power Usage, per Ampere, per Month**		
8.1.4.1.1	**Power Plant**		
8.1.4.1.1.1	Greater Than 60 Amps	$10.75	$0.00
8.1.4.1.1.2	Equal to 60 Amps	$10.75	$0.00
8.1.4.1.1.3	Less Than 60 Amps	$10.75	$0.00
8.1.4.1.2	**Power Usage**		
8.1.4.1.2.1	Less Than 60 Amps, per Amp	$3.64	$0.00
8.1.4.1.2.2	More Than 60 Amps, per Amp	$7.27	$0.00

Because both the "Power Plant" (8.1.4.1.1) and the "Power Usage" rate elements (8.1.4.1.2) are encompassed by the "*-48 Volt DC Power Usage*" charge category (8.1.4.1) described by the *Power Measuring Amendment*, McLeodUSA expected that Qwest would assess DC power usage charges for both 8.1.4.1.1.1 and 8.1.4.1.2.2 based upon the

amount of power actually used, not the amount that it had originally ordered (consistent with paragraph 1.2 of the *Amendment* described above).[2] Recall that the *DC Power Measuring Amendment* calls for usage-based billing for McLeodUSA collocations wherein McLeodUSA ordered DC power distribution cables exceeding 60 amps. Qwest, however, does not assess the usage charges in this manner. Instead, Qwest charges McLeodUSA for the "Power Plant" charge (8.1.4.1.1.1) based on the power capacity originally ordered by McLeodUSA for its power distribution cables, while billing the other DC power usage rate (8.1.4.1.2.2) based on actual usage. In other words, despite agreeing in the *Amendment* to bill DC power usage charges on an "as consumed" basis, Qwest has decided to continue to bill one of those elements (the most expensive element) on an "as ordered" basis.

Q. CAN YOU PROVIDE AN EXAMPLE THAT WILL HELP ILLUSTRATE THE PROBLEM?

A. Yes. Assume that McLeodUSA had originally ordered a 180 amp DC power distribution cable at Collocation A. However, due to numerous engineering variables described in Mr. Morrison's testimony, McLeodUSA only consumes 24 Amps of DC power within that collocation in a given month. Given the terms of the *Power Measuring Amendment*, McLeodUSA expected its monthly invoice to look similar to Table 1 below, wherein all - *48 Volt DC Power Usage* rate elements are assessed based on McLeodUSA's actual (or "as consumed") usage of 24 Amps:

[2] The DC Power Usage rate element under 8.1.4.1.2.1 would not be assessed on actual usage because the *Power Measuring Amendment* requires measured usage only in locations where McLeodUSA ordered power distribution cables greater than 60 Amps.

Table 1

MCLEODUSA INTERPRETATION		Recurring Charge	Actual Amperage Used	Invoice Amount
8.1.4.1	**-48Volt DC Power Usage, per Ampere, per Month**			
8.1.4.1.1.1	Power Plant - Greater Than 60 Amps	$10.75	24	$258.00
8.1.4.1.2.2	Power Usage - More Than 60 Amps, per Amp	$7.27	24	$174.48

Collocation A - Total DC Power Usage Charges **$432.48**

However, based upon what McLeodUSA believes to be an erroneous interpretation of the *Power Measuring Amendment*, Qwest bills McLeodUSA charges consistent with Table 2 below (assuming the same Collocation A characteristics):

Table 2

MCLEODUSA INTERPRETATION		Recurring Charge	Actual Amperage Used	Invoice Amount
8.1.4.1	**-48Volt DC Power Usage, per Ampere, per Month**			
8.1.4.1.1.1	Power Plant - Greater Than 60 Amps	$10.75	180	$1,935.00
8.1.4.1.2.2	Power Usage - More Than 60 Amps, per Amp	$7.27	24	$174.48

Collocation A - Total DC Power Usage Charges **$2,109.48**

Q. PLEASE DESCRIBE THE TWO EXAMPLES ABOVE.

A. Table 1 assumes that Qwest bills McLeodUSA consistent with McLeodUSA's interpretation of the *Amendment*, *i.e.*, Qwest assesses both *-48 Volt DC Power Usage* rate elements based upon the 24 Amps of power McLeodUSA actually consumes in the above example. In contrast, Table 2 represents the manner in which Qwest interprets the *Amendment* (as well as the manner in which Qwest actually bills McLeodUSA for power today), wherein Qwest bills only rate element 8.1.4.1.2.2 on an "as consumed" basis (24 Amps) while continuing to bill rate element 8.1.4.1.1.1 on an "as ordered" basis (180 Amps associated with McLeodUSA's order for power distribution cables). Note that the difference in the size of the invoice based upon these two different interpretations is dramatic:

McLeodUSA Interpretation -	Table 1:	$432.48 per month
Qwest Interpretation -	Table 2:	$2,109.48 per month
Difference (Table 1 - Table 2):		($1,677.00) per month

Though the magnitude of the difference in charges for this single representative collocation is significant, when one considers that this difference applies to nearly all of McLeodUSA's collocations in Arizona on a monthly basis, the importance (and urgency) of the situation becomes readily apparent. Ms. Spocogee discusses the total over-billed amount relative to this issue in her testimony.

Q. CAN YOU PLEASE SUMMARIZE THE PARTIES' DIFFERING INTERPRETATIONS OF THE *AMENDMENT*?

A. Yes. The difference is relatively simple. McLeodUSA believes the *Amendment* is clear in requiring that all rate elements included within the *-48 Volt DC Power Usage* section of Exhibit A (8.1.4.1), specifically rate elements 8.1.4.1.1.1 (*Power Plant – Greater Than 60 Amps*) and 8.1.4.1.2.2 (*Power Usage More than 60 Amps*), be assessed based upon measurements undertaken by Qwest to identify McLeodUSA's actual power consumption. Qwest, on the other hand, interprets the agreement as requiring that only one of those two rate elements (8.1.4.1.2.2) be billed based on actual, measured consumption. The other DC power usage charge (8.1.4.1.1.1 – *Power Plant Greater Than 60 Amps*), according to Qwest, should be billed based upon the ordered size of McLeodUSA's power distribution cables.

Q. PLEASE STATE YOUR REASONS AS TO WHY YOU BELIEVE "...THE *AMENDMENT* IS CLEAR IN REQUIRING THAT ALL RATE ELEMENTS

INCLUDED WITHIN THE "*-48 VOLT DC POWER USAGE*" SECTION OF EXHIBIT A (8.1.4.1), SPECIFICALLY RATE ELEMENTS 8.1.4.1.1.1 (*POWER PLANT GREATER THAN 60 AMPS*) AND 8.1.4.1.2.2 (*USAGE MORE THAN 60 AMPS*), BE ASSESSED BASED UPON ...ACTUAL POWER CONSUMPTION."

A. Section 2.0 of the *Amendment* identifies the rate elements to which the measurement agreement described in Section 1.0 will apply. Paragraphs 2.1, 2.2 and 2.2.1 each identify those rate elements exclusively as *DC Power Usage* as specified in Exhibit A. Exhibit A includes a specific rate grouping (8.1.4) entitled *Power Usage*, which contains Section 8.1.4.1 *-48 Volt DC Power Usage*. It seems obvious that this is the rate grouping alluded to in the *Amendment*. That rate grouping includes two primary rate categories: (a) *Power Plant* and (b) *Power Usage* - both categories which are broken up into different rates depending upon the size of the initial order - ± 60 Amps. Because the *Amendment* references the entire rate grouping by name when describing the rate elements to which the measurement agreement applies, it seems very clear that the intention was to apply the *Amendment* to the rates within the referenced rate group.

III. QWEST'S STRANDED INVESTMENT ARGUMENT

Q. HAS QWEST PROVIDED MCLEODUSA WITH AN EXPLANATION RELATED TO ITS INTERPRETATION OF THE *AMENDMENT*?

A. It is my understanding from testimony recently filed by Qwest in Iowa (Docket No. FCU-06-20) that Qwest's primary defense is to suggest that the *Amendment* was not meant to be interpreted consistent with McLeodUSA's position. Nonetheless, Qwest has also argued that if the *Amendment* were to be interpreted consistent with McLeodUSA's interpretation (*i.e.*, that the *Power Plant* charge be assessed on an "as consumed" basis

rather than an "as ordered" basis), Qwest would purportedly be unable to recover certain power plant investment undertaken by Qwest related to McLeodUSA's original order for collocation power.

Q. IS THERE ANY VALIDITY TO QWEST'S ARGUMENT IN THIS REGARD?

A. No. It is of primary importance that the Commission first understand that Qwest's interpretation is not consistent with the plain language of the *Amendment* and hence, the rationale underlying its misguided interpretation is somewhat superfluous. Nonetheless, it is also important for the Commission to understand that the rationale underlying Qwest's alternative interpretation likewise has no basis in fact. That is, Qwest would not experience un-recovered investment were the Commission to enforce the *Amendment* in the manner in which it is written (i.e., requiring that all *DC Power Usage* charges be assessed on the number of DC Amps actually consumed by McLeodUSA).

Q. CAN YOU PLEASE SUMMARIZE WHAT YOU UNDERSTAND TO BE QWEST'S ARGUMENT IN THIS REGARD?

A. As I understand it, Qwest's argument can be explained as follows (using the hypothetical – Collocation A – discussed above):

Qwest "Stranded Investment" Argument

1. Because McLeodUSA originally ordered power distribution cables capable of carrying 180 Amps to be delivered to its collocation space, Qwest was required to construct the power infrastructure (i.e., Power Plant) such that it can provide McLeodUSA those 180 Amps (whether McLeodUSA actually used them or not).

2. As such, 180 Amps worth of power plant infrastructure investment (whether it be new investment or existing investment) can be traced directly to McLeodUSA's original order for a 180 Amp power distribution cable, and

3. Were McLeodUSA now able to pay only for the 24 Amps it actually uses, Qwest would be unable to recover the investments it made to accommodate McLeodUSA's original request (180 Amps).

Q. DOES THIS ARGUMENT HAVE MERIT?

A. No. There are three important facts that fatally undercut the validity of this argument:

1. The entire Qwest Central Office ("CO") shares the same underlying Power Plant infrastructure for purposes of receiving -48 volt DC power. CLECs and Qwest share common DC Power Plant facilities (batteries, rectifiers, power boards, etc.). Accordingly, there are no Power Plant investments specific to McLeodUSA, regardless of the size of its original order.

2. Power Plant infrastructure is sized according to actual -48 volt DC power usage spread across the entire CO (in sufficient capacity to accommodate the requirements of the entire office during the busy hour when the power load of the central office is at its peak – what Mr. Morrison describes as the "List 1" drain). Therefore, an order for power distribution cables from an individual CLEC, or even groups of CLECs, does not generate additional investments in Power Plant facilities. In other words, McLeodUSA's original order for 180 Amp power cables did not require Qwest to invest in Power Plant infrastructure. Instead, Qwest's engineers should have estimated the actual load that would result from the equipment McLeodUSA intended to collocate and sized its power plant accordingly. Hence, there is no Qwest investment in power plant facilities that is specific to the McLeodUSA order.

3. Power Plant facilities are sized across the common power requirements of the entire office, on a busy-hour basis, based upon the actual power consumption in the office (i.e., "List 1" drain – not orders for power placed either by Qwest engineers or CLEC engineers). Thus, it is the actual power consumption contributed by McLeodUSA's equipment (in combination with the usage of all other equipment in the office) that is critical in sizing Qwest's power plant, not the size of the power cable order. As such, Power Plant costs are incremental to the overall level of power usage, not the size of an order (a fact perfectly consistent with McLeodUSA's interpretation of the *Amendment* and directly contrary to Qwest's interpretation).

Q. ARE YOU SUPPLYING THE ENGINEERING EXPERTISE INVOLVED IN YOUR THREE FACTUAL POINTS IDENTIFIED ABOVE?

A. No, Mr. Sidney Morrison, QSI's Chief Engineer, is also filing direct testimony in this proceeding. Mr. Morrison's testimony establishes the expert opinion and factual

foundation related to the three points above. I use Mr. Morrison's engineering analysis for purposes of drawing conclusions related to the reasonableness of Qwest's interpretation of the *Amendment* and also the economic validity of its "stranded investment" argument.

Q. PLEASE DESCRIBE YOUR RESPONSE TO QWEST'S "STRANDED INVESTMENT" ARGUMENT IN MORE DETAIL.

A. As Mr. Morrison describes in his testimony, power engineers design a central office Power Plant based upon the forecasted power requirements (or power draw) of the entire CO. Power engineers then build the initial Power Plant to accommodate this forecasted draw and likewise monitor existing power usage across the office to gauge the need for any augmentation that may be required. When the aggregate power draw of the central office begins to exceed a given "target" capacity constraint of the existing power plant equipment (what Qwest refers to as a "power embargo"), augmentation options are studied and if augmentation is required, additional equipment is added.

Q. WHY IS THAT IMPORTANT FROM AN ECONOMIC (I.E., COST CAUSATION) PERSPECTIVE?

A. Because the central office Power Plant is designed and managed relative to the power usage requirements of the entire CO, the initial design and subsequent augmentations are relatively blind to the individual power cable orders of any single collocator. Therefore, from a "cost causation" perspective, even if McLeodUSA ordered a 180 Amp power cable, but used only 24 Amps (as in the above example), it is the anticipated load (i.e., the usage) of 24 Amps that would drive any additional investment if necessary. This is true

for two reasons. First, because power monitoring generally focuses on the actual power usage (not power orders) in the office, it is only the 24 Amps relative to McLeodUSA's actual usage that would be noted in any augmentation analysis consistent with Qwest's internal engineering documentation – and it is this 24 Amps that might drive incremental investment (though it is highly unlikely). Second, because McLeodUSA's original power cable order (180 Amps) and its actual usage (24 Amps) are such a small component of the office-wide power requirement, Qwest's existing power plant would need to be very near its capacity target for any McLeodUSA-specific usage to have caused any augmentation activity. Accordingly, there is little chance that Qwest incurred any incremental investment relative to McLeodUSA's original power order that Qwest would be unable to recover if Qwest billed McLeodUSA on an "as consumed" basis for both DC power usage elements.

Q. HAVE YOU BEEN ABLE TO CONFIRM WHETHER QWEST HAS AUGMENTED ITS DC POWER PLANT IN RESPONSE TO A CLEC'S COLLOCATION ORDER FOR DC POWER?

A. No. McLeodUSA sought information related to this issue in McLeodUSA DR No. 4 to Qwest Arizona, issued March 7, 2006. McLeodUSA's DR #4 states as follows:

> Please identify each circumstance to date wherein a McLeodUSA collocation order required Qwest to invest in additional equipment or augment existing equipment relative to the equipment types listed below. Your complete response will identify the specific McLeodUSA collocation order and the specific equipment required to fulfill the order.
>
> a. Rectifiers
> b. Power monitors
> c. Battery Distribution Fuse Bays (BDFB)
> d. Power Boards
> e. Batteries
> f. Generator or Alternators
> g. Fuel tanks

Qwest objected to this request on March 21, 2006 as follows: "Qwest objects to this request on the grounds that it is unduly burdensome and would require Qwest to perform a manually labor intensive special study in order to answer." While Qwest has refused to provide the requested information in Arizona, it did indeed provide information responsive to this same request in Iowa, and after reviewing that information (and more detailed information ultimately provided by Qwest with its Iowa testimony), it became clear that the power plant augmentations highlighted by Qwest were actually being driven either by (a) older, outdated power equipment already overtaxed by existing usage (primarily Qwest usage) or (b) prior Qwest service orders being held until additional power resources could be made available. In other words, it was clear that the power augmentation activities were necessary regardless of whether McLeodUSA had placed an order for additional power or not, and, perhaps most importantly, the need to augment had nothing to do with the size of the McLeodUSA power cable order, as nearly any need for additional DC power would have triggered an augmentation in most of the circumstances identified by Qwest. To summarize, though Qwest has refused to date to provide information to substantiate its claims in Arizona, the information provided in Iowa belies Qwest's assertion that the size of a McLeodUSA power cable order drives incremental power plant investment (instead, it is clear that increased power usage from all power consumers – Qwest included - drives additional investment in power plant).

Q. DO YOU HAVE EXPERIENCE WITH ILEC COST STUDIES THAT MODEL POWER PLANT COSTS AND DEVELOP POWER PLANT-SPECIFIC RATES?

A. Yes, and I have never seen an ILEC cost study that attributes investment in Power Plant specifically to a collocator as Qwest's "stranded investment" argument would suggest. Nor would such an attribution be reasonable. Rather, given that power plant facilities are shared by telecommunications equipment housed throughout the entire CO (even Qwest's own equipment), costs generated by those Power Plant facilities should be (and generally are) recovered based upon an individual consumer's relative use of those facilities (in this case, the number of Amps consumed by each party). To the extent Qwest assesses (or has in the past assessed) the Power Plant charge based on the number of Amps included in a CLEC's original order for power cable(s) (as opposed to its actual usage), Qwest's application would be contrary to cost causative requirements inherent in the FCC's Total Element Long Run Incremental Cost ("TELRIC") rules. In other words, under Qwest's interpretation of the *Power Measuring Amendment*, CLECs in general, and McLeodUSA in particular, are and have been paying far more than their "fair share" of Qwest's power plant costs.

Q. HAS QWEST PROVIDED MCLEODUSA WITH A COPY OF ITS ARIZONA COLLOCATION COST STUDY SUPPORTING ITS POWER PLANT AND POWER USAGE RATES THAT ARE AT ISSUE IN THIS PROCEDDING?

A. No, it is my understanding that Qwest has objected to providing its cost study claiming that the study would fail to provide any meaningful information pertinent to this proceeding. Specifically, McLeodUSA's DR No. 3 in Set 1 asked Qwest to: "provide electronic, fully-executable copies of Qwest cost studies, and supporting documentation, supporting all collocation rates found at Section 8 of Exhibit A to the Qwest and McLeodUSA interconnection agreement." Qwest's non-response states as follows:

"Qwest objects to this request because it is not reasonably calculated to lead to the discovery of relevant or admissible evidence concerning the interpretation of the DC Power Measuring Amendment at issue in this case."

Nonetheless, cost study information provided by Qwest in the companion case in Iowa (FCU-06-20), after a successful Motion to Compel filed on behalf of McLeodUSA, supports McLeodUSA's position. That information clearly shows that Qwest develops its "per Amp" Power Plant charges based upon electrical consumption (i.e., Qwest divides its total Power Plant investment by its anticipated production of electrical amperage to arrive at per-Amp charges), not upon some amount of ordered power. While analysis of the Arizona-specific cost study will be necessary before Arizona-specific comparisons can be made to Qwest's Iowa information, when the rate structure and rate levels in Arizona are compared to those in Iowa, it seems clear that the Arizona cost study once produced, will likewise support McLeodUSA's position.

Q. WHY IS THE COST STUDY MEANINGFUL?

A. If the Qwest's cost study confirms my previous experience, such that it models power plant costs relative to the power used by various power consumers (including Qwest), and not relative to the size of a given collocator's order for power cable(s), this will be additional evidence showing that Qwest's interpretation is inconsistent with its own economic analysis relative to power capacity cost causation. It will also show that under Qwest's existing interpretation of the *Power Measuring Amendment*, Qwest is charging itself (and indirectly its end users using its retail services) less than it charges McLeodUSA for the same cost input – DC power plant. To the extent that Qwest is over-recovering DC power plant costs from McLeodUSA by virtue of charging McLeodUSA a

disproportionate share of the cost of DC power plant (because it bases those charges on the size of the McLeodUSA power cable order, and not relative to its actual power usage), then Qwest is paying less per amp used than is McLeodUSA. This discriminatory treatment puts McLeodUSA at a competitive disadvantage since it must recover significantly higher DC power plant costs than Qwest has to recover from its own customers.

Q. YOU MENTION ABOVE THAT QWEST HAS REFUSED TO PROVIDE THE COST STUDIES SUPPORTING ITS COLLOCATION POWER RATES IN ARIZONA, AND ONLY PROVIDED THEM IN IOWA AFTER THE IOWA BOARD GRANTED MCLEODUSA'S MOTION TO COMPEL. IS THIS INDICATIVE OF A LARGER EFFORT BY QWEST TO MAKE IT MORE DIFFICULT FOR MCLEODUSA TO BE ABLE TO SUBSTANTIATE ITS POINT REGARDING PROPER DC POWER PLANT COST RECOVERY WITH STATE-SPECIFIC DATA?

A. In my judgment, the answer is yes. The first state in which McLeodUSA requested this cost study information was in Iowa. Qwest's original response to this request in Iowa claimed that this cost study information was not only purportedly irrelevant, but also "extremely confidential trade secret information of Qwest detailing its costs and facility configuration and capabilities, and providing that information to McLeodUSA, a direct, facilities-based competitor, would place Qwest at a competitive disadvantage." Yet, before the hearing in Iowa, Qwest revised its position stating that its cost study was not actually confidential, but nonetheless irrelevant.

Fortunately, the Iowa Board granted McLeodUSA's motion to compel in that state, and once Qwest provided the requested information, I was able to demonstrate in Iowa through Supplemental Rebuttal Testimony that Qwest's collocation cost study develops DC power plant costs as I explain above (i.e., based on DC power usage), not the way in which Qwest claims (i.e., based on orders for DC power distribution cables). To the extent I can gain access to the Arizona-specific information, I will do the same here.

Q. HAS QWEST OFFERED MCLEODUSA A SEPARATE ICA AMENDMENT THAT WOULD ALLOW MCLEODUSA TO RE-CONFIGURE ITS POWER DISTRIBUTION FACILITIES SO AS TO REDUCE ITS POWER CAPACITY AND THEREBY REDUCE ITS POWER COSTS?

A. Yes, my understanding is that Qwest has offered to McLeodUSA an additional ICA amendment entitled *DC Power Reduction Amendment to the Interconnection Agreement between Qwest Corporation and McLeodUSA Telecommunications Services, Inc.* (hereafter *"Power Reduction Amendment"*). In general terms the *Power Reduction Amendment* would allow McLeodUSA to request changes to its existing power distribution systems (i.e., power cables and fuses) in its Qwest collocation arrangements, for purposes of reducing the power that could possibly be fed to those systems. According to Qwest, this would allow McLeodUSA to reduce the "ordered capacity" associated with its collocation power arrangements and, thus, when Qwest assesses the Power Plant rate (8.1.4.1.1.1) – on an "as ordered" basis – to McLeodUSA's new, lower "as ordered" power capacity, McLeodUSA would experience lower DC power costs.

Q. IS THIS A GOOD ALTERNATIVE TO THE *POWER MEASURING AMENDMENT*?

A. No, for reasons I will describe below, it is not. However, before I do that, it is important to point out that McLeodUSA is not searching for an alternative to the *Power Measuring Amendment* it has already signed with Qwest. McLeodUSA is asking that the Commission order Qwest to implement the *Power Measuring Amendment* correctly. If Qwest were required to implement the *Power Measuring Amendment* correctly, McLeodUSA would pay for DC power in a way that is reasonable and non-discriminatory (any excessive rate-level issues aside).

Q. WHY IS THE *POWER REDUCTION AMENDMENT* NOT A GOOD ALTERNATIVE TO THE *POWER MEASURING AMENDMENT*?

A. Mr. Morrison describes in detail in his testimony the importance of distinguishing between the *Power Plant* and *Power Distribution* components of a CO-based power system. In general terms, the *Power Plant* facilities (*e.g.*, batteries, rectifiers, generators) are shared by all power users in the CO, while *Power Distribution* facilities (*e.g.*, cables from the power board to the collocation arrangement, fuses) are generally dedicated to a single collocator. Qwest's *Power Reduction Amendment* would allow McLeodUSA to reduce only the voltage capability of its various *Power Distribution* facilities, many of which McLeodUSA has already paid for via substantial non-recurring charges and continues to pay for via monthly charges that are paid in addition to the *DC Power Usage* charges mentioned above. As such, the *Power Reduction Amendment* would require McLeodUSA to incur large re-arrangement fees to re-arrange *Power Distribution* facilities that it does not necessarily want to change (see Mr. Morrison's testimony

discussing a number of engineering reasons why the *Power Distribution* facilities should be sized substantially larger than both the static and busy-hour consumption). Further, McLeodUSA would incur these fees and make these changes just to reach a result which is significantly less attractive, and less reasonable, than the terms of the *Power Measuring Amendment* that it has already signed. For instance, Qwest's so-called solution still would not assess all DC power usage charges on an "as consumed" basis as the *DC Power Measuring Amendment* requires. Further, this outcome does not resolve the inherent inconsistency in Qwest's position with cost causation principles and the manner in which DC power plant is engineered. Simply put, the most economically-rational way to sell (and buy) DC power (*Power Plant*) in a CO is on an "as consumed" amperage basis, regardless of the size of the power distribution cables a power user ordered to serve its equipment. McLeodUSA has signed an amendment that provides it that right and there is no good economic or engineering reason why it should sign the far less reasonable *Power Reduction Amendment.*

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

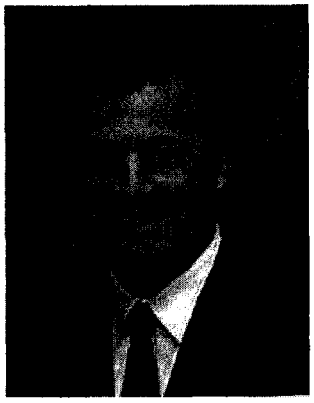
A. Yes, it does.

Exhibit MS-1

Curriculum Vitae of

Michael Starkey

Michael Starkey



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Biography

Mr. Starkey currently serves as the President and Founding Partner of QSI Consulting, Inc. QSI is a consulting firm concentrating primarily on regulated markets including the telecommunications industry. QSI assists its clients in the areas of regulatory policy, business strategy, financial and econometric analysis and inter-carrier issues involving rates and charges assessed by incumbent carriers. Prior to founding QSI Mr. Starkey served as the Senior Vice President of Telecommunications Services at Competitive Strategies Group, Ltd. in Chicago, Illinois.

Mr. Starkey's consulting career began in 1996 shortly before the passage of the Telecommunications Act of 1996. Since that time, Mr. Starkey has advised some of the world's largest companies (e.g., AT&T, MCI, Time Warner, Covad Communications, Comcast, Siemens Corporation, etc.) on a broad spectrum of issues including the most effective manner by which to interconnect competing networks. Mr. Starkey's experience spans the landscape of competitive telephony including interconnection agreement negotiations, mediation, arbitration, and strategies aimed at maximizing new technology. Mr. Starkey's experience is often called upon as an expert witness. Mr. Starkey has since 1991 provided testimony in greater than 150 proceedings before approximately 40 state commissions, the FCC and courts of varying jurisdiction.

Mr. Starkey's expertise with competitive communications issues is rooted not only in his consulting experience, but also in his previous employment. Mr. Starkey has worked for the Missouri, Illinois and Maryland public utility commissions, including his most recent position as Director of the Maryland Commission's Telecommunications Division (and as the Senior Policy Analyst for the Illinois Commission's Office of Policy and Planning and Senior Economist with the Missouri Public Service Commission).

Educational Background

Bachelor of Science, Economics, International Marketiing
Southwest Missouri State University, Cum Laude Honor Graduate

Graduate Coursework, Finance
Lincoln University

Numerous telecommunications industry training courses

QSI consulting, inc.

Professional Experience

Competitive Strategies Group
1996 – 1999
Senior Vice President
Managing Director of Telecommunications Services

Maryland Public Service Commission
1994-1995
Director
Telecommunications Division

Illinois Commerce Commission
1993 – 1994
Senior Policy Analyst
Office of Policy and Planning

Missouri Public Service Commission
1991-1993
Senior Economist
Utility Operations Division – Telecommunications

Professional Activities

Facilitator, *C³ Coalition* (Competitive Carrier Coalition - Ameritech Region). Facilitate industry organization representing 10-15 competitive carriers seeking to share information and "best practices" with respect to obtaining effective interconnection, UNEs and resold services from SBC/Ameritech.

Former member of the Missouri Public Service Commission's Task Force on FCC Docket Nos. 91-141 and 91-213 regarding expanded interconnection, collocation, and access transport restructure

Former member of the AT&T / Missouri Commission Staff, *Total Quality Management Forum* responsible for improving and streamlining the regulatory process for competitive carriers

Former member of the Missouri, Oklahoma, Kansas, Texas, and Arkansas five state Southwestern Bell Open Network Architecture (ONA) Oversight Conference

Former delegate to the Illinois, Michigan, Indiana, Ohio, and Wisconsin Ameritech Regional Regulatory Conference (ARRC) charged with the responsibility of analyzing Ameritech's "Customers First" local exchange competitive framework for formulation of recommendations to the FCC and the U.S. Department of Justice

Former Co-Chairman of the Maryland Local Number Portability Industry Consortium responsible for developing and implementing a permanent database number portability solution

Former member of the Illinois Local Number Portability Industry Consortium responsible for developing and implementing a permanent database number portability solution

Expert Testimony – Profile

The information below is Mr. Starkey's best effort to identify all proceedings wherein he has either provided pre-filed written testimony, an expert report or provided live testimony.

Before the Illinois Commerce Commission
Docket No. 05-0575
Illinois Bell Telephone Company Compliance with Requirements of 13.505.1 of the Public Utilities Act (Payphone Rates)
On behalf of The Illinois Public Telecommunications Association

Before the Public Utilities Commission of the State of California
Application 05-07-024
Application of Pacific Bell Telephone Company, d/b/a SBC California for Generic Proceeding to Implement Changes in Federal Unbundling Rules Under Sections 251 and 252 of the Telecommunications Act of 1996
On behalf of MCIMetro Access Transmission Services, LLC, Covad Communications Company and Arrival Communications, Inc.

Before the Public Service Commission of Wisconsin
Docket No. 6720-TI-108
Investigation of the Access Line Rates of Wisconsin Bell, Inc., d/b/a SBC Wisconsin, that Apply to Private Payphone Providers
On behalf of The Wisconsin Pay Telephone Association

Before the Public Utilities Commission of the State of California
Docket No. A.05-05-027
Application by Pacific Bell Telephone Company d/b/a SBC California (U 1001 C) for Arbitration of an Interconnection Agreement with MCImetro Access Transmission Services LLC (U 5253 C) Pursuant to Section 252(b) of the Telecommunications Act of 1996.
On behalf of MCIMetro Access Transmission Services, LLC

Before the Michigan Public Service Commission
Case No. U-14447
In the matter, on the Commission's own motion to commence a collaborative proceeding to monitor and facilitate implementation of Accessible Letters issued by SBC Michigan and Verizon
On behalf of Covad Communications Company.

Before the Public Utilities Commission of Ohio
Case No. 05-887-TP-UNC
In the matter of the Establishment of Terms and Conditions of an Interconnection Agreement Amendment Pursuant To The Federal Communications Commission's Triennial Review Order and Its Order on Remand.
On behalf of MCIMetro Access Transmission Services, LLC

Before the Public Service Commission of Wisconsin
Docket No. 05-MA-138
Petition of MCImetro Access Transmission Services, LLC and MCI WorldCom Communications, Inc. for Arbitration of Interconnection Terms and Conditions and Related Arrangements with Wisconsin Bell, Inc., d/b/a SBC Wisconsin Pursuant to Section 252(b) of the Telecommunications Act of 1996
On behalf of MCIMetro Access Transmission Services, LLC and MCI Worldcom Communications, Inc.

Indiana Utility Regulatory Commission
Cause No. 42893-INT 01

Indiana Bell Telephone Company, Incorporated d/b/a SBC Indiana Petition for Arbitration of Interconnection Rates Terms and Conditions and Related Arrangements with MCImetro Access Transmission Services LLC, Intermedia Communications LLC, and MCI Worldcom Communications, Inc. Pursuant to Section 252(b) of the Telecommunications Act of 1996
On behalf of MCIMetro Access Transmission Services, LLC, Intermedia Communications, LLC and MCI Worldcom Communications, Inc.

Before the Illinois Commerce Commission
Docket No. 05-0442
Petition for Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 with Illinois Bell Telephone Company to Amend Existing Interconnection Agreements to Incorporate the Triennial Review Order and the Triennial Review Remand Order
On behalf of Access One, Inc.; Broadview Networks, Inc.; BullsEye Telecom, Inc.; Cbeyond Communications, LLC; USXchange of Illinois, LLC, d/b/a ChoiceOne Communications; CIMCO Communications, Inc.; First Communications, LLC; Forte Communications, Inc.; Globalcom, Inc.; ICG Telecom Group, Inc.; King City Telephone, LLC, d/b/a Southern Illinois Communications; KMC Telecom V, Inc.; McLeodUSA Telecommunications Services, Inc.; Mpower Communications Corporation, d/b/a Mpower Communications of Illinois; Neutral Tandem – Illinois, LLC; New Edge Network, Inc.; nii Communications, Ltd.; Novacon Holdings,LLC; Nuvox Communications of Illinois, Inc.; OnFiber Carrier Services, Inc.; Talk America, Inc.; TCG Chicago; TCG Illinois; TDS Metrocom, LLC; and Trinsic Communications, Inc.

Before The Hawaii Public Utilities Commission
Docket No. 04-0140
Application of Paradise MergerSub, Inc., GTE Corporation, Verizon Hawaii Inc., Bell Atlantic Communications, Inc., and Verizon Select Services Inc. For Approval of a Merger Transaction and Related Matters
On behalf of the Hawaii Public Utilities Commission

Before the Illinois Commerce Commission
Docket No. 04-0469
Petition for Arbitration of Interconnection Rates, Terms and Conditions and Related Arrangements with Ilinois Bell Telephone Company Pursuant to Section 252(b) of the Telecommunications Act of 1996
On behalf of MCImetro Access Transmission Services, LLC, MCI Worldcom Communications, Inc. and Intermedia Communications LLC

Before the Public Utility Commission of Texas
Docket No. 28821
Arbitration of Non-Costing Issues for Successor Interconnection Agreements to The Texas 271 Agreement.
On behalf of MCImetro Access Transmission Services, LLC

Before the Public Service Commission of Wisconsin
Docket No. 6720-TI-187
Petition of SBC Wisconsin to Determine Rates and Costs for Unbundled Network Elements
On behalf of AT&T Communications of Wisconsin, LP, TCG Milwaukee and MCI, Inc.

Before the Illinois Commerce Commission
Docket No. 02-0864
Filing to increase Unbundled Loop and Nonrecurring Rates (Tariffs filed December 24, 2002)
On behalf of *The CLEC Coalition* (AT&T, Worldcom, Inc., McLeodUSA, Covad, TDS Metrocom, Allegiance, RCN Telecom, Globalcom, Z-Tel, XO Illinois, Forte Communications, CIMCO Communications)

Before the Connecticut Department of Public Utility Control

Docket No. 03-09-01PH02
DPUC Implementation of the Federal Communications Commission's Triennial Review Order – Hot Cut/Batch
On behalf of MCI

Before the Public Utilities Commission of the State of California
Rulemaking 95-04-043, Investigation 95-04-044
Order Instituting Rulemaking on the Commission's Own Motion into Competition for Local Exchange Service.
On behalf of MCImetro, MCI Worldcom

Before the Public Utility Commission of Texas
Docket No. 28607
Impairment Analysis of Local Circuit Switching for the Mass Market
On behalf of MCImetro, MCI Worldcom, Brooks Fiber Communications of Texas

Before the State Corporation Commission of the State of Kansas
Docket No. 03-GIMT-1063-GIT
In the Matter of a General Investigation to Implement the State Mandates of the Federal Communications Commission's Triennial Review Order
On behalf of MCImetro, MCI Worldcom

Before the Public Utilities Commission of Ohio
Case No. 04-34-TP-COI
In the Matter of the Implementation of the Federal Communications Commission's Triennial Review Regarding Local Circuit Switching in SBC Ohio's Mass Market
On behalf of MCImetro, MCI Worldcom

Before the Michigan Public Service Commission
Case No. U-13891
In the matter, on the Commission's own motion, to investigate and to implement, a batch cut migration process
On behalf of MCImetro, MCI Worldcom

Before the Michigan Public Service Commission
Case No. U-13796
In the matter, on the Commission's own motion, to facilitate the implementation of the Federal Communication Commission's Triennial Review determinations in Michigan
On behalf of MCImetro, MCI Worldcom

Before the Missouri Public Service Commission
Case No. TO-2004-0207
In the Matter of a Commission Inquiry into the Possibility of Impairment Without Unbundled Local Circuit Switching when Serving the Mass Market
On behalf of Sage Telecom, Inc.

Before the State of New York Public Service Commission
Case No. 02-C-1425
Proceeding on Motion of the Commission to Examine the Process, and Related Costs of Performing Loop Migrations on a More Streamlined (e.g., Bulk) Basis
On behalf of MCImetro, MCI Worlcom

Before the Indiana Utility Regulatory Commission
Cause No. 42393

In the Matter of the Commission Investigation and Generic Proceeding of Rates and Unbundled Network Elements and Collocation for Indiana Bell Telephone Company, Incorporated d/b/a SBC Indiana Pursuant to the Telecommunications Act of 1996 and Related Indiana Statutes
On behalf of *The CLEC Coalition* (AT&T, TCG Indianapolis, Worldcom, Inc., McLeodUSA, Covad, Z-Tel).

Before the Michigan Public Service Commission
Case No. U-13531
In the matter, on the Commission's own motion, to review the costs of telecommunications services provided by SBC Michigan
On behalf of AT&T, Worldcom, Inc., McLeodUSA and TDS Metrocom.

Before the Illinois Commerce Commission
Docket No. 03-0323
Petition to Determine Adjustments to UNE Loop Rates Pursuant to Section 13-408 of the Illinois Public Utilities Act
On behalf of *The CLEC Coalition* (AT&T, Worldcom, Inc., McLeodUSA, Covad, TDS Metrocom, Allegiance, RCN Telecom, Globalcom, Z-Tel, XO Illinois, Forte Communications, CIMCO Communications)

Before the Public Utility Commission of Ohio
Case No. 96-1310-TP-COI
In the Matter of the Commission's Investigation into the Implementation of Section 276 of the Telecommunications Act of 1996 Regarding Pay Telephone Services
On behalf of the Payphone Association of Ohio

Before the Wisconsin Public Service Commission
Docket No. 6720-TI-177
Investigation Into Ameritech Wisconsin's Loop Conditioning Services and Practices
On behalf of WorldCom, Inc., AT&T Communications of Wisconsin, L.P. and TCG Milwaukee, McLeodUSA Telecommunications Services, Inc., TDS Metrocom, LLC

Before the Michigan Public Service Commission
Case No. U-11756 - REMAND
Complaint Pursuant to Sections 203 and 318 of the Michigan Telecommunications Act to Compel Respondents to Comply with Section 276 of the Federal Telecommunications Act
On behalf of the Michigan Pay Telephone Association

Before the New York Public Service Commission
Case No. 00-C-0127
Proceeding on the Motion of the Commission to Examine Issues Concerning Provision of Digital Subscriber Line Services
On behalf of MCI Worldcom Network Services, Inc.

Before the Indiana Utility Regulatory Commission
Cause No. 42236
Complaint of Time Warner Telecom Against Ameritech Indiana Regarding Its Unlawful Market Practice of Issuing Equipment Vouchers in Violation of the Indiana Code and Opportunity Indiana II and Petition for Emergency Suspension of any and all Ameritech Indiana Equipment Voucher Marketing Practices Pending Commission Investigation
On behalf of Time Warner Telecom of Indiana, LP

Before the Pennsylvania Public Utility Commission

Docket No. P-00930715F0002
Re: Verizon Pennsylvania Inc., Petition and Plan for Alternative Form of Regulation Under Chapter 30, 2000 Biennial Update to Network Modernization Plan
On behalf of MCI Worldcom Network Services, Inc.

Before the Illinois Commerce Commission
Docket No. 01-0609
Investigation of the propriety of the rates, terms, and conditions related to the provision of the Basic COPTS Port and the COPTS-Coin Line Port
On behalf of Payphone Services, Inc., DataNet Systems, LLC, Illinois Public Telecommunications Association

Before the Indiana Utility Regulatory Commission
Cause No. 40611-S1 (Phase II)
In the Matter of: The Commission Investigation and Generic Proceeding on Ameritech Indiana's Rates for Interconnection Service, Unbundled Elements, and Transport and Termination under the Telecommunications Act of 1996 and Related Indiana Statutes
On behalf of AT&T, Worldcom, Inc., and McLeodUSA Telecommunications Services, Inc.

Before the State of North Carolina Utility Commission
Docket No. P-7, Sub 980, P-10, Sub 622
Enforcement of Interconnection Agreement Between KMC Telecom III, Inc. and KMC Telecom V, Inc., against Carolina Telephone and Telegraph Company and Central Telephone Company
On behalf of KMC Telecom, Inc.

Before the Illinois Commerce Commission
Docket Nos. 98-0252, 98-0335, 98-0764 (Reopening)
SBC/Ameritech Merger, Reopening to Discuss Settlement Agreement Regarding Merger Savings
On behalf of AT&T, Worldcom, Inc., and McLeodUSA Telecommunications Services, Inc.

Before the Public Utility Commission of Ohio
Docket No. 01-1319-TP-ARB
In the Matter of MCImetro Access Transmission Services, LLC Petition for Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Ameritech Ohio
On behalf of MCIWorldcom, Inc.

Before the Illinois Commerce Commission
Docket No. 00-0393 (Rehearing)
Illinois Bell Telephone Company, d/b/a Ameritech Illinois Proposed Implementation of High Frequency Portion of the Loop (HFPL)/Line Sharing Service
On behalf of AT&T Communications of Illinois, Inc. and Worldcom, Inc.

Before the Wisconsin Public Service Commission
Case No. 6720-TI-167
Complaint Against Ameritech Wisconsin Filed by Wisconsin Builders Association, Inc.
On behalf of Wisconsin Builders Association, Inc.

Before the Public Service Commission of South Carolina
Docket No. 2001-65-C
In the Matter of Generic Proceeding to Establish Prices For BellSouth's Interconnection Services, Unbundled Network Elements and Other Related Elements and Services

On behalf of NuVox Communications, Broadslate Networks, KMC Telecom, New South Communications, ITC^Deltacom Communications

Before the Louisiana Public Service Commission
Docket No. 27821
In the Matter of Generic Proceeding to Establish Interim and Permanent Prices for Docket No. 27821 xDSL Loops and/or Related Elements and Services
On behalf of Covad Communications

Before the Public Utility Commission of Ohio
Case No. 00-942-TP-COI
In the Matter of the Further Investigation into Ameritech Ohio's Entry into In-Region Interlata Service Under Section 271 of the Telecommunications Act of 1996
On behalf of AT&T, WorldCom and XO Communications

Before the Washington Utilities and Transportation Commission
Docket No. UT 003013, Part B
In the Matter of the Continued Costing and Pricing of Unbundled Network Elements, Transport and Termination
On behalf of Focal Communications, XO Washington, Inc.

Before the Illinois Commerce Commission
Docket No. 98-0195
Investigation into certain payphone Issues as directed in Docket No. 97-0225
On behalf of the Illinois Pay Telephone Association

Before the Alabama Public Service Commission
Docket No. 27821
Generic Proceeding to Establish Interim and Permanent Prices for xDSL Loops and/or Related Elements and Services
On behalf of The Data Coalition (Covad Communications and Broadslate Networks of Alabama, Inc.)

Before the Wisconsin Public Service Commission
Docket No. 6720-TI-160
Docket No. 6720-TI-161
Investigation Into Ameritech Wisconsin's Unbundled Network Elements
On behalf of AT&T, Worldcom, McLeodUSA, TDS Metrocom, KMC Telecom, Time Warner Telecom, Rhythms Links,

Before the Tennessee Regulatory Authority
Docket No. 00-00544
Generic Docket to Establish UNE Prices for Line Sharing per FCC 99-355, and Riser Cable and Terminating Wire as Ordered in Authority Docket No. 98-00123
On behalf of Covad Communications, Inc., Mpower Communications and BroadSlate Networks of Tennessee, Inc.

Before the Public Utilities Commission of the State of Hawaii
Docket No. 7702, Phase III
Instituting a Proceeding on Communications, Including an Investigation of the Communications Infrastructure of the State of Hawaii
On behalf of GST Telecom Hawaii, Inc.

Before the North Carolina Utilities Commission
Docket P100 Sub 133d, Phase II

General Proceeding to Determine Permanent Pricing for Unbundled Network elements
On behalf of a consortium of 13 new entrant carriers

Before the Federal Communications Commission
CCB/CPD No. 00-1
In the Matter of Wisconsin Public Service Commission Order Directing Filings
On behalf of the Wisconsin Pay Telephone Association

Before the North Carolina Utilities Commission
Docket P100 Sub 133d, Phase I
General Proceeding to Determine Permanent Pricing for Unbundled Network elements
On behalf of a consortium of 13 new entrant carriers

Before the State of New York Public Service Commission
Case No. 98-C-1357
Proceeding on Motion of the Commission to Examine New York Telephone Company's Rates for Unbundled Network Elements
On behalf of the CLEC Coalition

Before the Public Utilities Commission of the State of California
Rulemaking 0-02-05
Order Instituting Rulemaking on the Commission's Own Motion into reciprocal compensation for telephone traffic transmitted to Internet Service Providers modems
On behalf of ICG Telecom Group, Inc.

Before the Public Utilities Commission of the State of Colorado
Docket No. 00B-103T
In the Matter of Petition by ICG Telecom Group, Inc. for Arbitration of an Interconnection Agreement with US West Communications, Inc. Pursuant to Section 252(b) of the Telecommunications Act of 1996.
On behalf of ICG Telecom Group, Inc.

Before the Delaware Public Service Commission
PSC Docket No. 00-205
For Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Bell Atlantic – Delaware, Inc.
On behalf of Focal Communications Corporation of Pennsylvania

Before the Georgia Public Service Commission
Case No. 11641-U
Petition of Bluestar Networks, Inc. for Arbitration with BellSouthDocket No. 11641-U Telecommunications, Inc. pursuant to Section 252(b) of the Telecommunications Act of 1996
On behalf of BlueStar Networks, Inc.

Before the New Jersey Board of Public Utilities
Docket No. TO00030163
For Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Bell Atlantic-New Jersey, Inc.
On behalf of Focal Communications Corporation

Before the Pennsylvania Public Utility Commission
Docket No. A-310630F.0002
For Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Bell Atlantic-Pennsylvania
On behalf of Focal Communications Corporation

Before the Michigan Public Service Commission
Case No. U-12287
In the matter of the application, or in the alternative, complaint of AT&T COMMUNICATIONS OF MICHIGAN, INC. against Michigan Bell Telephone Company, D/B/A, Ameritech Michigan
On behalf of AT&T Communications of Michigan, Inc.

Before the Missouri Public Service Commission
Case No. 99-483
An Investigation for the Purpose of Clarifying and Determining Certain aspects Surrounding the Provisioning Of Metropolitan Calling Area Services After the Passage and Implementation Of the Telecommunications Act of 1996
On behalf of McLeodUSA Telecommunications Services, Inc.

Before the Illinois Commerce Commission
Docket No. 98-0396
Investigation into the compliance of Illinois Bell Telephone Company with the order in Docket 96-0486/0569 Consolidated regarding the filing of tariffs and the accompanying cost studies for interconnection, unbundled network elements and local transport and termination and regarding end to end bundling issues.
On behalf of AT&T Communications of Illinois, Inc. and McLeodUSA Telecommunications Services, Inc.

Before the Illinois Commerce Commission
Docket No. 99-0593
Investigation of Construction Charges
On behalf of McLeodUSA Telecommunications Services, Inc., MCI WorldCom, Inc. and Allegiance Telecom, Inc.

Before the Public Service Commission of Wisconsin
Case No. 05-TI-283
Investigation of the Compensation Arrangements for the Exchange of Traffic Directed to Internet Service Providers
On behalf of AT&T Communications of Wisconsin, AT&T Local Services, KMC Telecom, Inc., MCI WorldCom, Inc., McLeodUSA Telecommunications Services, Inc., TDS MetroComm, Time Warner Telecom

Before the Public Utility Commission of Texas
Docket No. 21982
Proceeding to Examine Reciprocal Compensation Pursuant to Section 252 of the Federal Telecommunications Act of 1996
On behalf of ICG Communications, Inc.

Before the Public Service Commission of the Commonwealth of Kentucky
Case No. 99-498
Petition of BlueStar Networks, Inc. for Arbitration with BellSouth Telecommunications, Inc. Pursuant to Section 252 of the Telecommunications Act of 1996.
On behalf of BlueStar Networks, Inc.

Before the Illinois Commerce Commission
Docket No. 00-0027
Petition for Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Illinois Bell Telephone Company d/b/a Ameritech Illinois.
On behalf of Focal Communications Corporation of Illinois

Before The Indiana Utility Regulatory Commission
Cause No. 41570
In the Matter of the Complaint of McLeodUSA Telecommunications Services, Inc. against Indiana Bell Telephone Company, Incorporated, d/b/a Ameritech Indiana, Pursuant to the Provisions of I.C. §§ 8-1-2-54, 81-12-68, 8-1-2-103 and 8-1-2-104 Concerning the Imposition of Special Construction Charges.
On behalf of McLeodUSA Telecommunications Services, Inc.

Before the Florida Public Service Commission
Docket No. 991838-TP
Petition for Arbitration of BlueStar Networks, Inc. with BellSouth Telecommunications, Inc. Pursuant to the Telecommunications Act of 1996
On behalf of BlueStar Networks, Inc.

Before the Public Utility Commission of Ohio
Case No. 99-1153-TP-ARB
In the Matter of ICG Telecom Group, Inc.'s Petition For Arbitration of Interconnection Rates, Terms and Conditions and Related Arrangements with Ameritech Ohio
On behalf of ICG Telecom Group, Inc.

Before the Public Utility Commission of Oregon
ARB 154
Petition for Arbitration of GST Telecom Oregon, Inc. Against US West Communications, Inc. Under 47 U.S.C. §252(b)
On behalf of GST Telecom Oregon, Inc.

Before the Michigan Public Service Commission
Docket No. U-12072
In the matter of the application and complaint of WORLDCOM TECHNOLOGIES INC. (f/k/a MFS INTELENET OF MICHIGAN, INC., an MCI WORLDCOM company) against MICHIGAN BELL TELEPHONE COMPANY d/b/a AMERITEHC MICHIGAN, AMERITECH SERVICES, INC., AMERITECH INFORMATION INDUSTRY SERVICES, AND AMERITECH LONG DISTANCT INDUSTRY SERVICES relating to unbundled interoffice transport.
On behalf of WorldCom Technologies, Inc.

Before the Illinois Commerce Commission
Docket No. 99-0525
Ovation Communications, Inc. d/b/a McLeodUSA, Complaint Against Illinois Bell Telephone Company d/b/a Ameritech Illinois, Under Sections 13-514 and 13-515 of the Public Utilities Act Concerning the Imposition of Special Construction Charges and Seeking Emergency Relief Pursuant to Section 13-515(e)
On behalf of McLeodUSA

Before the Public Service Commission of the Commonwealth of Kentucky
Case No. 99-218
Petition of ICG Telecom Group, Inc. for Arbitration with BellSouth Telecommunications, Inc. Pursuant to Section 252 of the Telecommunications Act of 1996.
On behalf of ICG Telecom Group, Inc.

Before the Tennessee Regulatory Authority
Docket No. 1999-259-C
Petition for Arbitration of ITC^DeltaCom Communications, Inc. with BellSouth Telecommunications, Inc. Pursuant to the Telecommunications Act of 1996
On behalf of ICG Communications, Inc.

Before the New Mexico Public Regulation Commission

Case No. 3131
In the Matter of GST Telecom New Mexico, Inc.'s Petition for Arbitration Against US West Communications, Inc., Under 47 U.S.C. § 252(b).
On behalf of GST Telecom New Mexico, Inc.

Before the Georgia Public Service Commission
Docket No. 10767-U
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Regarding a Docket to Consider Competition in the Provision of Local Telephone Service
On behalf of the Mississippi Cable Television Association

Before the Maryland Public Service Commission
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On behalf of the Staff of the Maryland Public Service Commission

Before the Maryland Public Service Commission

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On behalf of the Staff of the Maryland Public Service Commission

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Application of MCImetro Access and Transmission Services, Inc. For a Certificate of Exchange Service Authority Allowing it to Provide Facilities-Based Local Service in the Chicago LATA
On behalf of the Office of Policy and Planning, Illinois Commerce Commission

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On behalf of the Office of Policy and Planning, Illinois Commerce Commission

Before the Illinois Commerce Commission
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MFS-Intelenet of Illinois, Inc. Application for an Amendment to its Certificate of Service Authority to Permit it to Operate as a Competitive Local Exchange Carrier of Business Services in Those Portions of MSA-1 Served by Illinois Bell Telephone and Central Telephone Company of Illinois
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On behalf of the Office of Policy and Planning, Illinois Commerce Commission

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In the Matter of Proposals to Establish an Alternate Regulation Plan for Southwestern Bell Telephone Company
On behalf of the Telecommunications Department, Missouri Public Service Commission

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In the Matter of Southwestern Bell Telephone Company's Application for Classification of Certain Services as Transitionally Competitive
On behalf of the Telecommunications Department, Missouri Public Service Commission

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Denver, Colorado, February 5&6, 2002

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NARUC Winter Meeting 2001
Washington, D.C., February 25, 2001

Telecommunications Costing and Pricing
Interconnection and Inter-Carrier Compensation
Advanced Regulatory Studies Program
Michigan State University
Cincinnati, Ohio, October 13, 2000

Telecommunications Pricing in Tomorrow's Competitive Local Market
Professional Pricing Societies 9th Annual Fall Conference
Pricing From A to Z
Chicago, Illinois, October 30, 1998

Recombining Unbundled Network Elements: An Alternative to Resale
ICM Conferences' Strategic Pricing Forum
January 27, 1998, New Orleans, Louisiana

MERGERS – Implications of Telecommunications Mergers for Local Subscribers
National Association of State Utility Consumer Advocates Mid-Year Meeting,
Chicago, Illinois, June 24 1996

Unbundling, Costing and Pricing Network Elements in a Co-Carrier World
Telecommunications Reports' Rethinking Access Charges & Intercarrier Compensation
Washington, D.C., April 17, 1996

Key Local Competition Issues Part I (novice)

Key Local Competition Issues Part II (advanced)
with Mark Long
National Cable Television Associations' 1995 State Telecommunications Conference
Washington, D.C., November 2, 1995

Competition in the Local Loop
New York State Telephone Association and Telephone Association of New England Issues Forum
Springfield, Massachusetts, October 18, 1995

Compensation in a Competitive Local Exchange
National Association of Regulatory Utility Commissioner Subcommittee on Communications' Summer Meetings
San Francisco, California, July 21, 1995

Fundamentals of Local Competition and Potential Dangers for Interexchange Carriers
COMPTEL 1995 Summer Business Conference
Seattle, Washington, June 12, 1995

BEFORE THE ARIZONA CORPORATION COMMISSION

IN THE MATTER OF:	)	Docket No. T-03267A-06-0105
	)	Docket No. T-01051B-06-0105
McLEODUSA	)	
TELECOMMUNICATIONS	)	
SERVICES, INC.,	)	
Complainant,	)	
v.	)	
QWEST CORPORATION,	)	
Respondent.	)	

DIRECT TESTIMONY

OF

SIDNEY L. MORRISON

On behalf of

McLeodUSA Telecommunications Services, Inc.

May 12, 2006

PUBLIC VERSION

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I. INTRODUCTION AND QUALIFICATIONS

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

A. My name is Sidney L Morrison. My business address is 550 Sunset Lakes Boulevard SW, Sunset Beach, North Carolina 28468-4900. I am currently employed by QSI Consulting, Inc. (QSI) as a Senior Consultant and the Firm's Chief Engineer.

Q. PLEASE SUMMARIZE YOUR PROFESSIONAL EXPERIENCE.

A. I have over 30 years of experience in the telecommunications industry. I began my telecommunications career in 1966 in Charlotte, North Carolina as a cable helper for Southern Bell Telephone and Telegraph. Southern Bell was an incumbent local exchange carrier (ILEC) managing numerous exchanges throughout North Carolina. My duties involved splicing underground, buried and aerial cable. I also worked as a switching technician and special services technician.

Beginning in August of 1970, I transferred to Mountain Bell in Denver, Colorado as a central office technician. In 1972, I was promoted to supervise main distribution frame (MDF) operations. My duties included supervising the installation of Plain Old Telephone Service (or POTS), Special Services, Central Office area cuts, MDF replacements and many other projects. In 1980 and 1981, I performed time and motion studies for service provisioning on approximately 75 of Mountain Bell's MDF operations. These time and motion studies included components for running jumpers and administrative activities on each of these frames. From 1983 until 1986, I was the switching control center and MDF subject matter expert for US West. In this position, I was responsible for staff level support for service provisioning and maintenance,

including the development of enhancements for operational support systems (OSS) supporting these activities. From 1986 until 1993, I was responsible for the US West Automatic Message Accounting (AMA) teleprocessing organization for the fourteen state US West region.

In 1993, I retired from US West and began contract engineering work and consulting. In 1995, I took an assignment in Kuala Lumpur, Malaysia as a contractor/consultant with a team of specialists to build a competitive local exchange carrier (CLEC) network consisting of a Global System for Mobil (GSM) communications services, fixed network services, cable television (CATV) services and data services integrated into a common transport backbone. One of my primary responsibilities in Malaysia was organizing and implementing a field operations group (FOG) that was responsible for the installation and maintenance of all fixed network and CATV services. My responsibilities included the planning, organizing, staffing and implementation of the FOG, including an installation and maintenance group, assignment center, dispatch center, test center and a repair center. I also had the responsibility of developing business processes and OSS system requirements for provisioning and maintenance supporting the FOG. After launching the FOG, I managed the day-to-day operations of the department, ultimately refining the organization into an ISO 9002[1] qualified organization. In January 1997, the Binariang Maxis FOG became the first certified ISO 9002 service organization in Southeast Asia.

I returned from Malaysia in June of 1997 and worked for approximately two years as a contract outside plant/central office equipment (OSP/COE) engineer, and trained new engineers for US West collocation efforts.

[1] International Organization Standards, ISO 9002 is the standard set of requirements for an organization whose business processes range from, production, installation and servicing.

In May 1999, I accepted a contract in Switzerland building a new CLEC under the market name of diAx telecommunications. My responsibilities involved project management to establish OSS supporting all wireless, wireline, and data services offered by diAx. I also provided consulting services developing business processes supporting the establishment of the diAx Internet Provider Operations Center (IPOC) and diAx data services offerings. I established system requirements based on IPOC business processes for fault management systems, provisioning systems, capacity inventory systems, customer service inventory systems and workflow engines controlling overall maintenance and provisioning processes.

In December 2000, I returned from Switzerland and began working for QSI Consulting Inc. as a Senior Consultant. I provide telecommunications companies with engineering advice and counsel for direct network planning, management and cost-of-service support. My specific areas of expertise include network engineering, facility planning, project management, business system applications, incremental cost research and issues related to the provision of unbundled network elements.

Attached to my testimony as Exhibit SLM-1 is a copy of my *Curriculum Vitae*, which contains a comprehensive description of my work experience and educational background.

Q. DO YOU HAVE DIRECT EXPERIENCE IN PLANNING AND ENGINEERING COLLOCATIONS FOR US WEST (N/K/A QWEST) CENTRAL OFFICES?[2]

[2] The FCC approved the acquisition of US West by Qwest in March of 2000.

A. Yes. As mentioned above and in Exhibit SLM-1, I worked for 22 years in US West's Network Management Group. In 1997, I contracted to US West as a central office engineer, where I was responsible for collocation planning and engineering in the common systems planning and engineering center. My duties in this capacity included Central Office Equipment Facility Management (COEFM) collocation design, floor space planning and allocation, power engineering, tie cable engineering, collocation cage placement, Heating Ventilation and Air Conditioning (HVAC) and collocation AC power and overhead lighting. During this time frame, collocation business processes were being developed, and I provided input to the development of engineering business processes used in the implementation of collocation engineering practices and procedures within the US West Common Systems Planning and Engineering Center (CSPEC) organization.

During my time as a central office engineer, I acquired first-hand experience in observing the power usage trends of Qwest (then US West) central offices and recommending power augments for those offices based on my observations and sound engineering principles and practices. The proper planning and sizing of DC power components in the central office is crucial to proper resolution of the disputed issues in this proceeding, and I can speak to this issue based on direct working experience in planning and sizing the power requirements of a central office.

Q. HAVE YOU PREVIOUSLY TESTIFIED AS AN EXPERT WITNESS ON COLLOCATION POWER ISSUES BEFORE OTHER STATE REGULATORY COMMISSIONS?

A. Yes. Most recently, I submitted expert testimony providing the engineering framework supporting McLeodUSA's complaints against Qwest in Washington Docket No. UT-

063013, Utah Docket No. 06-2249-01 and Iowa Docket No. FCU-06-20, which all relate to the same collocation power issues addressed in the instant docket. Before that, I sponsored testimony before the Indiana Utility Regulatory Commission (Cause No. 42398), in which I described the results of the collocation power audits performed for a CLEC client in that state and explained that the CLEC did not, and indeed could not, utilize the amount of power for which it was being billed by AT&T/SBC Indiana. I wrote a similar audit report for a client in Public Utilities Commission of Ohio Docket No. 03-802-TP-CSS. The issues in this docket are identical to those in the companion Washington, Iowa and Utah dockets and very similar to those I have testified to in other regions, in that in all instances, the incumbent local exchange carrier is billing the CLEC for an amount of power that the CLEC does not, and indeed could not, use. Throughout my testimony, I will reference positions taken on these issues by Qwest in other states because I fully expect Qwest will take identical positions in its testimony here.

II. PURPOSE AND SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. QSI was retained by McLeodUSA to support the cost, policy and engineering framework underlying McLeodUSA's complaint against Qwest regarding the misapplication and excessiveness of Qwest's Direct Current (DC) power plant charges. Michael Starkey, from QSI, is filing testimony simultaneous with mine that will address the policy and cost framework, and my testimony addresses the engineering framework.

The purpose of my testimony is to, first, provide a general overview of electricity and power concepts and terminology that are important to a complete understanding of the disputed issues. Second, I will provide descriptions and diagrams of the components

of a central office power infrastructure, with an explanation of how these components are engineered and sized. Once the components of the central office power infrastructure are addressed, I will identify the components of the central office to which McLeodUSA's complaint applies – DC power plant –and explain from an engineering perspective why: (a) it is inappropriate from an engineering perspective for Qwest to bill McLeodUSA for DC power plant usage on an "as ordered" basis instead of on an "as consumed" basis, (b) there is nothing improper about a CLEC ordering larger DC power distribution cables than the CLEC can or will actually use, (c) Qwest power engineers would not augment the power plant of the central office based on individual orders for power distribution cables from McLeodUSA, other CLECs, or Qwest, and (d) why Qwest's power reduction offering is not a suitable alternative to billing DC power plant based on McLeodUSA's actual usage.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. My testimony concludes that McLeodUSA's recommended application of the DC power plant usage charge is consistent with the manner in which DC power plant is sized, and in turn, the manner in which Qwest incurs power plant costs. As my testimony will demonstrate, it is critical to distinguish between power *plant* facilities, which are shared among all power users in a particular central office and sized on an "as consumed" basis, from power *distribution* facilities, which are dedicated to a particular power user and sized on an "as ordered" basis. I will show that McLeodUSA makes the proper distinction between those two power-related infrastructure components by recommending that a power plant usage rate element be applied on an "as consumed" basis, while power distribution facilities may be recovered on an "as ordered" basis. Further, my testimony

concludes that since the DC power plant facilities are sized according to forecasted actual peak *usage* of all users in a central office, there is no relationship between *orders* for power cables by CLECs and DC power plant augment/investment. This is a very important point because, based on the other complaint filings to date, I expect Qwest witnesses will submit testimony in this proceeding claiming that DC power plant is sized based on CLEC power cable *orders* – not forecasted actual peak power usage. My direct testimony will demonstrate that Qwest's position is in direct conflict with Qwest's own engineering manuals and guidelines as well as inconsistent with the positions taken by Qwest's CLEC affiliate ("QCC") in testimony on DC power issues elsewhere. My testimony will also show that the Commission should interpret the DC power measurement amendment, and, in turn, require Qwest to apply the DC power plant usage charge, in a manner consistent with the way in which the DC power plant is sized (or the way in which Qwest incurs DC power plant costs). My testimony will demonstrate that McLeodUSA's recommendation adheres to this principle and Qwest's recommendation does not. Finally, I will explain that Qwest's Power Reduction is an unnecessary, risky and costly process that causes more problems instead of solving the existing problem related to Qwest's application of the DC power plant usage charge. As such, it is not a satisfactory alternative for addressing the problem of over-billed power charges when compared to a proper interpretation of the contract amendment at issue in this proceeding which should provide for "usage based" billing.

III. CENTRAL OFFICE POWER OVERVIEW

A. General Power Concepts and Their Application to Telecommunications Equipment

Q. IS A GENERAL UNDERSTANDING OF ELECTRICITY AND POWER CONCEPTS AND TERMINOLOGY IMPORTANT TO THIS PROCEEDING?

A. Yes. While I am an engineer by trade, my testimony will use layman's terms and descriptions when possible to limit the use of industry and technical jargon. However, there are certain technical terms and engineering concepts related to electricity and power that are important for a full understanding of the issues in dispute in this proceeding. Accordingly, I will provide a quick overview of the "building blocks" of power and then explain how these terms and concepts are relevant within the context of telecommunications equipment and collocation power. For ease of reference, I have attached to my testimony Exhibit SLM-2, which is a glossary of technical terms I use in my testimony.

Q. WHAT IS POWER AND HOW IS IT MEASURED?

A. In its most basic form, power is the rate at which work is done – whether that power is electrical or mechanical. Work is done whenever a force causes motion, and work is not done when a force does not cause motion. For instance, if a mechanical force is used to lift or move a weight, the force causes motion, and therefore, work is done. However, the force of a compressed spring acting between two fixed objects does not cause motion and, therefore, does not constitute work.

As it relates to electricity, electrical force is measured in voltage, which forces current to flow (i.e., electrons to move) in a closed circuit. When voltage (or force) exists between two points and current flows, then work is done. However, when voltage exists between two points, but current cannot flow, no work is done. This is analogous to the compressed spring example above that produced no motion.

When work is done by voltage causing electrons to move, the instantaneous rate at which this work is done is called the electrical power rate, and its unit of measure is the watt. The relationship between power, voltage and current can be expressed by the following equation: *Power = Voltage x Current*; where power is measured in watts, voltage is measured in volts and current is measured in amperes.

Q. PLEASE DESCRIBE THE FUNDAMENTAL DIFFERENCE BETWEEN ALTERNATING CURRENT (AC) VERSUS DIRECT CURRENT (DC).

A. Alternating current (AC) is a specific type of electric current in which the direction of the current's flow is reversed, or alternated, on a regular basis. Direct current is no different electrically from alternating current except for the fact that it flows in the same direction at all times. Nearly all modern electronic devices require direct current for their operation, but alternating current is what is provided by the electric utility. Therefore, rectifiers are used to convert AC power to DC power so that electronic devices can use it.[3] The issue of AC power and DC power is relevant because the power that is delivered to a telephone central office by the electric utility is AC power, but telecommunications equipment generally uses DC power (i.e., -48 VDC), and therefore, AC power must be converted to DC power at the central office.

[3] http://www.energyvortex.com/energydictionary/alternating_current_(ac)__direct_current_(dc).html

Q. HOW DOES ELECTRICAL EQUIPMENT CONSUME POWER?

A. This will depend on the type of electrical equipment. Typically, however, the power consumed by telecommunications equipment is largely dependent on two factors. First, the power consumed by telecommunications equipment is dependent on the number of active subscribers (or the percent fill) of the equipment. Second, telecommunications equipment power usage is dependent on actual traffic or usage the equipment is supporting. In other words, the consumption of electrical power is dependent upon the "work" undertaken by the equipment, and specific to telecommunications equipment, more (or less) work is generally dependent upon the fixed number of subscribers the equipment must be equipped to support, and the amount of activity required by that customer base.

Q. PLEASE DEMONSTRATE HOW TELECOMMUNICATIONS EQUIPMENT CONSUMES POWER USING AN ILLUSTRATIVE PIECE OF EQUIPMENT?

A. A Digital Subscriber Line Access Multiplexer (DSLAM) is a common piece of telecommunications equipment that exhibits power usage characteristics that are representative of how telecommunications equipment typically consumes power. A DSLAM receives signals from multiple customer Digital Subscriber Line (xDSL) connections and aggregates the signals on a high-speed backbone using multiplexing techniques. With the addition of a splitter, this combination of equipment allows voice (low band) and data (high band) signals to be carried over a copper twisted pair. To demonstrate my point, I will use a popular DSLAM model - the Alcatel 7300 Advanced

Services Access Manager (ASAM),[4] which according to Alcatel, is "the most widely deployed digital subscriber line access multiplexer (DSLAM) in the world..."[5] This Alcatel DSLAM is capable of serving 5,000 lines per network interface with subtending shelves.[6] Regarding the first point – that power consumed is dependent on the percent fill of the equipment – this DSLAM at 50% fill (or serving 2,500 of the possible 5,000 lines) uses less power than if it were at 100% fill (or serving all 5,000 customers), everything else equal.

Regarding the second point – that power consumption is dependent on the traffic handled – the DSLAM will use less power when handling relatively lower levels of traffic, or in other words, whether the DSLAM is serving 2,500 or 5,000 customers, the power consumption is less when the circuits are idle and thus experiencing little or no activity from those customers, everything else equal. Even considering that the DSLAM may be fully utilized at 100% fill, the actual traffic patterns of customers varies with periods of minimum use and rises to an average period of peak demand. Hence, two Alcatel 7300 DSLAMs both supporting 2,500 customers may experience very different power requirements depending upon the usage patterns of the individual subscribers they support.

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[4] I use this Alcatel DSLAM model for illustrative purposes because it is a popular model and because there is considerable public information available about the technical specifications of this particular DSLAM model. McLeodUSA may or may not use this particular Alcatel model somewhere in its collocations – though the particular DSLAM McLeodUSA does use in its collocations would exhibit power usage characteristics identical to those described above.

[5] http://www.alcatel.com/products/productsummary.jhtml?relativePath=/com/en/appxml/opgproduct/alcatel7300advancedservicesaccessmanagerasamansiversiontcm228115681635.jhtml

[6] Alcatel 7300 ASAM product guide, p. 3. This DSLAM serves a maximum of 2,592 lines without subtending shelves.

Q. ARE THESE FLUCTUATIONS IN POWER CONSUMPTION DUE TO PERCENT FILL AND ACTUAL USAGE PARTICULARLY CHARACTERISTIC OF TELECOMMUNICATIONS EQUIPMENT?

A. These general power consumption characteristics are largely common across telecommunications equipment, and they are particularly marked in a collocation environment. This results from the fact that, within a CLEC collocation, the CLEC equipment may have very low initial power requirements as the CLEC attempts to build a customer base relative to that central office. Yet, as the carrier's business grows, the percent fill increases and the actual usage for that equipment will increase, as will the power draw required to electrify the equipment. Hence, with regard to most telecommunications equipment, and collocated telecommunications equipment in particular, the percent fill and the level of actual traffic generated by these customers will change over time.

Q. YOU EXPLAIN ABOVE THAT TELECOMMUNICATIONS EQUIPMENT DOES NOT CONSUME POWER AT A CONSTANT RATE AND THAT POWER DRAW REQUIREMENTS CHANGE OVER TIME. WHY IS THAT IMPORTANT IN THIS CASE?

A. The manner in which telecommunications equipment uses power is important to this case because one of the key issues in dispute in this case is how DC power plant is sized by Qwest. And because telecommunications equipment does not consume power at a constant rate, the DC power consumption of central offices also varies. This variation in DC power consumption of central offices impacts the manner in which Qwest engineers size DC power plant in Qwest central offices. In sum, Qwest power engineer must make

sure that the central office is capable of accommodating the forecasted actual peak usage of the central office so that when power consumption peaks, Qwest's central office power system can accommodate that peak level. Sizing DC power plant below this level would be under-sizing the DC power plant and could lead to constraints on Qwest's ability to provide power, and sizing DC power plant above this level would be wasteful and inefficient. This peak capacity level by which power engineers size DC power plant is referred to as the "average busy hour,"[7] and represents the level when the load on the central office telecommunications equipment is at its greatest. Busy hours can vary by central office, and as such, proper DC power planning calls for power engineers to plan for DC power plant in sufficient amounts to accommodate the busy hour of that particular central office.

B. Central Office Power Infrastructure

Q. PLEASE DESCRIBE THE FUNDAMENTAL COMPONENTS OF A TYPICAL CENTRAL OFFICE POWER INFRASTRUCTURE?

A. There are four primary components of a typical central office power infrastructure. Those components are as follows:

1. **Commercial Alternating Current (AC) Power**: this category consists of the AC power procured from the electric utility and can include ancillary distribution equipment including, conduit, cabling, fasteners and protective equipment.[8]

[7] The average busy hour drain is established by determining the profile of the office load for the busy day of the busy season (excluding abnormally busy operating days such as Mother's Day and Christmas).

[8] Bellcore, Central Office Environment Detail Engineering Generic Requirements, Generic Requirements GR-1502-CORE, Issue 1, June 1994.

2. **Standby AC Power:** this category consists of AC distribution equipment including engine/alternator, fuel tanks, fuel, AC switching and distribution equipment, that can be used in case of a failure of the office's primary power source (i.e., the commercial source).

3. **Direct Current (DC) Power Plant**: this category consists of equipment used to convert AC power to DC power regardless of whether the AC power is obtained from the commercial source or standby source. DC power plant generally consists of the following equipment: (i) rectifiers, which are used for the AC/DC conversion;[9] (ii) batteries, which "provide the necessary current to power telephone switches [or equipment,]" "serve as a filter to smooth out fluctuations in the commercial power[,]" "remove the 'noise' that power often carries[,]" and "provide necessary backup power should commercial power fail[;]"[10] and (iii) controllers, which manage the DC power.

4. **DC Power Distribution**:[11] this category is the power infrastructure that consists of DC power cables and fuses in the Battery Distribution Fuse Bays (BDFBs) and circuit breakers in the Power Boards (PBs). The DC power distribution cabling consists of paired copper cables in insulated sheaths that complete a power circuit from the BDFB/PB to the telecommunications equipment lineups or CLEC collocation cages. One portion of each pair represents the "battery" or distribution of power and the other portion of each pair represents the "ground" or power return to the power source. Given the importance of un-interruptible power to the telecommunications equipment, power cables come in pairs for redundancy purposes. The primary cable feed is known as the "A" lead and the backup power cable is known as the "B" lead. If the A lead fails, the B lead should continue to power the equipment.

   The BFDB is a fuse bay that contains fuses to protect power leads and cables from power surges and provides a distribution point where a large DC power lead can be broken down into smaller increments of power for distribution to telecommunications equipment. The BDFB allows for users of power in the central office to use smaller, more cost-effective power leads to power their equipment, while the fuses housed therein protect the power cables and telecommunications equipment from power currents that exceed the rated amperage of the fuses. The BDFB also contains alarms and monitors and usually contains ampere meters for manual monitoring.[12] The PB is similar to and provides the same functionality as the BDFB but is typically used for larger current distribution to equipment and collocations. For instance, as indicated in the Qwest/McLeodUSA DC Power Measuring Amendment, Qwest utilizes a BDFB for power orders in increments equal to

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[9] Newton's Telecom Dictionary, 20th ed., p. 690.

[10] Newton's Telecom Dictionary, 20th ed., p. 103.

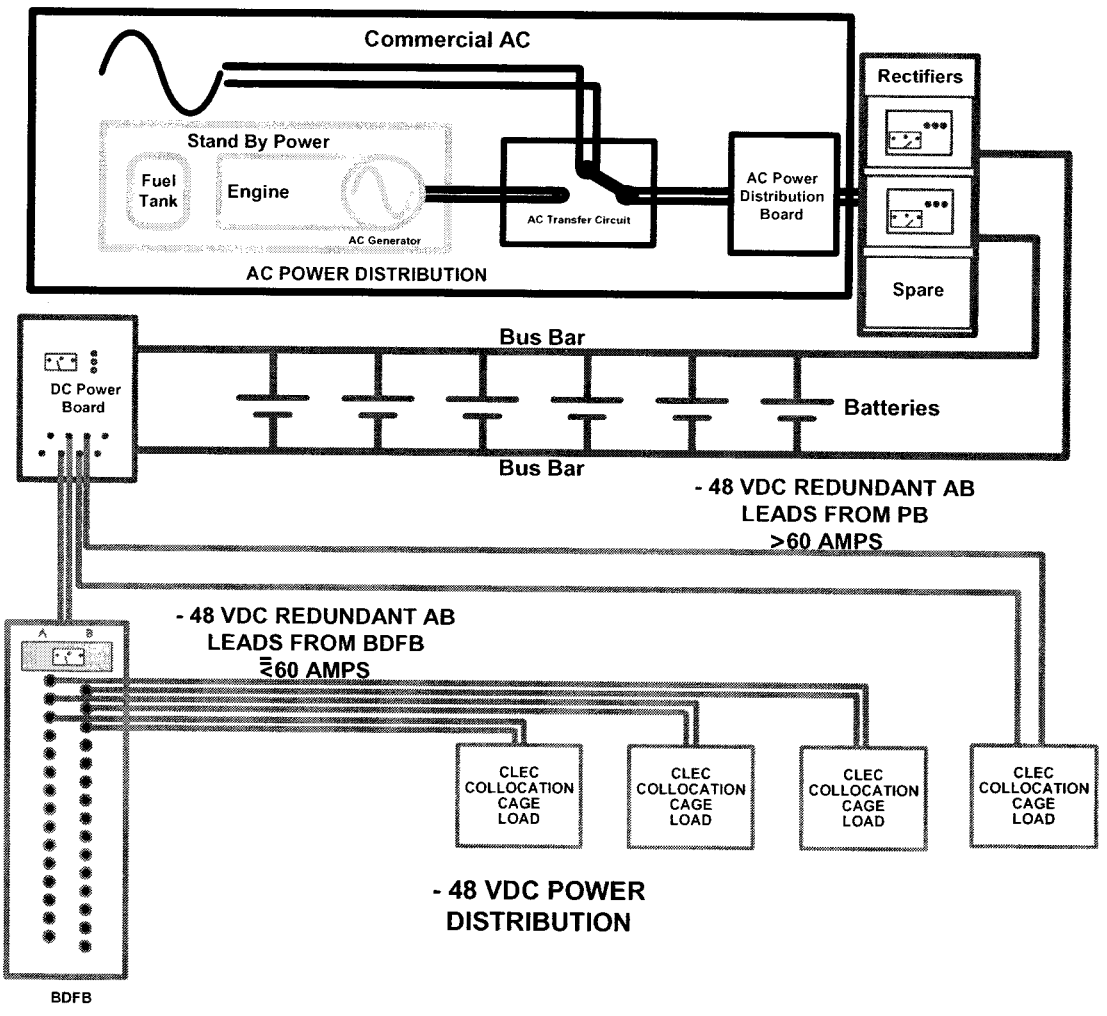
[11] DC power distribution is also referred to as delivery, and the terms DC power distribution and DC power delivery can be used interchangeably.

[12] Bellcore, Central Office Environment Detail Engineering Generic Requirements, Generic Requirements GR-1502-CORE, Issue 1, June 1994.

or less than 60 amps and uses PBs for orders in increments greater than 60 amps.[13]

Figure 1 is a diagram of a typical central office power infrastructure, color-coded so as to distinguish the primary components of the central office power infrastructure from one another.

Figure 1



[13] DC Power Measuring Amendment to the Interconnection Agreement between Qwest Corp. and McLeodUSA Telecommunications Services, Inc., Attachment 1, Sections 1.1 and 1.2.

As Figure 1 shows, the four basic power components – (1) AC commercial power (shown in black), (2) standby AC power (shown in green), (3) DC power plant (shown in blue), and (4) DC power distribution (shown in red) - work together to power the telecommunications equipment in a central office. It is important to note that the first 3 categories are shared among all power users in a central office, while the fourth category – DC power distribution – is dedicated to a specific customer (or group of customers). And while a CLEC collocation cage is depicted in Figure 1, the same AC power and DC power-related equipment are also used to serve Qwest's power needs in a nearly identical fashion.

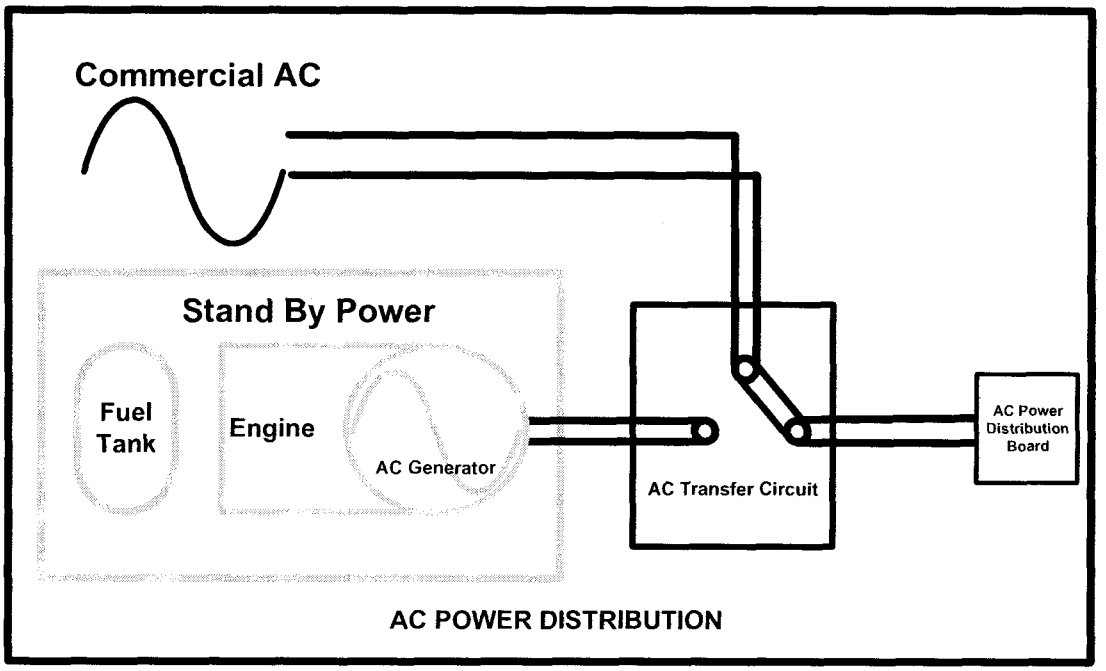
Q. YOU MENTIONED REDUNDANCY RELATED TO AC POWER SOURCES AND DC POWER DISTRIBUTION CABLES. WHY DO CENTRAL OFFICE POWER SYSTEMS EXHIBIT THIS LEVEL OF REDUNDANCY?

A. Redundancy is a basic concept in much of the telecommunications network. Given that electronic equipment commonly found in ILEC central offices is essential to providing service to customers (e.g., switches, processors, optical feeder networks), the power system is designed with redundancy so that this equipment can continue to function even if the primary source or delivery method fails.

Q. PLEASE ELABORATE ON EACH OF THE CATEGORIES OF CENTRAL OFFICE POWER COMPONENTS.

A. Figure 2 is a diagram of the components of AC power.

Figure 2



As Figure 2 shows, AC power is delivered to the central office by the electric utility (or the standby AC power source)[14] and is converted to DC power which is used by telecommunications equipment in the central office. AC power is delivered to the central office on a demand basis controlled by the requirements of the AC service within the office (e.g., AC lights, HVAC, elevators), and the demand requirements of the DC power plant serving telecommunications equipment.

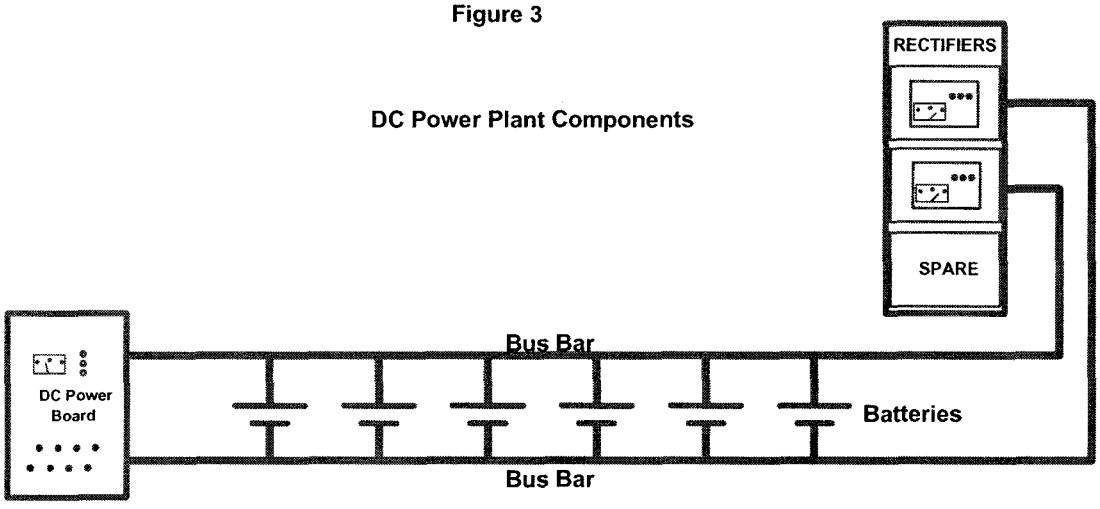
Q. PLEASE ELABORATE ON DC POWER PLANT.

A. Figure 3 below is a diagram of the DC power plant.

[14] Standby AC power consists of an arrangement of a engine, diesel, gasoline or jet turbine, and fuel tanks for producing mechanical power connected to a generator set for producing AC power and a switching mechanism, usually automated, to transfer AC service from a failed utility and to transfer service back to a successfully-recovered utility service.

Figure 3

DC Power Plant Components



The components of the DC power plant convert the AC power to DC power. The DC Power Plant is designed by power engineers to provide DC Power sufficient to accommodate the forecasted actual peak *usage* of all telecommunications equipment housed in that particular central office. Again, DC power plant equipment is common to the entire Qwest central office and is used to support the equipment of Qwest as well as the CLECs (and others).

Q. YOU STATE ABOVE THAT POWER ENGINEERS DESIGN THE DC POWER PLANT OF A CENTRAL OFFICE BASED ON THE FORECASTED ACTUAL PEAK USAGE FOR THAT OFFICE. PLEASE ELABORATE ON THIS PROCESS.

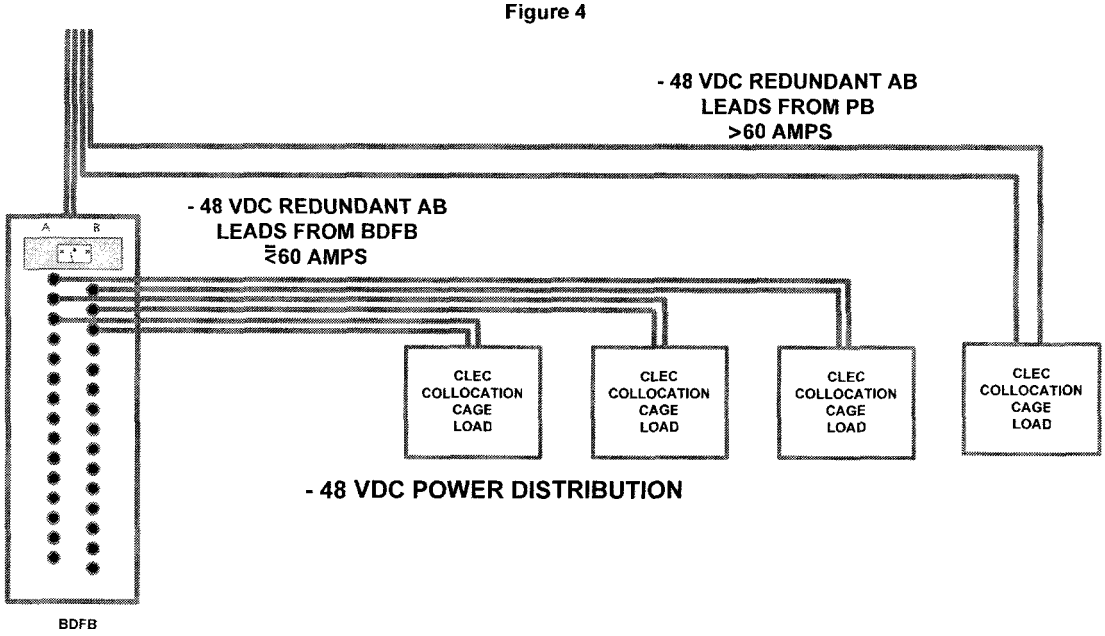
A. In a basic example of a Qwest central office, Qwest power engineers monitor the actual usage of DC power and observe the peak power usage that takes place at the busy hour. Qwest engineers would then take steps to ensure that the DC power plant is capable of handling the usage that occurs at this peak period. In other words, DC power plant is

sized based on the maximum power draw that takes place on a CO-wide basis during the busy hour. I will also refer to this in my testimony as the List 1 drain – or the amperage that the equipment uses when the power plant is operating normally at maximum capacity (discussed in more detail below). So, in other words, DC power plant is sized based on List 1 drain. Power engineers oftentimes utilize a fill factor to build in a "cushion" of excess capacity between the busy hour load and the actual capacity of the DC power plant. Or, perhaps more appropriately, those engineers identify a "target" usage level which may indicate to them that the existing power plant, given forecasted peak usage, may fall short in a busy hour scenario. Hence, when usage hits that "target" level, they begin to explore augmentation alternatives. Importantly, however, Qwest DC power engineers do not augment the DC power plant infrastructure based on particular orders for power distribution cables of a CLEC or Qwest. Given that DC power plant is sized based on forecasted actual peak usage for all equipment in the office, there is no relationship between Qwest's investment/augmentation in DC power plant and individual orders for power cables (whether they are from Qwest or a CLEC). I will demonstrate below in Section IV that my testimony on the proper sizing of DC power plant is backed by Qwest's own engineering manuals and guidelines.

Q. PLEASE ELABORATE ON DC POWER DISTRIBUTION.

A. Figure 4 below is a diagram of the components of the DC power distribution infrastructure.

Figure 4



As indicated in Figure 4, once the AC power is converted to DC power, that DC power is delivered to CLEC collocation equipment via power distribution cables. These power cables are protected from over-current situations by circuit breakers housed in power boards and fuses that are housed in the BDFBs. Unlike the DC power plant components which are a shared resource powering the equipment of all users in the office, the DC power distribution components are generally specific to a particular power user (or group of users), and it is, therefore, critical to distinguish the DC power *plant* from the DC power *distribution* when discussing how DC power systems are sized and how charges for DC power should be assessed to recover costs related to sizing these DC power system components.

Q. HOW IS DC POWER DISTRIBUTION SIZED?

A. The short answer to this question is that DC power distribution is sized based on List 2 drain. The List 2 Drain is the maximum current that the equipment will draw when the

power plant is in worst case condition of voltage and traffic distress - when the DC power plant's batteries are approaching a condition of total failure (List 2 drain will be discussed in more detail below in Section IV). That being said, the process of actually sizing DC power distribution cables is a bit more complex.

The basic idea behind distribution cable design is to make the voltage drop in the cable as small as possible, while at the same time installing the power cable with the smallest diameter allowable within specific parameters. Given that the cost of power cables and power cable installation increases significantly as cable diameter increases, the smallest cable capable of maintaining the minimum voltage drop is chosen to minimize the cable cost, as well as to control the amount of space the cables occupy in the power distribution cable racks.

Q. PLEASE ELABORATE ON THE SPECIFIC PARAMETERS WITHIN WHICH POWER DISTRIBUTION CABLES MUST BE SIZED.

A. DC power distribution cables are sized using a formula and process related to the amount of voltage drop that will be allowed across the power distribution cables. That formula for calculating copper feeder cables is as follows:

CM = [K x Amperes x Feet] / Voltage Drop

Where:

CM = Circular Mills

K = 11.1, the conductance constant for copper cables

Amperes = List 2 drain

Feet= Distance of loop as measured from the relay rack top of each connection point and is not inclusive of the relay rack drop length.

Voltage Drop = Allowable voltage drop from Power Board to BDFB and the allowable voltage drop from the BDFB to the Equipment or Load.

There are three key variables in the power cable sizing formula that leads to the correct sizing of power distribution cables. *First*, the amount of current (measured in amperes) that must be distributed through the cable is the primary variable. As an engineer increases the amount of current needed for distribution across the power cable, the larger the required cable diameter or cross sectional area that must be utilized to carry the added current. The amount of current (in amperes) used in the formula is referred to the List 2 Drain. When a DC power plant is in distress, as is the case with List 2 drain, the terminal voltage of the batteries begins to decrease. For the telecommunications equipment load to continue to draw the same amount of DC power, the current increases proportionately (recall that Power = Voltage x Current, wherein a drop in voltage requires a subsequent increase in current to keep the available power at a constant level). This increase in current and decrease in voltage occurs automatically in the telecommunications equipment, so it can continue operating properly. However, the power cable diameters must be sized to accommodate the additional current required in this worst case situation (or List 2 Drain). The List 2 drain is also known as the recommended amperage because it is the amperage level McLeodUSA must order to operate the equipment properly and in accordance with manufacturer's recommendations and safety standards. The recommended amperage is set at a higher amperage level (compared to the amperage that will actually be used by the equipment under normal circumstances) because it takes into account the worst case scenario, such as low voltage during a battery discharge.

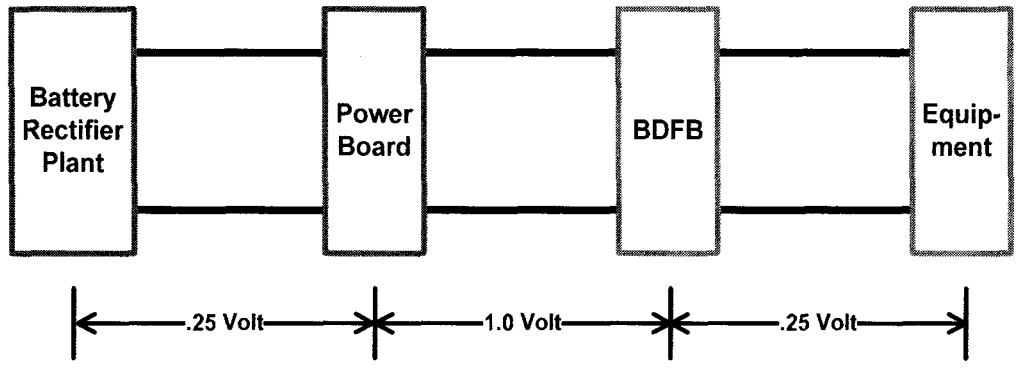
Second, the longer the DC power cable, the greater the voltage drop that will occur, all other factors held constant. This means that, the longer the distribution cable

through which the DC current must travel (measured in feet in the formula), the greater the cables resistance, thereby causing an increased voltage drop from the desired voltage level and corresponding increases in heat.

Third, the larger the diameter of the DC power distribution cable, the lower the voltage drop that will occur, assuming all else equal. That is, if the current has more cable cross-sectional area through which to travel, there is less resistance, thereby causing a smaller voltage drop and less heat.

When sizing power cables, a power engineer, using the formula above, must identify the allowable maximum voltage drop between the BDFB/PB and the telecommunications equipment or CLEC collocation. This allows the engineer to size the smallest diameter power cable based on the cable length that must be traversed with a given amperage. Figure 5 depicts an illustration of a typical voltage drop from the Power Board to BDFB and from the BDFB to the equipment.

Figure 5
Distribution Network Voltage Drops



In sum, the power distribution cables have a measurable resistance across them that must be controlled. This resistance causes a voltage drop that occurs between the DC Power Plant and the telecommunications equipment, which, if not managed, causes heat buildup in the distribution cables, and could lead to fire and/or service outages.

Q. IS THERE ANOTHER FACTOR THAT IS TAKEN INTO ACCOUNT WHEN SIZING DC POWER DISTRIBUTION CABLES?

A. Yes. Importantly, when a collocator orders a DC power distribution arrangement (or DC power cables), the CLEC is not ordering the size of DC power cable that the CLEC needs immediately based on current demand, but rather the size of DC power distribution cable that the CLEC will ultimately require in the collocation arrangement when it matures. This is reasonable because it is extremely costly and risky to routinely re-engineer and physically modify its DC power distribution arrangements (e.g., swapping out power cables or resizing fuses/breakers). These costs and risks can be avoided by sizing the DC power cables for their ultimate demand.

Q. HAVE CENTRAL OFFICE POWER PLANNING PRINCIPLES AND PROCEDURES MATERIALLY CHANGED DUE TO THE INTRODUCTION OF LOCAL COMPETITION?

A. No. The Telecommunications Act of 1996 and the advent of collocated CLECs did not necessitate material changes to the power planning guidelines or procedures that Qwest and other ILECs had used for years prior to that time. The host of Bellcore and Qwest engineering manuals and technical documents I reference above date back prior to 1996 (some going back to 1989), and are still relevant today, which shows that the introduction of collocated CLECs (due to the introduction of competition in local telecommunications markets) did not change the way in which central office DC power is engineered or how DC power plant is sized. Regardless of whether there is one (1) power user or ten (10) power users in a central office, DC power plant is sized based on the List 1 drain of all

telecommunications equipment being powered in the central office, and as such, DC power plants are designed to accommodate loads, and not particular carriers. Therefore, it is truly irrelevant within the context of DC power plant sizing whether the equipment powered is the ILEC's or a CLEC's because the guidelines would be the same under each scenario.

C. Qwest/McLeodUSA DC Power Measuring Amendment and "As Consumed" Versus "As Ordered" Billing

Q. PLEASE DESCRIBE YOUR UNDERSTANDING OF THE INTERCONNECTION AGREEMENT AMENDMENT SIGNED BETWEEN QWEST AND MCLEODUSA RELATIVE TO THE ISSUE OF POWER MEASUREMENT (AND WHICH SERVES AS THE BASIS FOR MCLEODUSA'S COMPLAINT).

A. For McLeodUSA collocation arrangements with power feeds greater than sixty (60) amps, the Qwest and McLeodUSA Amendment[15] requires that Qwest monitor McLeodUSA's DC power usage at the power board on a semi-annual basis (unless otherwise requested by McLeodUSA). Per the terms of the amendment, these measurements support a process whereby Qwest measures and records McLeodUSA's actual power consumption and assesses "Power Usage" charges according to that measured usage. The measured usage rate structure required by the Amendment is in contrast to previous situations wherein Qwest assessed all "Power Usage" elements on an "as ordered," as opposed to "as consumed" basis.

[15] DC Power Measuring Amendment to Qwest/McLeodUSA interconnection agreement.

Q. DO YOU UNDERSTAND THAT ONE OF THE PRIMARY POINTS OF CONTENTION BETWEEN MCLEODUSA AND QWEST IN THIS PROCEEDING IS WHETHER OR NOT THE "POWER PLANT" CHARGE SHOULD BE ASSESSED ON AN "AS CONSUMED" VERSUS AN "AS ORDERED" BASIS?

A. Yes, that is my understanding.

Q. AND DO YOU FURTHER UNDERSTAND THAT THIS PRIMARY ISSUE RESULTS FROM DISPARATE INTERPRETATIONS OF THE SAME POWER MEASURING AMENDMENT?

A. Yes, that is also my understanding.

Q. DO YOU ADDRESS COST-CAUSATION OR ECONOMIC-COST RELATED ASPECTS OF THIS COMPLAINT?

A. No, Mr. Starkey will address those issues in his testimony. However, I do provide through my testimony the engineering foundation upon which Mr. Starkey bases his conclusions related to cost-causation and proper cost recovery.

Q. IS THERE ANY ENGINEERING BASIS FOR MCLEODUSA'S INTERPRETATION OF THE AGREEMENT AMENDMENT?

A. Yes, in fact, I am surprised that any engineer with an understanding of how central office power plant and power distribution infrastructure are designed would interpret the amendment as Qwest is. The key here is to compare how each party recommends the DC power plant usage charge be applied (i.e., Qwest's "as ordered" recommendation or

McLeodUSA's "as consumed" recommendation) to each party's position on how the DC power plant is sized in the central office, and in turn, how Qwest incurs DC power plant costs.

Q. PLEASE SUMMARIZE MCLEODUSA'S VIEW ON "AS CONSUMED" VERSUS "AS ORDERED" BILLING FOR THE DC POWER PLANT USAGE CHARGE.

A. McLeodUSA's "as consumed" recommendation means that the DC power plant usage charge would be applied to the amps that McLeodUSA actually uses, as measured by Qwest pursuant to the terms of the Power Measuring Amendment. Power plant related equipment is sized and constructed based upon the shared usage demands of the entire office, and as such, it is perfectly logical that users who consume more power will pay more, while users who consume less power should pay less (i.e., these costs should be recovered on an "as consumed" basis). Likewise, because power distribution systems are largely dedicated to individual users or groups of users, and must be sized to the original orders of the user, then those costs are legitimately recovered on an "as ordered" basis. I have read the Power Measuring Amendment and I interpret it to provide for exactly this situation.

Q. WHEN QWEST CLAIMS THAT DC POWER *PLANT* IS SIZED ACCORDING TO CLEC ORDERS FOR POWER, WHAT DOES THAT ACTUALLY MEAN?

A. The CLEC power orders that Qwest claims serve as the trigger for DC power plant augments/investment are orders for *DC* power *distribution* (*i.e.*, power cables), and as such, Qwest is saying that DC power *plant* is sized according to orders for power *distribution* cables. Or, in other words, Qwest claims that if a CLEC orders a 175 Amp

power cable to power its collocation cage, Qwest will build 175 Amps of capacity into its DC power plant infrastructure.[16] However, this is not the case, and Qwest is attempting to confuse the two issues of DC power plant and DC power distribution. As was explained above (and will be demonstrated in more detail below through the use of Qwest's own engineering manuals), DC power distribution is sized based on List 2 drain and DC power plant is sized based on List 1 drain. By claiming that DC power plant is sized based on CLEC orders for power distribution (or List 2 drain), Qwest is either misunderstanding or intentionally mischaracterizing its own engineering practices such that they appear to support Qwest's interpretation of the Amendment, wherein Qwest would prefer to continue applying the DC power *plant* usage charge based on ordered amperage for DC power *distribution.* Fortunately, Qwest's engineers who work with power plant on a daily basis document their actual practices in accordance with sound engineering standards and those records refute Qwest's claims in this regard.

In the following section of my testimony, I will demonstrate that Qwest's "as ordered" billing recommendation fails to adhere to Qwest's engineering manuals and guidelines and does not square with positions on DC power expressed by Qwest Arizona's affiliate, Qwest Communications Corporation.

IV. MCLEODUSA'S APPLICATION OF THE DC POWER PLANT RATE ELEMENT IS CONSISTENT WITH THE MANNER IN WHICH DC POWER PLANT IS ENGINEERED

[16] In fact, in Iowa, Qwest witness Robert Hubbard testified that "even 175 amps...will definitely trigger a power plant capacity growth job." Direct Testimony of Robert J. Hubbard, Iowa Utilities Board Docket No. FCU-06-20, March 23, 2006, page 8.

A. It is critical to distinguish the sizing of DC power plant from the sizing of DC power distribution

Q. YOU EXPLAINED ABOVE THAT DC POWER PLANT IS SIZED DIFFERENTLY THAN DC POWER DISTRIBUTION. PLEASE EXPLAIN WHY THIS IS SO, AND HOW THIS IMPACTS MCLEODUSA'S COMPLAINT?

A. I explained that DC power plant is sized by power engineers monitoring the DC power load requirements of the central office at peak capacity – based on List 1 drain - and growing the DC power plant accordingly, and as such, DC power plant is sized according to forecasted actual peak usage of the central office, in terms of the busy hour for that office. DC power distribution cables, on the other hand, are sized based on the List 2 drain, or the power draw of the equipment when the power plant is under a worst case scenario, and is sized based on the ultimate demand for power. This results in a situation whereby the size of the DC power distribution cables (expressed in amperage) ordered by CLECs for their collocations (or "as ordered"amount), exceeds (oftentimes significantly) the DC power actually consumed by their equipment (or "as consumed" amount), which is the level by which the DC power plant is sized.[17] By billing McLeodUSA the DC Power Plant charge on an "as ordered" basis – or on the capacity level by which DC power ***distribution*** is sized - Qwest is attempting to fit a square peg in a round hole. Instead, DC power plant is sized on an "as consumed" basis and, therefore, it would be consistent and appropriate for the DC power plant charge to apply on an "as consumed" basis. In my opinion, therefore, the interpretation of the Amendment by McLeodUSA is correct.

[17] Notably, in the context of collocation, DC power distribution is dedicated to a specific user, while DC power plant is shared among all users in the central office (i.e., Qwest and CLECs alike).

Q. PLEASE DISCUSS IN MORE DETAIL THE CONCEPTS OF LIST 1 DRAIN AND LIST 2 DRAIN?

A. List 1 drain and List 2 drain are industry-standard measurements used to measure the power draw requirements of various types of equipment. As mentioned above, List 1 drain is the busy hour current during normal plant operation. The value is used to size DC power plant, such as batteries and rectifiers. List 2 drain is the peak current under worst case conditions of voltage, traffic etc. This current is used to size power distribution cables, plant discharge capacity and over-current protectors. Generally, List 1 drain corresponds with the "as consumed" capacity (at the peak level), while List 2 drain corresponds to the "as ordered" capacity level. So, restating the problem with Qwest's application of the DC power plant usage charge in terms of List 1 drain and List 2 drain: Qwest is assessing the DC power plant charge based on the List 2 drain, when in reality, List 1 drain defines DC power plant sizing, augmentation and investment. Therefore, assessing the DC power plant charge on a List 2 drain is inconsistent with proper engineering practices. Also, as described above, the List 2 drain significantly exceeds the List 1 drain, which means that Qwest's billing of McLeodUSA for DC power plant based on the higher List 2 drain results in DC power plant charges that significantly exceed the charges that would result from applying the charge to the "as consumed" amperage.

Q. MUST QWEST SIZE DC POWER PLANT BASED ON LIST 2 DRAIN SUCH THAT IN THE CASE OF A CATASTROPHIC EVENT, ITS DC POWER PLANT CAN ACCOMMODATE ALL CARRIERS GOING INTO LIST 2 DRAIN AT THE SAME TIME?

A. No. Qwest does not engineer power plant based on List 2 drain because it would lead to safety hazards (by overheating the power cables) and a significant amount of power plant investment that simply will not be used.

Q. IS QWEST'S ASSERTION THAT QWEST SIZES DC POWER PLANT BASED ON POWER CABLE ORDERS OF CLECS CONSISTENT WITH QWEST'S ENGINEERING REQUIREMENTS AND MANUALS?

A. No, it is not. Qwest's own engineering guidelines and requirements belie Qwest's assertions in this regard. In discovery, McLeodUSA asked Qwest to provide various technical documents used by Qwest's collocation planning and power engineers when they design central offices and their associated power infrastructure.[18] This documentation clearly supports my view of the proper sizing and engineering of DC power systems (both DC power plant and DC power distribution), and directly contradicts Qwest's view.

Q. PLEASE PROVIDE SOME EXAMPLES WHEREIN QWEST'S INTERNAL ENGINEERING DOCUMENTATION SUPPORTS YOUR POSITION AND REFUTES THE POSITION TAKEN BY QWEST.

[18] McLeodUSA Data Request #1 of First Set to Qwest reads as follows: "**Request 1:** Please provide the following Qwest technical documents, or their closest equivalents, used by Qwest collocation planning and power engineers. It is McLeodUSA's understanding that all of these documents were originally produced either by AT&T, Bellcore/Telcordia or US West Business Resources, Inc. and, in some cases, were adapted for Qwest's internal use."

A. Consider "*Qwest Technical Publication: Power Equipment and Engineering Standards*, Technical Document No. 77385, Issue H, September 2003, Copyright 1996, 1998, 1999, 2000, 2001 and 2002."[19]

Chapter 2 of this document entitled "*DC Power Plants and Chargers*" states as follows:

> **2.4 Engineering Guidelines**
> When sizing power plants, the following criteria shall be used:
>
> **List 1** drain is used for sizing batteries and chargers; the average busy-hour current at normal operating voltage should be used. Telephony List 1 drains are measured at 9 ccs or at 18 ccs for the first 2 hours of a discharge and 6 ccs thereafter.
>
> **List 2** drain is used for sizing feeder cables, circuit breakers, and fuses; the current that is required for projected peak under worst operating conditions should be used. Telephony List 2 drains are measured at 36 ccs at -42.75 V for a nominal -48 VDC plant.

On the same page, the engineering manual discusses the sizing of battery plant – a component of DC power plant – as follows:

> BATTERY PLANT SIZING — when a battery plant is initially installed, the meter and bus bar should be provided based on the projected power requirements for the life of the plant. Base chargers and batteries should be provided based on the projected end of engineering interval connected average busy-hour current drains (List 1).

Q. IS THERE OTHER INFORMATION THAT SUPPORTS YOUR VIEW OF DC POWER PLANT SIZING AND DIRECTLY CONTRADICTS QWEST'S VIEW?

A. Yes. Take for example Bellcore's "*DC Distribution*," Technical Document No. 790-100-656, which confirms the information above in Qwest's Technical Publication.

Specifically, Section 2 "Telecommunications Equipment Loads" states as follows:

[19] Provided in response to McLeodUSA Data Request #1b and available at http://www.qwest.com/techpub

722 ***BEGIN CONFIDENTIAL
723
724 [redacted]
725
726
727 [redacted]
728
729
730
731 END CONFIDENTIAL***
732
733 Furthermore, legacy document REGN 790-100-654RG "DC Plant" (published by Qwest)
734 states as follows:

735 ***BEGIN CONFIDENTIAL
736
737 [redacted]
738
739
740 [redacted]
741
742
743 [redacted]
744
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747 END CONFIDENTIAL***
748

749 Another excerpt from Qwest's engineering manuals specifically warns against doing
750 precisely what Qwest is claiming that it does – i.e., size DC power distribution on "as
751 ordered" capacity, or List 2 drain. Qwest technical document REGN 790-100-655G
752 "Batteries" Issue No. 9 dated February 2006 (at page 22) states:

753 ***BEGIN CONFIDENTIAL
754
755 [redacted]
756
757
758
759
760
761
762

[redacted]

END CONFIDENTIAL***

It is concerning that Qwest would advocate a position that its own engineering manuals recommend against and that would create situations of ***[redacted] **END CONFIDENTIAL*****

Another one of these manuals – Bellcore technical document "Power Systems Installation Planning" BR 790-100-652 (at page 5-1) elaborates on a power study procedure used to size DC power systems. First it requires engineers to ***BEGIN CONFIDENTIAL [redacted] **END CONFIDENTIAL*** This document also contains Figure 5-2 which is a flow diagram of a "Power Study Procedure". This flow diagram, which is documentation memorializing he DC power plant sizing exercise I described, shows the following steps to sizing DC power plant (pages 5-4 and 5-5): ***BEGIN CONFIDENTIAL [redacted] **END CONFIDENTIAL*** This manual also includes an example of the graph (see page 6-11, Figure 6-1) that is created ***BEGIN CONFIDENTIAL [redacted]

[redacted]

[redacted]

[redacted]. **END CONFIDENTIAL*****

Q. WHAT DO THESE QWEST ENGINEERING GUIDELINES AND REQUIREMENTS SHOW?

A. The above excerpts from Qwest's own power engineering manuals, individually and taken together, makes several points very clear:

*****BEGIN CONFIDENTIAL**

[redacted]

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All three (3) of these points support my testimony and the position of McLeodUSA.

Q. YOU POINT TO A NUMBER OF ENGINEERING REQUIREMENTS AND MANUALS THAT SUPPORT YOUR VIEW OF THE METHOD FOR SIZING DC POWER PLANT AND DC POWER DISTRIBUTION. DID QWEST POINT TO

ANY ENGINEERING MANUALS, REQUIREMENTS OR OTHER DOCUMENTATION SUPPORTING ITS VIEW IN IOWA OR ELSEWHERE?

A. No and I highly doubt that Qwest will provide any relevant cites to engineering manuals in Arizona either, primarily because there are no engineering manuals or specifications supporting Qwest's notion that DC power plant is sized according to power cable orders – or List 2 drain.

Q. YOU ALSO MENTIONED THAT QWEST'S ASSERTION THAT DC POWER PLANT IS SIZED BASED ON POWER CABLE ORDERS IS INCONSISTENT WITH THE POSITION QWEST'S CLEC AFFILIATE HAS TAKEN ELSEWHERE. PLEASE ELABORATE.

A. Qwest Communications Corporation ("QCC," which is, like Qwest Corp. the ILEC, a direct subsidiary of Qwest Services Corporation)[20] recently sponsored testimony in Illinois Commerce Commission Docket No. 05-0675, which addressed AT&T/SBC Illinois' collocation DC power policy. In the Illinois case, SBC Illinois is attempting to change the way in which it currently assesses collocation power charges and is attempting to convert its existing measured, kWh based charge to a simple per-amp charge, similar to that assessed by Qwest in Arizona. The testimony of the QCC witness (Victoria Hunnicutt-Bisahra) in Illinois undermines Qwest's position, and I have provided Ms. Hunnicutt-Bishara's response and surrebuttal testimony from Illinois as Exhibit SLM-3 to my direct testimony. For instance, Ms. Hunnicutt-Bishara testified as follows in Illinois:[21]

[20] Qwest Services Corporation is a direct subsidiary of the ultimate parent company, Qwest Communications International, Inc.

[21] Surrebuttal Testimony of Victoria Hunnicutt-Bishara, ICC Docket No. 05-0675, March 29, 2006, p. 4.

Q. WHAT IS THE PURPOSE OF THE LIST 1 AND LIST 2 DRAIN SPECIFICATIONS?

A. In the telecommunications industry, List 1 and List 2 drains are the designations of the load current drains. These are used to size various elements of the battery plant. Generally speaking, the List 1 current drain is used to size batteries and rectifiers in the plant. The List 2 current drain is used to size the DC load feeder cables and the circuit protection device (fuse) for the DC power arrangement. The fuse size is also dependent upon the ampacity of the smallest conductor comprising the protected feeder. Protectors should be rated as high as allowable to avoid nuisance tripping due to high load conditions or inrush current during startup."

Ms. Hunnicutt-Bishara also testified in Illinois as follows:

Q. DOES BELLCORE HAVE ANY DOCUMENTATION RELATING TO THE FUSING OF TELECOMMUNICATIONS EQUIPMENT?

A. Yes, in its definition of List 2 drain, Bellcore (previously known as Bell Communications Research, now known as Telcordia) states:

> "These drains are used to size feeder cables and fuses. These drains represent the peak current for a circuit or group of circuits under worst case operating conditions. For example, a constant power load requires maximum current at minimum operating voltage." (footnote omitted)"

The excerpts from QCC's Illinois testimony shows that at least one Qwest–sponsored witness understands that, consistent with Qwest's engineering guidelines, List 1 drain is used to size DC power plant and List 2 drain is used to size DC power distribution. Indeed she cites to the same Bellcore technical document I cited to above ("*DC Distribution*," Technical Document No. 790-100-656) as support for her testimony and attaches this document to her testimony as an exhibit. There is no plausible explanation that Qwest can provide that can square its position in Arizona that DC power plant is

sized based on CLEC power cable orders (or List 2 drain) and its affiliate's testimony in Illinois stating (correctly) that DC power plant is sized based on List 1 drain. Indeed, based on my experience with this same issue in Iowa, I suspect that Qwest Arizona may not even address the concepts of List 1 drain and List 2 drain in its testimony, despite their importance to this proceeding, because when Qwest is forced to concede that DC power plant is sized on List 1 drain and DC power distribution is sized on List 2 drain, Qwest's position in Arizona that McLeodUSA should pay for DC power plant based on List 2 drain is exposed as fatally flawed.

Q. ARE THERE OTHER PORTIONS OF QWEST COMMUNICATIONS CORP.'S TESTIMONY IN ILLINOIS THAT CONFLICT WITH QWEST'S POSITION IN ARIZONA?

A. Yes. In Illinois, Ms. Hunnicutt-Bishara testified that one of the problems with AT&T/SBC-Illinois' position in the Illinois docket was SBC's "false assumption that telecommunications equipment draws power at the maximum load required twenty-four hours a day, seven days a week."[22] Ms. Bishara explained that "[t]his assumption of a maximum and linear power load is erroneous..."[23] In other words, Ms. Hunnicutt-Bishara criticized AT&T/SBC Illinois for assuming in its DC power charge development that Qwest's equipment collocated in AT&T/SBC Illinois central offices draws a maximum load at all times. Instead, Ms. Hunnicutt-Bishara argued that Qwest's CLEC equipment draws power relative to factors associated with busy-hour usage.

[22] Response Testimony of Victoria Hunnicutt-Bishara, Illinois Commerce Commission Docket No. 05-0675, on behalf Qwest Communications Corp., QCC Exhibit 1.0, Public Version, February 2, 2006, p. 8.

[23] *Id.*

Despite the recognition by its affiliate of the falsehood of a maximum 24x7 load, Qwest Arizona is billing McLeodUSA for DC power plant usage as if this continuous, maximum load exists.

Q. IN IOWA, QWEST CLAIMED THAT IT MUST ENGINEER POWER PLANT BASED ON THE AMOUNT OF POWER (DISTRIBUTION) ORDERED BECAUSE QWEST HAS NO IDEA OF HOW FAST THE POWER REQUIREMENTS OF MCLEOD OR ANY OTHER CLEC ARE GOING TO GROW.[24] IS THIS TRUE?

A. No, this is factually inaccurate. Qwest does have an idea of how fast the power requirements of McLeodUSA and other CLECs will grow because CLECs must provide this information to Qwest when ordering and augmenting collocations. For instance, the collocation application form for a collocation new/change/augment contains Section II.F.5, which requires the collocator to provide: (1) a description of the equipment it will collocate, (2) the model numbers of collocated equipment, (3) functionality of collocated equipment, (4) dimensions of collocated equipment and (5) quantity of collocated equipment. Furthermore, Section III.B. of the collocation application form requires the collocator to indicate the quantity of DS0s, DS1s and DS3s the collocator intends to support. Therefore, collocated CLECs keep Qwest well-informed about how fast the power requirements of collocated CLECs are likely to grow.

Q. QWEST ALSO CLAIMED IN IOWA THAT IT MUST ENGINEER DC POWER PLANT AT THE "AS ORDERED" CAPACITY LEVEL BECAUSE EQUIPMENT

[24] See, e.g., Direct Testimony of Robert J. Hubbard, Iowa Utilities Board Docket No. FCU-06-20, March 23, 2006, p. 9, lines 17 – 20.

MODIFICATIONS TO THE POWER PLANT ARE TIME CONSUMING AND IT WOULD TAKE TOO LONG FOR QWEST TO RESPOND TO ACTUAL DEMAND FLUCTUATIONS.[25] IS THIS CORRECT?

A. No. Not only is Qwest made fully aware of the equipment type and amount that is collocated in its central office as well as the expected number of circuits served by that equipment, Qwest is also given ample time to augment its DC power plant should conditions require it. For instance, Section 8.4.3.4.1 of Qwest Arizona's SGAT shows that when certain conditions are met, Qwest has 90 days from receipt of a complete collocation application to provision the request. Accordingly, Qwest cannot be taken by surprise by an increase in usage at a collocation arrangement because it is aware of the equipment the DC power plant is serving, and Qwest is made aware well in advance of any changes to that equipment configuration.

Moreover, demand fluctuations are already accounted for in the proper sizing of DC power plant when it is sized according to List 1 drain. In other words, by sizing DC power plant based on List 1 drain, Qwest is sizing at peak capacity at the busy-hour, which means that all short-term (e.g., daily, weekly, etc.) demand fluctuations are accounted for and can be handled by the DC power plant.

Q. QWEST CLAIMED IN IOWA THAT IF MCLEODUSA ORDERS 175 AMPS OF POWER (OR 175 AMP DISTRIBUTION CABLE), QWEST WOULD DEFINITELY AUGMENT ITS DC POWER PLANT REGARDLESS OF MCLEODUSA'S ACTUAL POWER USAGE. WOULD QWEST ALREADY HAVE THE CAPACITY ON ITS DC POWER PLANT TO PROVIDE

[25] See, e.g., Direct Testimony of Robert J. Hubbard, Iowa Utilities Board Docket No. FCU-06-20, March 23, 2006, page 8, lines 14 – 17.

MCLEODUSA THE POWER USAGE OVER MCLEODUSA'S HYPOTHETICAL 175 AMP POWER CABLE WITHOUT AUGMENTING ITS DC POWER PLANT IN A VAST MAJORITY OF INSTANCES?

A. Yes. McLeodUSA's actual power draw constitutes a very small portion of the total DC power capacity of the central office. Further, as even Qwest concedes, the power requirements of the entire central office are taken into account when sizing the DC power plant infrastructure to serve that central office. Since this DC power plant infrastructure is sized in the aggregate (with spare capacity), individual orders by CLECs for DC power distribution cables should not trigger an investment in DC power plant unless the power plant at that particular location is already nearing an augmentation threshold because of the aggregate demand for power from all users in the central office. Because the relative size of that individual order compared to the aggregate investment in DC power plant would be relatively small, it should have little effect on the ability of the DC power plant infrastructure to serve the power needs of that office. Rather, the power requirements associated with the usage over those cables would be aggregated with the power requirements associated with the usage over all other cables in the central office (as observed relative to the busy hour) to determine the appropriate level of investment in DC power plant. So, when added to the mix, McLeodUSA's hypothetical 175 amp order would require no additional DC power plant augment/investment. This is especially true given that Qwest will monitor the aggregate power requirements of the central office over time and augment DC power plant on a central office-wide basis.

Q. QWEST'S POSITION RESTS ON THE ASSUMPTION THAT QWEST ADDS DC POWER PLANT EQUIPMENT WHEN MCLEODUSA ORDERS POWER

CABLE(S) FOR A COLLOCATION ARRANGEMENT. DOES QWEST ALSO ASSUME THAT QWEST REMOVES DC POWER PLANT EQUIPMENT WHEN MCLEODUSA (OR ANY OTHER CLEC) DECOMMISSIONS A COLLOCATION ARRANGEMENT?

A. No, indeed Qwest specifically states that it does not remove or reduce DC power plant equipment when CLECs decommission collocation arrangements. In response to McLeodUSA data request #5, Qwest responded as follows:

> ***As a rule Qwest does not remove or reduce its Power Plant capacity based on decommissioned collocations.*** However there are instances where Qwest will reassign fuse positions for Battery Distribution Fuse Bays ("BDFB") and Power Boards ("PBD"), based on demand. (emphasis added)

Therefore, what Qwest is saying is that CLEC orders for power distribution cables drive the addition of (and Qwest investment in) DC power plant equipment, but that CLEC requests to decommission collocation (thereby removing collocated equipment and rendering the DC power distribution arrangement to that collocation cage useless) would not trigger the removal of DC power plant equipment. Following Qwest's logic, what would result is an ever-increasing DC power plant capacity that has no relationship to the power requirements of the central office – regardless of whether those "power requirements" are based on List 1 drain as I contend or List 2 drain as Qwest contends.

Furthermore, Qwest's assertion in this regard conflicts again with its engineering guidelines -specifically Bellcore's "Power Systems Installation Planning" manual (at page 6-2), which states that ***BEGIN CONFIDENTIAL [redacted]

[redacted] **END CONFIDENTIAL***** Thus, the busy-hour drain is calculated by Qwest and, in turn, the DC power plant is sized by Qwest, based on equipment in service. Again, this information contradicts Qwest's position which paints a picture of DC power plant being based on CLEC power orders, with Qwest being left "holding the bag" with regard to DC power plant investment when CLECs do not pay for the amperage level of their ordered power distribution cables. What Qwest power engineers actually do is ***BEGIN CONFIDENTIAL [redacted]

[redacted] **END CONFIDENTIAL***** Hence, if CLEC A decommissions its collocation cage, the feeder serving those collocations would not have in-service equipment associated with it, and would therefore not be captured in the List 1 drain or included when sizing DC power plant.

Q. YOU EXPLAIN ABOVE THAT QWEST'S POSITION IS UNDERMINED BY ITS ENGINEERING MANUALS AS WELL AS QWEST EXPERT TESTIMONY IN ILLINOIS. IS QWEST'S POSITION IN THIS CASE ALSO UNDERMINED BY ITS DISCOVERY RESPONSES?

A. Yes. As mentioned above, Qwest's response to McLeodUSA data request number 5 indicates that Qwest does not remove DC power plant equipment when a CLEC decommissions a collocation arrangement. Therefore, following Qwest's logic that DC power plant investment is based on CLEC power cable orders and that Qwest would definitely augment its DC power plant capacity to accommodate a CLEC order for 175 amp DC power distribution cable, if that CLEC subsequently decommissioned its collocation arrangement, there should be 175 amps of DC power plant available for that

central office. If McLeodUSA or another CLEC subsequently requests a collocation arrangement in that office – everything else equal – there should be 175 amps of DC power plant to serve McLeodUSA without any DC power plant augment/addition/investment. According to Qwest, instead of using the available 175 amps of excess power plant freed up by the original CLEC, Qwest would build in another 175 amps of power plant to meet McLeodUSA's request. This would be wasteful and inefficient – not to mention inconsistent with Qwest's engineering guidelines. And this example is conservative because it only assumes one decommissioned collocation arrangement. If we modify the scenario to assume that five (5) CLECs decommissioned collocation arrangements, each with 175 amps of DC power distribution cables, Qwest would apparently ignore the 875 amps of "freed up" DC power plant that it purportedly built to meet the CLECs' power cable orders, and instead, grow the power plant by an additional 175 amps to meet McLeodUSA's request.

Q. HAVE YOU PERFORMED YOUR OWN ANALYSIS OF MCLEODUSA'S "AS ORDERED" AMPERAGE VERSUS "AS CONSUMED" AMPERAGE?

A. Yes. I performed my own analysis of the actual DC power draw requirements of a McLeodUSA collocation site. On February 28, 2006, I visited three (3) McLeodUSA collocation sites in Denver, Colorado: (i) Denver Curtis Park, (ii) Denver Capitol Hill and (iii) Denver South. During these visits, I had an opportunity to take my own measurements of the actual DC power draw of McLeodUSA's collocated equipment and the distribution of that DC current within the collocation cages to the collocated equipment being powered. I then compared these measurements to the amperage of the DC power distribution cables. The results of this comparison show that DC power

distribution capacity for each of these collocation sites significantly exceed McLeodUSA's actual DC power draw at the busy hour.

Q. PLEASE ELABORATE ON THESE POWER MEASUREMENTS?

A. I personally measured the actual current in amperage being delivered from Qwest to these McLeodUSA collocation sites via a Fluke clamp-on meter for both the A and B power distribution leads during the busy-hour period of between 10AM and Noon (exact time of measurements provided below). I then checked the power distribution cable tags at the McLeodUSA mini-BDFBs for the power ratings of each cable. The tags are an installation requirement and state the design capability of the power distribution cables in amperes. The power data collected from the actual power measurements as well as the power distribution cable tags is provided below in Figure 6.

*****BEGIN CONFIDENTIAL**

Figure 6. McLeodUSA "as ordered" versus "as consumed" amperage

Qwest Central Office	"As ordered" Amperage	"As consumed" Amperage	Date & Time of Measurement	% Fused Vs Measured E = C/B
A	B	C	D	E
Denver Curtis Park	[redacted]	[redacted]	2/28/2006 10:31AM	[redacted]
Denver Capitol Hill	[redacted]	[redacted]	2/28/2006 10:52AM	[redacted]
Denver South	[redacted]	[redacted]	2/28/2006 11:48AM	[redacted]

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Q. PLEASE EXPLAIN THE DATA PRESENTED IN FIGURE 6.

A. Column A of Figure 6 provides the name of the Qwest central office in which the McLeodUSA collocation sites I visited reside. Column B is the amperage of the DC power distribution cables ("as ordered" amperage), as taken from the power distribution cable tags, which represents the current distribution capacity to the McLeodUSA collocation cage (i.e., the "as ordered" amount). Column C is the actual measured amperage or "as consumed" power of the McLeodUSA collocation arrangement, as measured by me at the date and time specified in Column D. Finally, Column E represents the percent of total "as ordered" amps that McLeodUSA's collocation was actually using at the time of the power measurement.

Column E of Figure 7 shows that, for each McLeodUSA collocation site, the actual "as consumed" usage is about ***BEGIN CONFIDENTIAL [redacted] END CONFIDENTIAL***of the "as ordered" amperage. In other words, the "as ordered" amount of the power distribution cables exceeds the "as consumed" amount by about ***BEGIN CONFIDENTIAL [redacted] END CONFIDENTIAL***.

Q. DOES DATA EXIST TO SHOW THAT YOUR FINDINGS REGARDING THE DIFFERENCE BETWEEN"AS ORDERED" AND "AS CONSUMED" POWER IN COLORADO, MAY BE CONSERVATIVE FOR ARIZONA?

A. Yes. In response to McLeodUSA DR No. 8, Qwest provided data showing McLeodUSA's busy hour power draw and McLeodUSA's ordered amperage for its power distribution cables by central office. Of the 24 central offices shown on this exhibit, McLeodUSA's busy hour power draw is, on average, about ***BEGIN CONFIDENTIAL [redacted] END CONFIDENTIAL*** of the "as ordered" DC power distribution amperage amount. Or, in other words, the "as ordered" amount exceeds the

"as consumed" amount by more than ***BEGIN CONFIDENTIAL [redacted] END CONFIDENTIAL***. It should be noted that this is an average, and this difference varies by central office.

Q. DO THESE RESULTS INDICATE THAT MCLEODUSA HAS SIMPLY "OVER-ORDERED" DC POWER DISTRIBUTION CAPACITY FROM QWEST?

A. No. Recall that McLeodUSA is required by engineering specifications and manufacturers' requirements to order power distribution capacity at amperage levels that significantly exceed the actual power draw of its collocated equipment at peak periods. In any event, DC power distribution facilities are sized differently and McLeodUSA compensates Qwest for costs related to DC power distribution facilities through separate charges.

B. Proper DC power sizing and engineering supports McLeodUSA's recommended application of the DC power plant usage charge

Q. YOU EXPLAINED ABOVE THAT DC POWER DISTRIBUTION IS SIZED BASED ON LIST 2 DRAIN AND THAT DC POWER PLANT IS SIZED BASED ON FORECASTED ACTUAL PEAK USAGE (OR LIST 1 DRAIN). HOW DOES THIS RELATE TO MCLEODUSA'S COMPLAINT?

A. This shows that there is no relationship between the CLEC's order for power distribution cables and power plant investment/augmentation or the power the CLEC should be required to pay for. Therefore, Qwest's application of the rate for DC power plant needs to recognize the distinction between the ordering of the DC Power distribution network, which sizes the power distribution cables extended into the CLEC collocation

arrangement on List 2 drain, *separately* from the demand for DC Power itself (i.e., List 1 drain). Any connection between the engineered size of the DC Power distribution network and the rate for DC power plant usage is inappropriate and inconsistent with the way in which DC power is sized and consumed. The crux of McLeodUSA's complaint stems from the fact that Qwest is assessing a DC power plant usage charge, based on the "as ordered" amps, when the 2004 DC Power Measuring Amendment and proper engineering practice calls for Qwest to assess this charge based on the actual power consumed (or "as consumed" amps).

Q. DOES THE FACT THAT CLECS ORDER DC POWER DISTRIBUTION CAPACITY BASED ON A HIGHER LIST 2 DRAIN IMPACT QWEST'S DC POWER PLANT PLANNING/AUGMENTS/INVESTMENTS?

A. No. Again, DC power plants are sized based on forecasted actual peak usage, i.e., busy hour for the entire central office, and is not dependent on the size of power cable(s) ordered by a particular CLEC for a collocation. Therefore, the central office engineers observe the peak power draw of the central office as a whole and augment the DC power plant if the peak usage approaches a level that would exceed the current power capacity. DC power plant augments are not driven by individual power cable orders by CLECs (or Qwest).[26] Simply put, Qwest does not plan or augment its power plant based on individual power cable orders of CLECs and hence, its power plant investments are not incremental to those orders (as described in more detail by Mr. Starkey).

[26] Note: a possible exception to this general rule is if Qwest would install an entire switch or major switch addition, or similar, very large-scale equipment addition. My testimony above pertains to the normal, or average, growth in power plant capacity that typically occurs within a central office, the type of growth experienced by McLeodUSA collocated equipment.

Q. WILL QWEST BE FULLY COMPENSATED FOR DC POWER PLANT COSTS IF IT ASSESSES THE DC POWER PLANT USAGE CHARGE ON AN "AS CONSUMED" BASIS INSTEAD OF AN "AS ORDERED" BASIS?

A. Michael Starkey addresses cost recovery in his testimony. However, in Iowa, Qwest has argued against billing DC power usage on an "as consumed" basis, claiming that such a rate structure will result in stranded DC power plant investment. The basic (and erroneous) premise of Qwest's argument is: since CLECs order power distribution cables based on the relatively higher List 2 drain, Qwest must build out its DC power plant to meet these power requirements, and therefore, assessing DC power plant charges based on the relatively lower "as consumed" amperage would result in stranded costs for DC power plant. There is no engineering validity to such an argument.

Q. WHY DO YOU SAY THAT THERE IS NO ENGINEERING VALIDITY TO QWEST'S ARGUMENT?

A. As explained above, ILECs do ***not*** augment the shared DC power plant of their central offices based on the ordered amperage of the power distribution cables, and as such, Qwest would not have augmented (or invested in) its DC power plant based on McLeodUSA's (or any other CLEC's) power cable orders. Accordingly, there is no stranded investment related to billing DC power plant on an "as consumed" basis because this so-called stranded investment was never made in the first place, assuming Qwest is monitoring and sizing its DC power plant consistent with proper engineering practices.

C. Qwest's Power Reduction offering is not a suitable option to billing DC power usage charges on an "as consumed" basis

Q. QWEST OFFERS A "POWER REDUCTION" AMENDMENT THAT CLECS CAN INCORPORATE INTO THEIR INTERCONNECTION AGREEMENTS. QWEST HAS ARGUED THAT THIS AMENDMENT SHOULD ALLOW MCLEODUSA TO MORE CLOSELY ALIGN ITS "AS ORDERED" USAGE WITH ITS "AS CONSUMED" USAGE SO AS TO AVOID THE TYPES OF ISSUES YOU DESCRIBE ABOVE. PLEASE BRIEFLY DESCRIBE POWER REDUCTION.

A. Qwest's "Power Reduction" offering allows CLECs to eliminate or reduce multiple feeds from 60 to zero amps or reduce main feeds from 60 to 20 amps.[27] According to Exhibit A to the Power Reduction Amendment, the work performed by Qwest under the Power Reduction offering includes: changing fuses at the BDFB, changing breakers at the power plant, re-engineering smaller power cables and various other detailed engineering work aimed at re-engineering a CLEC's power *distribution* infrastructure. Qwest has proposed non-recurring charges for Power Reduction of $787 and $1,028 if power cabling changes are not necessary and ICB-based rates for power cabling changes. Apparently, Qwest has offered the Power Reduction offering in order for CLECs to reduce the fused amp capacity of their DC power ***distribution*** infrastructure (i.e., fuses and power cables).

Q. YOU EXPLAIN ABOVE THAT QWEST'S POWER REDUCTION OFFERING PERTAINS TO RESIZING DC POWER *DISTRIBUTION* INFRASTRUCTURE. DOESN'T THE PRIMARY DISPUTE IN THIS PROCEEDING PERTAIN TO QWEST'S RATES RELATED TO ITS DC POWER *PLANT* – NOT DISTRIBUTION – CHARGES?

[27] Qwest DC Power Reduction Amendment, Attachment 1, Section 4.0.

A. Yes, and this underscores the inapplicability of the Power Reduction Amendment and its inability to solve the problem McLeodUSA believed it was solving in signing the Power Measuring Amendment. That is, Qwest is apparently attempting to resolve an issue pertaining to its billing of DC power ***plant*** charges by creating a process (and a costly one at that) for the CLEC to resize its DC power ***distribution*** infrastructure.

Qwest's position is that the Power Reduction offering will allow CLECs to more closely align their "as ordered" capacity in their DC power distribution arrangements and their "as consumed" DC power usage, such that the CLEC could theoretically lower its DC power plant charges. While Mr. Starkey will address the appropriate charges for DC power plant, from an engineering standpoint, the possibility of reducing power charges through the Power Reduction process is riddled with flaws and is not a suitable substitute for assessing DC power plant charges on an "as consumed" basis.

Q. WHAT ARE THE PROBLEMS WITH QWEST'S POWER REDUCTION OFFERING?

A. First and foremost, a CLEC does not want to align its "as ordered" capacity for DC power distribution with the "as consumed" amperage of the DC power plant, which is the stated objective of Qwest's Power Reduction offering. As discussed above, there is no relationship between DC power distribution capacity and DC power plant investment, and Qwest should not attempt to create such a relationship through the Power Reduction offering because doing so could result in refusing DC power distribution arrangements below the level recommended by manufacturers and safety standards. As a result, the most evident problem is that it does nothing to address the problem with the manner in which Qwest assesses its DC power plant charge. Under Qwest's proposal, it would

continue to bill the DC power plant charge on an "as ordered" basis instead of "as consumed." For example, if a CLEC resizes its power distribution arrangement from 60 Amps to 20 Amps, but only uses 8 Amps of DC power, the CLEC is still overpaying for DC power by 12 Amps (instead of the higher overpayment of 52 Amps). Such a situation is still inconsistent with the manner in which DC power plant is sized and would still result in overcharges to McLeodUSA. Furthermore, Qwest's Power Reduction is unnecessary, potentially dangerous, service-affecting and costly.

Q. PLEASE ELABORATE ON WHY QWEST'S POWER REDUCTION OFFERING IS UNNECESSARY, POTENTIALLY DANGEROUS, SERVICE-AFFECTING AND COSTLY?

A. Qwest's power reduction offering is unnecessary because the CLECs to which this offering is geared have already engineered and installed power distribution infrastructure and fused that equipment based on the proper engineering criteria described above. Hence, to subsequently resize the power cables and fuses serves no real useful purpose. For instance, if a CLEC's power cables and fuses are sized for 60 Amps, it makes no sense to reduce the fuse size to 20 Amps, such that the CLEC's power feeds are 60 Amps while the fuses that protect them are 20 Amps. And since power distribution infrastructure is sized for ultimate demand, if a CLEC reduces the rated amperage of its power cables through Qwest's Power Reduction offering (and incurs the costs to resize), the CLEC may find itself in a situation where it must add capacity in the future. This constant resizing of DC power distribution infrastructure based on existing demand is unnecessary and does not comport with good engineering practice.

Such resizing of DC power distribution infrastructure can also be dangerous and service-affecting. Any time power is augmented in the central office for a collocation arrangement, there is a risk of losing power altogether to that collocation arrangement, which, in turn, risks service outages for CLEC customers. For instance, I have explained that CLECs engineer redundancy into their collocation power leads, wherein a collocation arrangement is served by both an "A" lead and a backup "B" lead. If the power for that collocation is switched over to the "B" lead while augmenting the "A" lead or associated fuses, power could be lost in the transition. Further, augmenting power cables within the cable racks in the central office, as would be performed under Qwest's power reduction offering, poses operational risks related to technicians.

Qwest's Power Reduction offering is also costly. According to Qwest, this offering poses both administrative (e.g., Quote Preparation Fee) and engineering costs, and can exceed $1,000 to change a fuse and potentially thousands of dollars to change out a power cable.[28] This is in addition to the internal costs that CLECs would incur to make these changes. Additionally, the CLEC would place their collocation sites at risk for large, additional power charges each time equipment additions are made to the collocation site. In sum, instead of assisting CLECs in managing their power costs, Qwest's Power Reduction offering would likely result in very large power charges to the CLEC for changing power requirements to meet ongoing equipment changes and augments within a particular CLEC collocation site, while at the same time providing no assistance relative to the underlying problem, i.e., Qwest will continue to bill power plant-related charges inappropriately on an "as ordered" as opposed to an "as consumed" basis.

[28] Qwest proposes individual case basis (ICB)-based pricing for this option, so the pricing is not actually known. However, it is reasonable to assume that it will significantly exceed the charges for changing fuses.

Q. DO YOU HAVE OTHER CONCERNS WITH THE POWER REDUCTION AMENDMENT?

A. Yes. Qwest's Power Reduction would force the CLEC to bear all risk associated with this unnecessary and costly work. Section 2.6 of Qwest's DC Power Reduction Amendment states: "CLEC assumes all responsibility for outages and/or impacts to CLEC-provided service and equipment due to the reduction in DC Power." As explained above, there is potential risk of service-affecting problems due to changing out fuses/breakers and replacing power cables – all of which is unnecessary given that the power infrastructure is already in place and working properly – and Qwest's Amendment provides no recourse for a CLEC should a Qwest mistake result in the CLEC's customers being without service. Further, given the power problem would be localized to BDFBs or power cables dedicated specifically to the CLEC (as opposed to the DC power plant shared by the entire central office), the service-affecting problems would only be experienced by the customers of that particular CLEC – not by Qwest's customers or the customers of other carriers.

Q. DID QWEST'S AFFILIATE EXPRESS SIMILAR CONCERNS RELATED TO A "RE-FUSING" PROPOSAL OF AT&T/SBC ILLINOIS?

A. Yes. In the same Illinois case mentioned above, AT&T/SBC Illinois apparently modified a fusing proposal such that instead of fusing at 125% of the ordered amount, it would fuse at 100% of the ordered amount provided that the fuse size is not more than 200% greater than the CLEC's actual usage. Qwest witness Hunnicutt-Bishara's testimony explained QCC's concerns related to AT&T/SBC's fusing proposal as follows:

Q. WHAT ARE YOUR CONCERNS WITH SBC'S MOST RECENT FUSING PROPOSAL?

A. I have three major concerns, among others, with SBC's most recent fusing proposal. These concerns are legal, financial and operational. First, if the DC power arrangements are fused based upon the usage at any point in time, and not the List 2 drain of the load, it is probable that the fusing would not be in compliance with NFPA 70-2005, Article 215.3. As a result, the fusing would violate Administrative Code Part 785.20(b)(1), which obligates companies to abide by NFPA 70. In other words, collocators will be forced to either ignore SBC's fusing limitations or ignore the Commission's electrical and fire safety requirements.

Second, on a financial level, changes in a collocator's power draw (for instance, because it adds cards to an existing, but under-utilized, multiplexer) will require the collocator to pay SBC to re-fuse the collocator's collocation power arrangement. For each power delivery arrangement (a single collocation arrangement may include multiple power delivery arrangements), SBC would charge the collocator an Order Charge of $300.50 (physical caged and shared) or $115.26 (cageless and virtual) and a Power Delivery charge of $1,802.03. Regular or periodic re-fusing – which is unnecessary from a safety perspective and, in fact, inconsistent with national fire protection standards and the Commission's rules – will obviously prove quite expensive for collocators.

Third, on an operational level, the low fusing amperage will make unnecessary and harmful overloads more likely and more common. An overload is an overcurrent that is confined to normal current paths and could occur when a single high amperage device is on a circuit that is marginally sized for the demand. The purpose of overcurrent protection devices is to prevent conductor insulation failure caused by overloads or short circuits. An overload condition would be the result of a marginally fused power feed during a power outage.

Q. WHAT ARE THE IMPACTS OF A BLOWN FUSE TO QWEST COMMUNICATIONS CORPORATION ("QCC")?

A. The impacts of power outages due to a blown fuse are numerous, including but not limited to equipment damage, economic loss due to lost production, and irreparable damage to the reputation of QCC with respect to service reliability.

Q. COULD A BLOWN FUSE REALLY DO DAMAGE TO DIGITAL TELECOMMUNICATIONS EQUIPMENT?

A. Absolutely. Years ago, equipment was not as susceptible to power outages as is the sensitive digital equipment of today. Any equipment containing microprocessors, such as computers and telecommunications equipment, is especially vulnerable to power down via a blown fuse. The May 24, 1999 article in Telephony Magazine Online "CIRCUIT PROTECTION RUNS DEEP" by Dan O'Shea speaks to this issue specifically:

> "The telecom industry's migration to digital networking has taken several years but is now nearly worldwide. The shift to digital networks triggers numerous benefits that affect network efficiency, performance, capacity and reliability. However, one side effect of this trend is the fact that distributed electronics are more sensitive to fuse outages. Also, the migration to new network architectures and equipment means that different network elements are constantly being replaced or installed, brought on-line or taken off-line. This type of situation is conducive to fuse overloads and other potential problems." (footnotes omitted)"

The above excerpt from QCC's testimony in Illinois is relevant because it shows that Qwest Arizona's affiliate shares the same concerns related to AT&T/SBC Illinois' re-fusing proposal (i.e. such proposal is unnecessary, costly, may result in service outages, etc.) as I have about Qwest Arizona's re-fusing proposal. Indeed, Ms. Hunnicutt-Bishara recognizes the disproportionate impacts such re-fusing proposals could have on competitors of the incumbent as follows: "SBC's own equipment – used to serve *its* own retail customers – will likely remain unaffected given that SBC fuses based on List 2 drain, according to SBC's own technical publication." (pg. 9)

Q. WOULD THESE COSTS AND RISKS ASSOCIATED WITH QWEST'S POWER REDUCTION OFFERING OCCUR IF THE COMMISSION ADOPTS MCLEODUSA'S RECOMMENDATION WITH REGARD TO THE DC POWER PLANT CHARGE?

A. No. McLeodUSA believes it has already addressed this issue by signing the Power Measuring Amendment. If the Commission requires Qwest to abide by the terms of that Amendment and apply its DC power plant charge on an "as consumed" basis, the risks, costs and futility of power reduction activities would be avoided.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

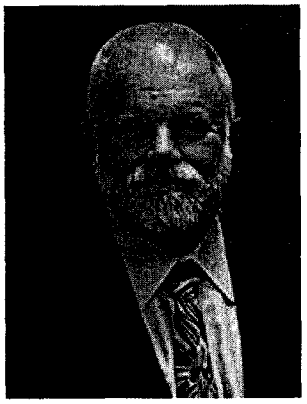
A. Yes, at this time.

Exhibit SLM-1

Curriculum Vitae of

Sidney Morrison

Sidney L. Morrison



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Biography

Mr. Morrison is QSI's Chief Engineer and in charge of QSI's Technical Services Division. Mr. Morrison aids QSI's clients in all aspects of network deployment, maintenance and engineering. Mr. Morrison brings to QSI over 22 years of experience within U S WEST's Network Management group, where he was responsible for managing many of U S WEST's largest and most important network deployment initiatives. He also has nearly 10 years of international consulting experience. Mr. Morrison has engineered and assisted in the deployment of numerous landline communications systems (both copper and fiber based) as well as wireless and microwave platforms within the United States and abroad. Mr. Morrison is a recognized expert in Digital Subscriber Line ("xDSL") technology and has extensive experience in managing, engineering, and deploying digital switching and inter-office networks.

Educational Background

Mr. Morrison's training includes work in applied electrical engineering sciences and business administration from Central Piedmont College in North Carolina and Regis University in Denver.

QSI consulting, inc.

Professional Experience

QSI Consulting, Inc.
2001 - Current
Chief Engineer

DiAx Telecommunications
1999-2000
Senior Consultant
Operations Support Systems

OSP Consultants
1998 – 1999
Technical Consultant

Maxis Communications
1995 – 1997
Senior Manager/Consultant

Expert Testimony – Profile

The information below is Mr. Morrison's best effort to identify all proceedings wherein he has either provided pre-filed written testimony, an expert report or provided live testimony.

Before the State of New Jersey Board of Public Utilities
Docket No. T00060356
In the Matter of the Review of Unbundled Network Elements Rates Terms and Conditions of Verizon – New Jersey
On behalf of WorldCom, Inc.
Direct 2000

Before the Wisconsin Public Service Commission
Docket No. 6720-T1-161
Investigation into Ameritech Wisconsin's Unbundled Network Elements
On behalf of AT&T communications of Wisconsin, TCG Milwaukee, MCI WorldCom, Inc., McLeodUSA Telecommunications Services, Inc., Rhythms Links, Inc., TDS Metrocom, Time Warner telecom, KMC Telecom, Inc.
Direct 2001

Before the Public Service Commission of Wyoming
Docket No. 700000-TA-00-599 (Record No. 5924)
In the Matter of the Application of Qwest Corporation Regarding Relief under Section 271 of the Federal Telecommunications Act of 1996, Wyoming's Participation in a Multi-State Section 271 Process, and Approval of Qwest's Statement of Generally Available Terms and Conditions.
On behalf of Covad Communications Company, Rhythms Links, Inc., New Edge Networks, Inc.
Direct 2001

Before the Arizona Corporation Commission
Docket No.T-000000A-00-0194, Phase II – A
In the Matter of the Investigation into Qwest Corporation's Compliance with Certain Wholesale Pricing Requirements for Unbundled Network Elements and Resale Discounts.
On behalf of WorldCom, Inc.
Direct September, 2001

Before the Public Utilities Commission of the State of Colorado
Docket no. 99A-577T
In the Matter of US WEST Communications, Inc.'s Statement of Generally Available Terms and Conditions

On behalf of Covad Communications Company, Rhythms Links, Inc., New Edge Networks, Inc.
Direct June, 2001

Before the Commonwealth of Massachusetts Department of Telecommunications and Energy
Docket No. D.T.E. 01-20
In the Matter of Investigation by the Department on Its Own Motion into the Appropriate Pricing, Based upon Total Element Long-Run Incremental Costs, for Unbundled Network Elements and Combinations of Unbundled Network Elements, and the Appropriate Avoided Cost Discount for Verizon New England Inc., d/b/a Verizon Massachusetts' Resale Services
On behalf of Allegiance Telecom of Massachusetts, Inc., Covad Communications, Company, El Paso Networks, LLC, and Network Plus, Inc. (collectively called the "CLEC Coalition")
Direct July, 2001

Before the Washington Utilities and Transportation Commission
Docket No. UT-003013
In the Matter of: The Continued Costing and Pricing of Unbundled Network Elements, Transport, Termination and Resale.
On behalf of WorldCom, Inc.
Direct December, 2001

Before the Florida Public Service Commission
Docket No. 990649B-TP
In the Matter of: Investigation into Pricing Unbundled Network Elements.
On behalf of the ALEC Coalition.
Direct January, 2002

Before the Indiana Utility Regulatory Commission
Cause No. 42398
In The Matter, Complaint of Nuvox Communications of Indiana, Inc., Against SBC Indiana Regarding its Unlawful Billing Practices for Collocation Power Charges
On Behalf Of Nuvox Communicatioins Of Indiana, Inc.
Direct Apr, 2002

Before the Indiana Utility Regulatory Commission
Docket No. 40611-S1
In the Matter of: The Commission Investigation and Generic Proceeding on Ameritech Indiana's Rates for Interconnection Service. Unbundled Elements, and Transport and Termination under the telecommunications Act of 1996 and Related Indiana Statutes
On behalf of AT&T Communications of Indiana, GP and TCG Indianapolis, WorldCom, Inc., McLeodUSA Telecommunications Services, Inc.
Direct April, 2002

Before the Indiana Utility Regulatory Commission
Cause No. 42393
In the Matter of the Commission Investigation and Generic Proceeding of Rates and Unbundled Network Elements and Collocation for Indiana Bell Telephone Company, Incorporated D/B/A SBC Indiana Pursuant to the Telecommunications Act of 1996 and Related Indiana Statues.
On Behalf of WorldCom, Inc. ("MCI") McLeodUSA Telecommunications Services, Inc., Covad Communications Company, Z-Tel Communications, Inc.
Direct August, 2003

Before the New Mexico Public Regulation Commission
Utility Case No. 3495, Phase B

In the Matter of the Consideration of Costing and Pricing Rules for OSS Collocation, SharedTransport, Nonrecurring Charges, Spot Frames Combination of Network Elements and Switching
On behalf of the Public Regulation Commission Staff
Direct September, 2002

Before the State of North Dakota Public Service Commission
Case No. PU-2342-01-296
In the matter of: Qwest Corporation Interconnection/Wholesale Price Investigation.
On behalf of US Link, Inc., 702 Communications, McLeodUSA Telecommunications, and IdeaOne Telecom Group
Direct May, 2003

Before the Illinois Commerce Commission
Docket No. 02-0864
In the Matter of: Illinois Bell Telephone Company, Filing to Increase Unbundled Loop and Nonrecurring Rates (Tariffs Filed December 24, 2002)
On Behalf of WorldCom, Inc., McLeodUSA Telecommunications Services, Inc., Covad Communications Company, TDS Metrocom, LLC, Allegiance Telecom of Illinois, Inc., RCN Telecom Services of Illinois, LLC., Globalcom, Inc., Z-Tel Communications, Inc., XO Illinois, Inc., Forte Communications, Inc., CIMCO Communications, Inc.
Direct May, 2003

Before the Michigan Public Service Commission
Case No. U-13531
In the Matter, on the Commission's Own Motion, to Review the Costs of Telecommunications Services Provided by SBC Michigan
On Behalf of MCImetro Access Transmission Services LLC, MCI WorldCom Communications, Inc., and Brooks Fiber communications of Michigan, Inc. ("MCI")
Direct January, 2004

Before the State Of New York Public Service Commission
CASE 02-C-1425
In The Matter, Proceeding on Motion of the Commissioin to Examine the Processes, and Related Costs of Performing Loop Migrations on a More Streamlined (e.g., Bulk) Basic
On Behalf of Conversent Communications of New York, LLC
Rebuttal December, 2003

Before the State Of New Jersey Public Service Commission
Docket No. TO03090705
In The Matter, The Implementation Of the Federal Communications Commission's Triennial Review Order
On Behalf of Conversent Communications of New Jersey, LLC
Rebuttal February, 2004

Before the State Of Rhode Island And Providence Plantations Public Utilities Commission
Docket Nos. 3550 and 2861
In The Matter, Implementation of the Requirements of the FCC's Triennial Review Order ("TRO")
On Behalf of Conversent Communications of Rhode Island, LLC
Rebuttal February, 2004

Before the Maryland Public Utilities Commission
Case No. 8988
In The matter, The Implementation Of The Federal Communicatioin Commission's Triennial Review Order.
On Behalf of Cavalier Telephone, LLC

Responsive February, 2004

Before the Commonwealth Of Massaachusetts Department Of Telecommunications and Energy
D.T.E. 03-60
Proceeding by the Department on its own Motion to Implement the Requirements of the Federal Communications Commission's Triennial Review Order Regarding Switching for Mass market Customers
On Behalf of Conversent Communications of Massachusetts, LLC
Direct February, 2004

Before the Federal Communications Commission, Washington, D.C.
WC Docket No. 04-313, CC Docket No. 01-338
In the Matter of Unbundled Access to Network Elements, Reviewof Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers.
On Behalf of MCI, Inc.
Direct January, 2004

Before the New Mexico Public Regulation Commission
Case No. 04-00237-UT
In The Matter Of The Investigation Of Whether Qwest Corporation Is In compliance With The Amended Alternative Form Of Regulation Plan
On Behalf of The Office Of The New Mexico Attorney General]
Rebuttal November, 2004

Selected Reports, Presentations and Publications

QSI Final Report to the Hawaii Public Utilities Commission "Analysis and Recommendations Related to Docket No. 04-0140 *Merger Application Of Paradise Mergersub, Inc. (n/k/a Hawaiian telecom Mergersub, Inc.), Verizon Hawaii, Inc. and Related Companies*" February 7, 2005

Exhibit SLM-2

Glossary of Power Terms

Power Glossary

The terms defined in this glossary are, in most cases, electrical engineering terms and are defined within that context as well as within the specific context of telecommunications - 48Volt DC Battery Plant engineering practices.

-48 VDC: refers to 48 volts of direct current, which is the voltage required to power most telecommunications equipment.

A/B Distribution: refers to the redundancy built into DC power distribution systems. From the primary distribution system, most power systems rely on two (2) power feeder cables to prevent loss of power for call processing, which are independently protected for power surges or over-current situations. The primary power distribution cable is referred to as the "A" lead and the redundant power cable is referred to as the "B" lead. If the primary "A" lead should fail, the redundant "B" lead should provide uninterruptible power (and vice versa). Each of the two leads (and associated over-current protection) is engineered to provide the total power requirements of the load.[i].

Alternating Current (AC): an electrical current that alternates between positive and negative charged values at regular intervals.[ii] In North America, this is typically delivered by the local power utility to your home at 120 volts[iii].

Ampere or Amp: the measure of the unit quantity of electricity (electrons) moving through an electric circuit in a period of time. An ampere is equal to 6.28×10^{18} electrons (one coulomb) moving past a point in an electrical circuit in a given period of time. One ampere equals one coulomb of electrical energy past a point in one second.[iv]

Ampere-Hour: the capacity rating of a storage batteries' capability to deliver a quantity of electrical current, delivered by one ampere flowing for one or more hours.[v]

Battery: a device providing a source of backup, filtered -48VDC current to telecommunications central office equipment.[vi] Batteries transform chemical energy into electrical energy, and then discharge the electrical energy as electric current. Also referred to as a "cell." Cells are known as galvanic or voltaic cell, and in their simplest form, consist of a piece of carbon and zinc suspended in a container with a sulfuric acid solution.[vii]

Battery Capacity: the energy stored in a battery expressed in ampere-hours. In the telecommunications industry, a typical reference to battery capacity would be expressed in amperes (Amps) for a period of time, usually in hours. See, "Ampere Hour."

Battery Charger: a rectifier used for transforming alternating current into direct current for charging a battery.

Battery Lead: refers to the lead extending from the power plant to the load (or equipment) which, in concert with the ground return and load, comprises the battery circuit. See also, "ground return" and "load".

Battery Discharge: the release of current from a fully-charged battery.

Battery Distribution Board (BDB): DC power plant bays and panels used for distribution of -48VDC to telecommunications equipment or BDFB. The BDB panels consist of discharge fuses, circuit breakers, and switch and fuse units.

Battery Distribution Fuse Bay/Board (BDFB): equipment frames fed by large copper cables from the power board, which are equipped with fuses or circuit breakers that protect power distribution cables and telecommunications equipment from over-current and allow power to be distributed to equipment via smaller, less expensive distribution cables.

Battery Plant: an identifiable group of power equipment consisting of batteries, rectifiers, controllers and distribution bays.

Battery Stand: a racking structure made from metal or other material capable of supporting telecommunications batteries for the purpose of constructing and maintaining a DC power plant.

Bay: a telephone industry term for the space between the vertical panels or mounting strips (or rails) of the rack. One rack may contain several bays. A bay is another place you put equipment.

Bus Bar: copper or aluminum flat bars sized to carry high amperage loads, which are used to connect AC generators, AC feeders, batteries, rectifiers and other high current devices within a power plant.

Busy-Hour: a consecutive 60-minute interval that represents the highest levels of measurement or derived load used in traffic and power engineering within a telephone central office.[viii]

Busy-Hour Drain: the amount of current required by telecommunications equipment over a period of time, usually one hour, at peak usage. See also, "Busy-Hour."

Cable: in the context of power engineering, a cable refers to an insulated copper or aluminum conductor used to carry AC or DC power from one point to another.[ix] In other telecommunications applications, "cable" refers to fiber or copper wires consisting of pairs or groups capable of carrying voice, data, video, etc.[x]

Cable Rack: a metal frame used for overhead support of electrical cables. Also referred to as a ladder rack due to the resemblance to a ladder.

Central Office: a building that houses telecommunications switching, transmission and other telecommunications service-bearing equipment. The central office connects subscribers to telecommunications equipment and provides for connections to other subscribers by using devices such as switches, cables and next generation network elements.[xi]

Circuit: the complete path of an electrical current.[xii]

Circuit Breaker: a device that is utilized to "break" and restore a power circuit. Circuit breakers open (or break) a circuit when a predetermined voltage or current level is exceeded.

Circular Mil (CM): the measure of cross sectional area of a wire.

Collocation: a physical location where a CLEC locates its telecommunications equipment within an ILEC central office, which serves as the point at which the telephone companies hand-off telecommunications traffic to each other. The CLEC can construct a cage within the ILEC central office in which to house and maintain its equipment (physical collocation) or it can install equipment outside of a cage and allow the ILEC to maintain the equipment (virtual collocation). Adjacent collocation is also available.[xiii]

Commercial AC Power: utility-provided alternating current.

Conductivity: the ability of a conductor's substance or material to carry an electric current. This is the opposite of resistance. See, "resistance."

Controller: A device controlling the function of electrical machines or devices connected to it. -48VDC power plants use controllers to manage the performance of rectifiers supplying DC current.

Coulomb: the quantity of electricity transferred by a current of one ampere in one second. One unit of quantity in measuring electricity.[xiv]

Current: a measure of how much electricity passes a point on a wire in a given timeframe. Current is measured in amperes, or amps.[xv]

DC Current: current that is induced by a voltage source that does not change direction from positive to negative.[xvi]

DC Power Distribution: power equipment that is used as the primary distribution point from a DC power plant to telecommunications equipment.

DC Power Plant: power equipment that coverts AC power to DC power and distributes DC power to DC power distribution equipment.

Digital Subscriber Line (DSL): a family of technologies that provide digital data transmission over the wires used in the "last mile" of a local telephone network. The download/upload speed of DSL varies depending on DSL technology and service level implemented.

Digital Subscriber Line Access Multiplexer (DSLAM): a piece of telecommunications equipment that receives signals from multiple customer Digital Subscriber Line (xDSL) connections and aggregates the signals on a high-speed backbone using multiplexing techniques, and with the use of splitters, allows voice (low band) and data (high band) signals to be carried over a copper twisted pair.

Feeder: cables providing current to all of the branch circuits from the main supply of current.

Fuse: an electrical device typically consisting of a wire or strip of fusible metal that melts to interrupt an electrical circuit when current exceeds the rated level of the fuse. The idea is that in any electrical circuit, the fuse should be the weakest point – thus the point that heats up when things go wrong and melts. See also "circuit breaker."[xvii]

Fuse Panel: a distribution panel at the top of the rack that serves each device. To protect the rectifier from an over-current condition, each device has its own fuse.[xviii]

Ground Return: the path of a circuit from the load to the positive ground return of the DC power plant, which in concert with the battery lead and load, comprises the battery circuit. See also, "load" and "battery lead."

HVAC: denotes heating, ventilation and air conditioning systems.

List 1 Drain: the average busy-hour current during normal plant operation (i.e. at float voltage). The value is used to size DC power plant equipment such as batteries and rectifiers.

List 2 Drain: the peak current under worst case conditions of voltage, traffic etc. This current is used to size DC power distribution equipment such as load feeder cables, plant discharge capacity and over-current protectors.

List 3 Drain: the summation of the simultaneous peak drains of the loads on a converter or rectifier, based upon a constant voltage input to the converter or rectifier.

Load: in general terms, the actual work required to be done by a machine. In terms of electricity, it is the current that flows through a circuit to serve the power requirements of one or more pieces of electrical equipment.

Meter: an electrical measurement device that records instantaneous values or cumulative values of electrical parameters, such as voltage, current and power.

Multiplexing: to transmit two or more signals over a single channel. Multiplexing equipment provides the capability of carrying the telecommunications transmissions of a number of devices or users at one time.

Ohm: the unit of electrical resistance.

Ohm's Law: a precise relationship exists between current, voltage and resistance. This relationship is called Ohm's law and is stated as follows:
The current in a circuit is directly proportional to the applied voltage and inversely proportional to the circuit resistance. Ohm's Law may be expressed as an equation:

I=E/R

I = current in amperes

E= voltage in volts

R = resistance in ohms

If any two of the quantities in the above equation are know, the third may be easily calculated.[xix]

Power Board (PB): a component of the DC power plant that serves as the primary distribution point for DC power. Connections to BDFBs as well as connections for high current equipment/collocations (greater than 60 amps in the case of Qwest) originate at this point.

Power Distribution Cable: power cables extending from the BDFB or the Power Board to the telecommunications equipment or collocation arrangement.

Rectifier: a device that serves as a unidirectional conductor for converting alternating current to direct current. The rectifier offers a high opposition to current flow in one direction but not in the other.[xx]

Redundant DC Power Leads See, A/B Distribution.

Relay Rack: open iron work designed to mount and support electronic equipment. A relay rack is to electronic equipment what a distribution frame is to wire.[xxi]

Resistance: opposition to the flow of electric charge and is generally a function of the number of free electrons available to conduct the electric current.[xxii]

Standby Engine: a fuel powered engine (e.g., gasoline, diesel, jet turbine) that drives a power generator for the purposes of providing a backup AC power source to replace or supplement utility-supplied AC power.

Voltage: the force that causes electrons to move in a conductor as an electric current. Measured in volts. When a difference in potential exists between two charged bodies that are connected by a conductor, electrons will flow along the conductor.[xxiii]

Watt: a basic unit of power. It is equal to the voltage across a circuit multiplied by current through the circuit. This represents the rate at any given instant at which work is being done in moving electrons through the circuit.[xiii] The formula for watt is $P = E \times I$, where: "P" represents power in watts, "E" represents voltage in volts, and "I" represents current in amperes.

FOOTNOTES

[i] Telcordia Technologies, Notes on the Network Technologies Special Report SR-2275, Issue 4, October 2000, Section 9.3.2, page 9-21.

[ii] Basic Electricity, prepared by the Bureau of Naval Personnel, Dover Publications, Inc., New York, page 159.

[iii] Newton, Harry. Newton's Telecom Dictionary, 21st Updated and Expanded Edition, CMP Books, San Francisco, page 39.

[iv] Basic Electricity, prepared by the Bureau of Naval Personnel, Dover Publications, Inc., New York, page 32.

[v] Newton, Harry. Newton's Telecom Dictionary, 21st Updated and Expanded Edition, CMP Books, San Francisco, page 63.

[vi] Newton, Harry. Newton's Telecom Dictionary, 21st Updated and Expanded Edition, CMP Books, San Francisco, page 107.

[vii] Basic Electricity, prepared by the Bureau of Naval Personnel, Dover Publications, Inc., New York, page 34.

[viii] Telcordia Technologies, Notes on the Network Technologies Special Report SR-2275, Issue 4, October 2000, Section Glossary- 41.

[ix] Clayton, Jade. McGraw-Hill Illustrated Telecom Dictionary, McGraw-Hill, New York, 1998, page 66.

[x] Newton, Harry. Newton's Telecom Dictionary, 21st Updated and Expanded Edition, CMP Books, San Francisco, page 144.

[xi] Newton, Harry. Newton's Telecom Dictionary, 21st Updated and Expanded Edition, CMP Books, San Francisco, page 172.

[xii] Basic Electricity, prepared by the Bureau of Naval Personnel, Dover Publications, Inc., New York, page 458.

[xiii] Clayton, Jade. McGraw-Hill Illustrated Telecom Dictionary, McGraw-Hill, New York, 1998, page 96.

[xiv] Newton, Harry. Newton's Telecom Dictionary. 20th Ed., CMP Books, San Francisco, page. 212.

[xv] Newton, Harry. Newton's Telecom Dictionary. 20th ed., p. 219.

[xvi] Clayton, Jade. McGraw-Hill Illustrated Telecom Dictionary, McGraw-Hill, New York, 1998, page 120.

[xvii] Newton, Harry. Newton's Telecom Dictionary, 20th ed., page 356.

[xviii] Newton, Harry. Newton's Telecom Dictionary, 20th ed., page 356.

[xix] Basic Electricity, prepared by the Bureau of Naval Personnel, Dover Publications, Inc., New York, page 58.

[xx] Basic Electricity, prepared by the Bureau of Naval Personnel, Dover Publications, Inc., New York, page 270.

[xxi] Newton, Harry. Newton's Telecom Dictionary, 20th ed., page 694.

[xxii] Newton, Harry. Newton's Telecom Dictionary, 20th ed., page 698.

[xxiii] Basic Electricity, prepared by the Bureau of Naval Personnel, Dover Publications, Inc., New York, page 27.

Exhibit SLM-3

Testimony of
Qwest Communications Corporation
Witness Victoria Hunnicutt-Bishara
In ICC Docket No. 05-0675

BEFORE THE ILLINOIS COMMERCE COMMISSION

Docket No. 05-0675

RESPONSE TESTIMONY OF

VICTORIA HUNNICUTT-BISHARA

FOR

QWEST COMMUNICATIONS CORPORATION

QCC Exhibit 1.0

PUBLIC VERSION

FEBRUARY 2, 2006

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Victoria S. Hunnicutt-Bishara. My business address is 1801 California St. #4760, Denver, Colorado.

Q. PLEASE STATE YOUR EMPLOYER AND POSITION.

A. I am employed by Qwest Services Corporation as a senior technical analyst in the Public Policy department.

Q. PLEASE DESCRIBE YOUR EDUCATION BACKGROUND AND TELECOMMUNICATIONS EMPLOYMENT EXPERIENCE

A. I have a Bachelor of Science in Electrical Engineering from the University of Virginia. I have taken numerous telecommunications seminars and classes including graduate courses in Telecommunications Management. I have been employed by Qwest (formerly, US West) since 1998. My original position was with the transport modeling team in the Pricing and Regulatory Matters department as a Cost Analyst. In 1999, I assumed responsibility for the Collocation Cost Model, programming the model and producing the cost studies for the various Qwest Corporation cost dockets. In 2003, I began working with the loop modeling team working with the loop model and creating documentation for the Qwest Corporation loop program, LoopMod. In 2004, I began work as a technical analyst and developer in the Public Policy department. Presently, my responsibilities

include technical and cost analyses, as well as providing subject matter expert support on collocation issues in regulatory proceedings.

Q. HAVE YOU EVER FILED TESTIMONY FOR QWEST COMMUNICATIONS CORPORATION BEFORE?

A. No, I have not previously filed testimony for Qwest Communications Corporation ("QCC").

Q. YOU MENTIONED BOTH QWEST CORPORATION AND QCC. PLEASE BRIEFLY DESCRIBE THE RELATIONSHIP BETWEEN THE TWO COMPANIES.

A. Qwest Corporation is the ILEC in a fourteen state region occupying most of the western and northwestern United States. Qwest Corporation has no business operations in Illinois, and is not participating in this proceeding. QCC is an interexchange carrier, operator services provider and a CLEC. QCC is certificated to provide telecommunications services in Illinois. QCC is collocated in **[BEGIN CONFIDENTIAL]** XX **[END CONFIDENTIAL]** SBC Illinois ("SBC") central offices, and provides both facilities-based and resold services in competition with SBC and others in Illinois.

Qwest Corporation and QCC are both direct subsidiaries of Qwest Services Corporation, which is a direct subsidiary of the ultimate corporate parent company, Qwest Communications International Inc.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to demonstrate that, contrary to SBC's testimony, the proposed SBC collocation tariff modifications will not be revenue neutral or anywhere near revenue neutral to SBC or cost neutral to CLECs in Illinois. Instead, I would fully expect CLECs to incur far greater collocation power consumption expenses and SBC to obtain far greater revenue. I expect that revenue shift will far exceed the 38% under-billing SBC claims in its testimony. It certainly will for QCC, as I illustrate below.

I have organized the main body of my testimony into two sections. The first illustrates the net effect of the SBC proposal on QCC, and demonstrates that the proposal is far from revenue or cost neutral. The second substantive section provides explanation, from a technical perspective, why the simple conversion from kilowatt hours ("kWh") to Amps would not be revenue neutral in this case. In this latter section, I discuss the different types of power loads using, for illustrative purposes, common electrical equipment with which most of us are familiar. In addition, I have included an example using equipment specific to the telecommunications industry.

II. <u>THE SBC PER AMP PROPOSAL WILL NOT BE COST OR REVENUE NEUTRAL.</u>

Q. DOES SBC ARGUE THAT ITS PER AMP PROPOSAL WILL BE REVENUE NEUTRAL?

A. Yes, SBC does claim this. Specifically, at page 7 of her Direct Testimony, SBC witness Stephanie Brissenden describes the proposal as doing "nothing to alter the level of the

approved per KWH cost; it merely converts an existing approved cost (per KWH) to a different unit of measure (per amp)." She then states, "[t]here is no increased SBC Illinois cost being attributed to CLECs' power usage with this simple conversion proposal...[which] will result in a neutral net effect, from a cost perspective, to both the CLECs and SBC Illinois."

Q. DO YOU AGREE WITH MS. BRISSENDEN THAT THIS "SIMPLE CONVERSION" WILL BE REVENUE AND COST NEUTRAL?

A. No, I do not agree. SBC's conversion proposal will be far from revenue or cost neutral to the CLECs or SBC Illinois, and will significantly advantage SBC to the detriment of, not only QCC, but, presumably, all CLECs relying on SBC collocation in Illinois. In fact, SBC claims that the power metering units ("PMUs") it designed and installed currently under-measure DC power consumption by ***36% or 38%*** on average.[1] Yet, SBC's conversion proposal would increase QCC's DC power costs ***over 8900%*** if QCC makes no changes to its current power requests and ***approximately 2700%***, even if QCC takes advantage of SBC's power fuse reduction offer.[2] The calculations associated with these increases are discussed in greater detail below.

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[1] *See* Direct Testimony of Jeanne Muellner, SBC Illinois Exhibit 4.0, at 15 ("Leakage current is present in CLEC collocation arrangements. The leakage ranged as high as 90% and averaged 38%"); SBC Revised Response to QCC Data Request 2.19 ("As stated in the direct testimony of Mr. Parker [citation omitted], AT&T Illinois relies on the 2002 Superior central office study (36%) when estimating its revenue shortfall.").

[2] Proposed Tariff Ill. CC. No. 20, Part 23, Section 4.1.C.18-C.20 (Original Sheet 31.6).

Q. CAN YOU QUANTIFY THE COST IMPACT ON QCC OF SBC'S PER AMP PROPOSAL?

A. Yes, I can. The SBC rate conversion proposal would result in QCC's power consumption charges increasing by anywhere from 2700% to 8900%. These calculations are broken down more specifically in Schedule VHB-1, attached.

The wide range of the increase (2700% to 8900%) will depend upon to what extent QCC is able to alter its power request from SBC in the various central offices. As Schedule VHB-1 illustrates, QCC currently has ordered DC power ranging from [BEGIN CONFIDENTIAL] XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXX.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX[3] XXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

[3] The Commission should bear in mind that QCC invested significant sums to obtain and build out its collocation spaces. Decommissioning involves significant expense, as can fuse reductions and subsequent fuse expansions. Prematurely decommissioning or downsizing sites, when QCC has no firm business plans to abandon service in a particular wire center, is not economically reasonable, especially given the cost QCC will have to incur to subsequently increase its power order should it choose to expand service from that wire center.

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Q. WON'T THE INCREASED RECURRING CHARGES YOU PREDICT FOR QCC SIMPLY COVER THE AMOUNT SBC STATES ITS PMUS ARE UNDERMEASURING TODAY?

A. No, QCC's increased cost will far exceed the amount SBC claims it is losing as a result of current leakage. As noted above, SBC claims (based on the study conducted by Ms. Muellner and the earlier Telcordia study SBC commissioned) the PMUs are under-measuring, thus, SBC is under-billing, DC power consumption by 38%. Actually, SBC's own evidence seems to cut that percentage dramatically. In its conclusion, the Telcordia study describes the DC leakage issue as follows, **[BEGIN CONFIDENTIAL]** XXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXX[4] **[END CONFIDENTIAL]** Completely leaving aside how indefinite, imprecise, and equivocal Telcordia's leakage findings appear to be, SBC's own evidence suggests (even if the Commission agrees that a leakage problem exists and leads to 36% or 38%

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[4] *See* Direct Testimony of Marvin Nevels, Schedule MN-6, at 26.

under-measurement where leakage occurs), the average under-billing should be found to be no more than **[BEGIN CONFIDENTIAL]** XXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXX **[END CONFIDENTIAL]** The net effect of SBC's proposal on QCC will obviously dwarf SBC's alleged measure of under-billing, to the extent the Commission believes SBC has supported its claim of DC leakage.

Q. DID SBC SUGGEST OR EVEN EXPLORE ANY ALTERNATIVE SOLUTIONS TO THE ALLEGED LEAKAGE PROBLEM PRIOR TO FILING ITS PER AMP PROPOSAL?

A. Apparently, SBC did not explore, nor consider, alternative solutions. No alternatives were identified in SBC's testimony and, in discovery, SBC failed to identify whether it even considered any alternative fixes to the leakage issue on which this proceeding is based.[5] SBC seems to have ignored the simplest, least disruptive and most obvious fix, specifically, the addition of a factor to the monthly recurring charge for power consumption. If, for example, the Commission finds that SBC has proven the PMUs under-measure DC power consumption by 36%, SBC could eliminate the problem entirely, without any undue increased cost for CLECs or SBC, by increasing the recurring charge for power consumption from $.28 per kWh by 36% to $.38 per kWh. As mentioned above, it appears, from SBC's own direct case, there is at most a **[BEGIN CONFIDENTIAL]** XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXX **[END CONFIDENTIAL]** This simple solution would permit SBC to recover all future lost revenue without fundamentally shifting the power billing methodology in Illinois from a usage-based system to a capacity-based system.

III. A BASIC UNDERSTANDING OF POWER REQUIREMENTS EXPLAINS WHY SBC'S PROPOSAL IS NOT REVENUE OR COST NEUTRAL.

Q. IN THE SECTION ABOVE, YOU INDICATED THAT QCC'S POWER COSTS WOULD DRAMATICALLY INCREASE, EVEN IF QCC TAKES ADVANTAGE OF SBC'S POWER FUSE REDUCTION PROPOSAL. HOW IS THAT POSSIBLE IF SBC IS SIMPLY SUGGESTING A CONVERSION FROM ONE UNIT OF MEASURE TO ANOTHER?

A. Understanding the answer to this question is really the key to understanding why SBC's "simple conversion" from per-kWh to per-Amp measurement is anything but a simple conversion without revenue and cost impacts. Underlying SBC's incorrect assertion that its proposal will be revenue and cost neutral is the false assumption that telecommunications equipment draws power at the maximum load required twenty-four hours a day, seven days a week. This assumption of a maximum and linear power load is erroneous, as I will explain below.

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[5] SBC's response to QCC Data Request 1.16.

Q. AS BACKGROUND, PLEASE BRIEFLY EXPLAIN THE BASIC CONCEPTS PERTAINING TO TELECOMMUNICATIONS EQUIPMENT POWER.

A. The power purchased from the electric utility is Alternating Current (AC). After the AC power reaches the telephone company's central office, it is converted to Direct Current (DC). It is DC power that is delivered to the collocation sites in the central offices to power CLECs' telecommunications equipment. Power, measured in Watts, is comprised of Voltage and Current. Power is equal to Voltage times Current. Voltage is measured in Volts (V). If the voltage is Direct Current (DC), as with the batteries and telecommunications equipment, the unit of measurement is VDC. Telecommunications equipment generally requires (nominally) -48 VDC. Current is measured in amperes (Amps). The measure of power consumed over time is Watt-hours. Since the measurement is taken over time, a large number of Watts can be consumed. To keep the numbers manageable, wattage is typically divided by 1000 and "kilo" is added to the unit of measure: 1000-Watt-hour, or kilowatt-hour, or kWh. The kWh is equivalent to one kilowatt (1 kW) of power expended for one hour of time.

Equipment power specifications generally list recommendations for the power, the voltage, and the amperage. Below is an example of how a power specifications list might look:

- Recommended Input Voltage: -48 VDC
- Acceptable Input Voltage Range: -40 to -56.7 VDC
- Maximum Power Consumption: 1060 W

- Recommended Amperage: 30 A

Q. DOES ALL ELECTRICAL EQUIPMENT CONSUME POWER AT A CONSTANT RATE?

A. No, all electrical equipment does not draw power at a constant rate, although some does. Devices such as incandescent light bulbs, toasters, and heating devices are classified as resistive loads, or constant loads. A "load", as used here, is a device that consumes power. Generally speaking, these loads will consume power at a constant rate. The rated power of a resistive device, in Watts, is the amount of power the device will typically consume. For example, a 60 Watt light bulb will draw the rated power of 60 Watts at a constant rate while lit.

Other electrical equipment, such as household appliances, computers and telecommunications equipment are reactive loads.[6] These power loads are non-linear, meaning they do not consume power at a constant rate. For these types of electrical equipment, the running loads may be small compared to the starting load (i.e., the load when the equipment is initially started up). The required starting power of reactive loads can be many times higher than the running load.

[6] See, for example, *www.simplexdirect.com/LoadBank/types.html*.

Q. PLEASE CLARIFY THE DIFFERENCE BETWEEN A REACTIVE LOAD AND A RESISTIVE LOAD.

A. For ease of reference, I will use common, household examples. The light bulb, a resistive load mentioned above, requires no additional wattage (power) for lighting. The running wattage requirements are as indicated on the bulb. With the exception of a dimmer, the intensity of the light remains constant as does the power the light bulb consumes. For the light bulb, the startup load and the running load are the same. So, if one were to order power for this light bulb, the rated wattage on the bulb could be ordered.

On the other hand, a refrigerator is an example of a reactive load. Its running power requirement is approximately 700 Watts with an additional starting wattage requirement of 2200 Watts. The power load of the refrigerator will vary after startup depending on such variables as the outside temperature, how full the refrigerator is and how many times the refrigerator door is opened. If you stand by the refrigerator long enough, you will hear when the variations in the power load occur as it kicks on and off to maintain the preset internal temperature. As the outside temperature rises, more power is required to maintain the preset internal temperature.

Q. IS THERE A DIFFERENCE BETWEEN THE MANUFACTURER'S RECOMMENDED AMPERAGE, THE MAXIMUM POWER CONSUMPTION AND THE POWER ACTUALLY CONSUMED BY ELECTRICAL EQUIPMENT?

A. Yes, there is. Since reactive loads do not consume power at a constant rate over time, there can be a significant difference among the recommended amperage, maximum power

requirements for the equipment, and the actual power consumed during normal operations. Today, CLECs pay SBC Illinois for actual power consumed. Under SBC's proposal, CLECs would pay SBC for the combined recommended amperage of all the equipment installed in its collocation space. Let me explain the differences among recommended amperage, maximum power requirements and actual power consumed.

The recommended amperage is the manufacturer's recommended power level the power plant must be provisioned to deliver to the equipment for proper operation of the equipment. In other words, the recommended amperage is the power level QCC must order to operate the equipment properly. The recommended amperage is a higher number than the maximum power consumption to provide a necessary buffer at startup or at very low voltage during a long battery discharge.

The maximum power consumption, a lesser number than the recommended amperage, represents the expected maximum amount of power the equipment would draw when operating fully provisioned and experiencing its maximum usage under normal operating conditions. For example, in the case of a multiplexer, maximum power consumption would be expected to occur when all card slots are filled and the traffic through each card is operating at its maximum.

The actual power consumed, a lesser amperage than the maximum power consumption, would vary over time with the configuration of the equipment, as well as the usage, or traffic as in the case of the multiplexer mentioned above.

SBC's own technical publication (Tech Pub: SBC-TP-76400: Detail Engineering Requirements, dated November 10, 2005) recognizes the need to provision and fuse power for SBC's own telecommunications equipment at a power level higher than the equipment actually consumes during normal operating use. An excerpt of that technical publication (Section 12, page 12-11, section 6.3.1) is attached as Schedule VHB-2. The List 2 current drain, which is synonymous with recommended amperage, is the level of fusing required by the equipment manufacturer to take into consideration the worst case current drain. The power distribution cables must be fused at this level for overcurrent protection.

Q. USING TELECOMMUNICATIONS EQUIPMENT, CAN YOU STEP THROUGH THE POWER SPECIFICATIONS MENTIONED ABOVE AND HOW THEY RELATE TO THE POWER CONSUMED AND THE POWER ORDERED?

A. Yes, with the background provided above, I will return the example of the multiplexer. A multiplexer is a device commonly used in telecommunications applications. The multiplexer enables a number of communications signals to be combined into a single broadband signal and transmitted over a single circuit. When the single broadband signal

reaches its destination, it can be dissected into the original signals, preserving the integrity of each separate signal.

One example of a multiplexer is the Cisco ONS 15454 (formerly known as Cerent 454) platform. The Cisco ONS 15454 combines Internet Protocol (IP) over Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) with Asynchronous Transfer Mode (ATM), Frame Relay and Time Division Multiplexing (TDM). The unit contains a 240 Gbps (gigabits per second) shelf with multiple, general-purpose card slots for interfaces from DS1 to OC-192. Stated another way, the Cisco ONS 154545 is a fast, multipurpose piece of telecommunications equipment with multiplexing capabilities.

According to the technical specifications for the ONS 15454, the manufacturer's recommended power requirements (referred to as the Recommended Amperage) for proper operation of the device is 30 Amps. To order the required power accurately commensurate with the power requirements of QCC's collocated equipment, QCC would have to order power at a minimum of 30 Amps for this single piece of equipment. The Maximum Power Consumption for the same system is 1060 Watts. The 1060 Watts of power equates to 20 Amps at a normal central office operating voltage of -52.8 VDC.[7] Please note, the Recommended Amperage (30 Amps) is a 50% increase over the Maximum Power Consumption (20 Amps), even assuming the equipment is running at maximum operating power consumption twenty-four hours a day, seven days a week.

[7] Amps (20) = Watts (1060) / Volts (52.8).

Q. USING THE ONS 15454 EXAMPLE ABOVE, PLEASE DISCUSS HOW THE POWER ORDERED COMPARES TO THE POWER ACTUALLY CONSUMED.

A. The ONS 15454 can be configured in a number of different ways depending on the cards installed. The operating power load will vary with the cards installed in the shelf and the traffic on the cards. The ONS 15454 would be operating at its Maximum Power Consumption (20 Amps) when the shelf is fully carded and usage is at its maximum. Based on QCC's experience with this equipment, traffic variations through the shelf can result in a 20% swing in power consumption, thus reducing the operating power load from the 20 Amp Maximum Power Consumption to around 16 Amps.

To summarize, based on the technical specifications of the ONS 15454 and the usage of the shelf, the operating semi-continuous power load operates around 16 Amps for extended periods of time. This does not take into account the lesser loads that would be consumed when the shelf is not fully carded and utilized. Yet, QCC would be required, under SBC's proposal, to order and pay for power for this equipment at a minimum of 30 Amps. The provisioned amperage (30 Amps) required to operate the equipment properly, as recommended by the manufacturer, is nearly twice the amperage of the average operating power load (16 Amps) when fully carded and utilized.

This disparity is even more dramatic in the event QCC is using equipment in a given collocation site at less than its full capacity. If, for instance, QCC is serving fewer

customers than it has in the past (or hopes to in the future) from a particular central office, its average power draw will be less than 16 Amps. Nevertheless, because SBC's proposal will require collocators to pay for all recommended amperage and will not in any way discount the per-Amp charge to reflect the reality that telecommunications equipment does not constantly draw power at that recommended amperage, the proposal will result in QCC paying as if the equipment were drawing 30 Amps twenty-four hours a day, seven days a week. It is for this reason that SBC's "simple conversion" proposal is not revenue neutral for SBC and not cost neutral for CLECs.

The disparity among recommended amperage, maximum power consumption and actual power consumed is not limited to the Cisco multiplexer. I have attached as Schedule VHB-3 a case study performed by Convergence IP Technology (a systems integrator and managed services provider) describing the technical specifications of two Fujitsu multiplexers. On pages 3 and 5 of Schedule VHB-3, under the heading "Power Consumption," Convergence distinguishes between the "maximum" power consumption and the significantly lower "typical" power consumption. This case study indicates that, during Convergence's testing, one Fujitsu multiplexer *typically* ran 21% below its maximum power consumption, while the other Fujitsu multiplexer *typically* ran 73% below its maximum power consumption.

IV. CONCLUSION

Q. WILL YOU PLEASE SUMMARIZE YOUR TESTIMONY?

A. Yes, I will. My testimony establishes that, contrary to Ms. Brissenden's testimony for SBC, the SBC proposal will not be revenue neutral or anywhere near revenue neutral to SBC or cost neutral to CLECs in Illinois. Instead, CLECs will incur far greater collocation power consumption expenses and SBC will obtain far greater revenue. This significant shift will occur because, while SBC characterizes its proposal as a simple conversion from one unit of measure (kWh) to another (Amp), the per-Amp methodology will greatly benefit SBC by allowing it to bill CLECs for power not actually consumed. This will lead to a dramatic increase in expense for CLECs and a dramatic increase in revenue for SBC in Illinois. If SBC is truly concerned its PMUs are under-measuring DC power consumed by CLECs by 36%, it could have simply recommended that the monthly recurring charge of $.28 per kWh be increased by 36%. Instead, SBC proposed a change in methodology that will increase CLEC costs, in QCC's case, between 2700% and 8900%.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

BEFORE THE ILLINOIS COMMERCE COMMISSION

Docket No. 05-0675

SURREBUTTAL TESTIMONY OF

VICTORIA HUNNICUTT-BISHARA

FOR

QWEST COMMUNICATIONS CORPORATION

QCC Exhibit 1.1

March 29, 2006

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME.

A. My name is Victoria Hunnicutt-Bishara.

Q. ARE YOU THE SAME VICTORIA HUNNICUTT-BISHARA WHO SUBMITTED RESPONSE TESTIMONY IN THIS DOCKET ON FEBRUARY 2, 2006?

A. Yes, I am.

Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A. My testimony responds primarily to the testimony of SBC witness Roman Smith. Specifically, I will address SBC's new fusing proposal.

II. SBC'S NEW FUSING PROPOSAL

Q. IS MR. SMITH'S REBUTTAL TESTIMONY REGARDING FUSING CONSISTENT WITH HIS DIRECT TESTIMONY ON FUSING?

A. No, it is not consistent. It appears SBC has revised its original fusing proposal.

Q. HOW DOES MR. SMITH'S REBUTTAL TESTIMONY MODIFY SBC'S FUSING PROPOSAL?

A. In his direct testimony, Mr. Smith stated, "Pursuant to its internal engineering practices, SBC Illinois plans to fuse the power leads at least **125% of the requested amount** in order to build in a margin for growth. This is an internal practice; it is not a requirement." [emphasis added] (Page 12, lines 256-258)

In his rebuttal testimony, Mr. Smith states, "AT&T Illinois is willing to maintain existing fuses provided they are no greater than 100% of the capacity of the power cable and provided that the fuse size is not more than **200% of actual usage** specified by the CLEC." [emphasis added] (Page 11, lines 196-198) Originally, SBC was proposing to size the fuse for the power leads at 125% of the request amount. In the revised proposal, the fuse size is limited by "actual usage."

Q. IS SBC'S MODIFIED FUSING PROPOSAL FOR CLECS CONSISTENT WITH SBC'S OWN ENGINEERING REQUIREMENTS WITH RESPECT TO FUSING FOR ITS OWN EQUIPMENT?

A. No, it is not. SBC's internal engineering requirements, as set out in SBC's own technical publication (SBC-TP-76400, dated November 11, 2005)[1] direct SBC personnel to determine the minimum fuse size based on the List 2 Drain, not usage. Specifically, "Overcurrent[2] protection (fuses or circuit breakers) and secondary distribution cables are sized using List 2 current drain. List 2 current drain represents the peak current for a circuit under worst-case operating conditions." (Section 6.3.1, page 12-11).

Q. IS SBC'S MODIFIED FUSING PROPOSAL FOR CLECS CONSISTENT WITH NATIONAL FIRE SAFETY STANDARDS?

A. No, SBC's fusing proposal is not consistent with National Fire Protection Agency ("NFPA") Code 70:National Electrical Code ("NEC"). Section 215.3, Overcurrent

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[1] An excerpt from SBC-TP-76400 is attached to my surrebuttal testimony as Schedule VHB-4.

[2] Overcurrent is a condition which exists on an electrical circuit when the normal load current is exceeded. Overcurrents take on two separate characteristics - overloads and short circuits.

Protection (page 99), of the NEC 2005 Handbook (NFPA 70:National Electrical Code)[3] states, "Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device **shall not be less than** the noncontinuous load plus 125 percent of the continuous load." [emphasis added] A *continuous load* is defined by the Institute of Electrical and Electronics Engineers (IEEE) The Authoritative Dictionary of IEEE Standards Terms (IEEE 100), Seventh Edition, to be "A load where the current continues for 3 h[ours] or more." A *noncontinuous load* is a load not classified as continuous and is the difference, in amps, between the List 1 drain (continuous load) and the List 2 drain. More specifically, continuous and noncontinuous loads are ranges. The amperage limit for the continuous load is the rated List 1 current drain of the equipment. The amperage range for the noncontinuous load is the amperage between the List 1 current drain and the List 2 current drain.

SBC's revised fusing proposal for CLECs bases the fuse size on actual usage at any moment in time (regardless of whether the collocated equipment is being under-utilized, is not fully carded or is serving few customers), not the peak current of the load (List 2 drain) as specified by the NFPA and network element manufacturers.

Q. WHAT ARE LIST 1 AND LIST 2 CURRENT DRAINS?

A. List 1 and List 2 current drains, sometimes referred to simply as List 1 and List 2 drains, are equipment specifications determined by the equipment manufacturer providing the

[3] Excerpts from the 2005 and 1990 NEC Handbooks (NFPA 70) are attached to my surrebuttal testimony as Schedule VHB-5.

maximum power usages for two usage scenarios. The List 1 current drain, in amperes, is the average "busy-hour" current draw during normal plant operation, assuming maximum configuration of the equipment. The List 2 current drain, in amperes, is the peak current under worst case conditions of voltage, traffic, and equipment configuration.

Q. WHAT IS THE PURPOSE OF THE LIST 1 AND LIST 2 DRAIN SPECIFICATIONS?

A. In the telecommunications industry, List 1 and List 2 drains are the designations of the load current drains. These are used to size various elements of the battery plant. Generally speaking, the List 1 current drain is used to size batteries and rectifiers in the plant. The List 2 current drain is used to size the DC load feeder cables and the circuit protection device (fuse) for the DC power arrangement. The fuse size is also dependent upon the ampacity of the smallest conductor comprising the protected feeder. Protectors should be rated as high as allowable to avoid nuisance tripping due to high load conditions or inrush current during startup.

Q. CAN YOU GIVE AN EXAMPLE OF A FUSE SIZE CALCULATION USING LIST 1 DRAIN (CONTINUOUS LOAD), LIST 2 DRAIN, AND NONCONTINUOUS LOAD?

A. Yes, I can. Qwest Communications Corporation's (QCC) collocation arrangements generally consist of multiple, separately-fused bays of equipment in series. Consider, as an example, within one of those bays is a circuit that feeds equipment with a List 1 current drain (continuous load) of 20 amps and a List 2 current drain of 30 amps. The noncontinuous load would be the difference between the List 2 current drain and the List 1 current drain, or 10 amps (30 amps – 20 amps). Using these specifications and the

NFPA code requirements (stated above), the minimum allowable fuse size for this hypothetical QCC DC power arrangement is calculated as follows:

= noncontinuous load + (1.25 x continuous load)

= (List 2 Drain – List 1 Drain) + (1.25 x List 1 Drain)

= (30 – 20) + (1.25 x 20)

= 10 + 25

= 35 amps.

Under SBC's fusing proposal, however, this QCC arrangement would not necessarily be fused at or above 35 amps. If, for example, the equipment in this arrangement were not maximally configured with respect to cards and shelves, but only partially-configured,[4] and the actual usage was not measured at "busy-hour," that equipment may only be measured at 5 amps. Under SBC's proposal – which focuses only on actual usage at any moment in time – the fuse could be no larger than 10 amps, far below the minimum acceptable fuse size under the NFPA code.

Q. WHAT ARE YOUR CONCERNS WITH SBC'S MOST RECENT FUSING PROPOSAL?

A. I have three major concerns, among others, with SBC's most recent fusing proposal. These concerns are legal, financial and operational. First, if the DC power arrangements are fused based upon the usage at any point in time, and not the List 2 drain of the load, it

[4] The minimal configuration could be due to a smaller number of customers being served during a particular period of time.

is probable that the fusing would not be in compliance with NFPA 70-2005, Article 215.3. As a result, the fusing would violate Administrative Code Part 785.20(b)(1), which obligates companies to abide by NFPA 70.[5] In other words, collocators will be forced to either ignore SBC's fusing limitations or ignore the Commission's electrical and fire safety requirements.

Second, on a financial level, changes in a collocator's power draw (for instance, because it adds cards to an existing, but under-utilized, multiplexer) will require the collocator to pay SBC to re-fuse the collocator's collocation power arrangement. For each power delivery arrangement (a single collocation arrangement may include multiple power delivery arrangements), SBC would charge the collocator an Order Charge of $300.50 (physical caged and shared) or $115.26 (cageless and virtual) and a Power Delivery charge of $1,802.03.[6] Regular or periodic re-fusing – which is unnecessary from a safety perspective and, in fact, inconsistent with national fire protection standards and the Commission's rules – will obviously prove quite expensive for collocators.

Third, on an operational level, the low fusing amperage will make unnecessary and harmful overloads more likely and more common. An overload is an overcurrent that is

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[5] Section 785.20(b)(1) of Title 83 of the Administrative Code states that "[t]he Agencies adopt as their rules the following portions of the NFPA Fire Codes (1991) edition:...Code 70, National Electric Code (effective Feb. 21, 1991)." Section 785.5 defines the "Agencies" as "the Illinois Commerce Commission, the Office of the State Fire Marshal, and the Illinois Emergency Management Agency." Article 215.3 of the NFPA 70-2005 is substantively identical to Article 220-10(b) of the NFPA 70-1990. See Schedule VHB-5.

[6] See Ill. C.C. No. 20, Part 23, Section 4. SBC confirmed the applicability of these charges in its response to QCC Data Request 3.14.

confined to normal current paths and could occur when a single high amperage device is on a circuit that is marginally sized for the demand. The purpose of overcurrent protection devices is to prevent conductor insulation failure caused by overloads or short circuits. An overload condition would be the result of a marginally fused power feed during a power outage.

Q. WHAT ARE THE IMPACTS OF A BLOWN FUSE TO QWEST COMMUNICATIONS CORPORATION ("QCC")?

A. The impacts of power outages due to a blown fuse are numerous, including but not limited to equipment damage, economic loss due to lost production, and irreparable damage to the reputation of QCC with respect to service reliability.

Q. COULD A BLOWN FUSE REALLY DO DAMAGE TO DIGITAL TELECOMMUNICATIONS EQUIPMENT?

A. Absolutely. Years ago, equipment was not as susceptible to power outages as is the sensitive digital equipment of today. Any equipment containing microprocessors, such as computers and telecommunications equipment, is especially vulnerable to power down via a blown fuse. The May 24, 1999 article in Telephony Magazine Online "CIRCUIT PROTECTION RUNS DEEP" by Dan O'Shea[7] speaks to this issue specifically:

> "The telecom industry's migration to digital networking has taken several years but is now nearly worldwide. The shift to digital networks triggers numerous benefits that affect network efficiency, performance, capacity and reliability. However, one side effect of this trend is the fact that distributed electronics are more sensitive to fuse outages.

[7] Mr. O'Shea's article can be reviewed in its entirety at *http://telephonyonline.com/mag/telecom_circuit_protection_runs/index.html*.

Also, the migration to new network architectures and equipment means that different network elements are constantly being replaced or installed, brought on-line or taken off-line. This type of situation is conducive to fuse overloads and other potential problems."

Q. DOES BELLCORE HAVE ANY DOCUMENTATION RELATING TO THE FUSING OF TELECOMMUNICATIONS EQUIPMENT?

A. Yes, in its definition of List 2 drain, Bellcore (previously known as Bell Communications Research, now known as Telcordia) states[8]:

"These drains are used to size feeder cables and fuses. These drains represent the peak current for a circuit or group of circuits under worst case operating conditions. For example, a constant power load requires maximum current at minimum operating voltage."

Q. WHAT IS MEANT BY "MAXIMUM CURRENT AT MINIMUM OPERATING VOLTAGE" IN BELLCORE'S DEFINITION, ABOVE?

A. During the power outages, the power to the telecommunication equipment is supplied by batteries. For a time, a diesel engine would be supplying additional backup power for the batteries. Once the power backup plant is running solely off battery power, the batteries begin to discharge. The voltage begins to drop from about -52.8 VDC , past the nominal -48 VDC, down to equipment failure at -42.75 VDC. Since power (Watts) is voltage (volts) times current (amps) (W=V x A), as the voltage drops, the current (amperes) increases to maintain the power level. In other words, as the voltage approaches a minimum, the current approaches a maximum. That maximum current for any piece of equipment, again, is referred to as the List 2 drain of the equipment.

[8] An excerpt from Bellcore Practice BR 790-100-656 is attached to my surrebuttal testimony as Schedule VHB-6.

Q. HOW DOES SBC'S FUSING PROPOSAL, BASED ON ACTUAL USAGE, IMPACT THE EFFICACY OF THE POWER BACKUP?

A. The power backup system could be rendered useless. As mentioned above, during a power drain due to a power outage, the current (in amps) increases as the voltage decreases. If QCC is not able to fuse its DC power arrangements based on List 2 drain, as required by NFPA, Commission rule (Section 785.20(b)(1)), SBC's internal requirements and manufacturer's specifications, during an extended power outage, the elevated amperage would blow the fuse resulting in QCC's collocated equipment being powered down in a matter of minutes, not hours. SBC's own equipment – used to serve *its* own retail customers – will likely remain unaffected given that SBC fuses based on List 2 drain, according to SBC's own technical publication. See Schedule VHB-4.

Q. DOES BELLCORE SPEAK TO ANY OTHER INSTANCES WHERE THE NONCONTINUOUS LOAD IS GENERATED?

A. Yes. In the same definition of List 2 drain, mentioned above, Bellcore states:

> "List 2 current may also be generated by circuit operating variability (traffic, test condition, etc.) while at normal float voltage[9]."

In the definition above, Bellcore acknowledges the power load of the equipment varies enough to generate noncontinuous (List 2) current while at normal, non-emergency, operating conditions. As with the battery discharge mentioned above, the reduced fusing proposed by SBC could result in a blown fuse even during normal operating conditions.

[9] In backup applications, the batteries are kept at a constant state of maximum potential in order to ensure maximum power reserve. This state of maximum potential is called *float voltage.*

Q. CAN YOU GIVE AN EXAMPLE OF AN INSTANCE WHERE NONCONTINUOUS LOAD (LIST 2 DRAIN) COULD BE GENERATED UNDER NORMAL OPERATING CONDITIONS?

A. Absolutely. An electric motor is a good example. Many electronic components, like computers and telecommunications equipment, generate heat. In order to protect equipment from overheating, the equipment contains fans to maintain the appropriate operating temperature. Most fans are operated by a thermostat. Because of the thermostat, the fans will turn on and of as needed generating noncontinuous (List 2) current. Fans are operated by electric motors. When most motors start, they draw current in excess of the motor's full-load current rating. This current draw is for a very short interval, relative to the equipment, but the duration could be long enough to blow the fuse if the DC power feed is marginally fused as SBC's revised fusing proposal requires.

In addition to the extra current (List 2 current or noncontinuous load) required to start the motors running the fans, there are other inrush currents associated with the equipment. On startup, electronics require a small instance in time to charge the capacitors. Again, this initial charge generates the List 2 current drain.

Q. IS THERE NOT A SECOND, REDUNDANT, POWER FEED TO THE COLLOCATORS' COLLOCATION ARRANGEMENTS?

A. Yes. As I understand it, redundant power feeds serving telecommunications equipment are an industry standard. In SBC's "Common Systems Equipment Interconnection

Standards for the SBC Local Exchange Companies" (SBC-TP-76450, Section 2.1.2, page 7),[10] it states:

> "Redundant power feeders are **required** for all equipment serving network elements. The term network element refers to all switching, transport, data, operator services equipment, and any adjuncts for those elements." [emphasis added]

As indicated in the footnote in Schedule VHB-6, the redundant power feeds are to ensure uninterrupted power to either the A or B side to maintain power to the telecommunications equipment in the event of a power loss of either power feeds.

Q. WOULD THIS REDUNDANT POWER FEED TO THE COLLOCATORS' COLLOCATION ARRANGEMENTS HANDLE ANY INCREASE IN CURRENT?

A. Not necessarily. During normal operating conditions, it is possible for the second feed to cover the inrush current. But, the redundant feed is provisioned to ensure uninterrupted power during abnormal operating conditions. The footnote in Schedule VHB-6 (SBC's technical publication) states, "The maximum List 2 current supported at the BDFB cannot exceed 50% of the supply fuse rating regardless of the size. This will insure uninterrupted power to either the A or B side in the event of a power loss of either power feeds."

Further, by relying solely on the redundant power feed to handle any increased current, collocators cannot realize the full backup protection of both the backup power plant and the power feed redundancy.

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[10] An excerpt from the SBC-TP-76450 is attached to my surrebuttal testimony as Schedule VHB-6.

III. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

BEFORE THE ARIZONA CORPORATION COMMISSION

IN THE MATTER OF:	)	Docket No. T-03267A-06-0105
	)	Docket No. T-01051B-06-0105
McLEODUSA TELECOMMUNICATIONS SERVICES, INC., Complainant,	)	
v.	)	
QWEST CORPORATION, Respondent.	)	

DIRECT TESTIMONY

OF

TAMI J. SPOCOGEE

ON BEHALF OF

MCLEODUSA TELECOMMUNICATIONS SERVICES, INC.

May 12, 2006

PUBLIC VERSION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Tami J. Spocogee. My business address is 15 East 5th Street, Tulsa, Oklahoma 74103.

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

A. I am employed by McLeodUSA Incorporated as a Director – Network Cost and Access Billing. McLeodUSA Incorporated is the parent company of McLeodUSA Telecommunications Services, Inc. ("McLeodUSA").

Q. PLEASE DESCRIBE YOUR RELEVANT WORK EXPERIENCE.

A. I have been involved in the telecommunications industry since 1980, when I began working for Southwestern Bell Telephone Company ("SWBT"). I held a variety of positions with SWBT starting in the commercial business office. In 1985 I joined the Inter-exchange Carrier Service Organization where my primary responsibilities concentrated on Access and Interconnect billing. My specific titles and responsibilities were Service Representative in the Service Center and Manager - SWBT Headquarters handling billing and dispute processes. I also was a member of a BellCore (now Telcordia) task force established to improve integrity between the billing, ordering and network systems for SWBT. The last position I held at SWBT was Manager in the Service Center handling billing issues for most inter-exchange carriers and competitive local exchange carriers ("CLECs"). In August 1994 I joined WilTel, subsequently acquired by WorldCom and changed to MCI, as a Manager in the Network Cost Organization. I subsequently moved to Senior Manager over the Network Cost

organization, handling payments, audits and disputes of network and CLEC services. During this time, I was also a participant, and for two years a Co-Leader, of the Billing Committee in the Order and Billing Forum. I joined McLeodUSA Incorporated in September 2000 as a Senior Manager over the network cost organization. My organization is responsible for payments, audits and disputes of network services purchased from other telecommunications service providers. In December of 2004, I also started managing the group responsible for access services and Carrier Access Billing System access services billings and the related billing disputes. Presently, I am the Director of Network Cost and Access Billing.

Q. HAVE YOU PREVIOUSLY TESTIFIED IN REGULATORY MATTERS?

A. Yes, I have testified in an Illinois docket investigating a proposal by Illinois Bell to eliminate metered collocation power arrangements. I am also sponsoring testimony supporting McLeodUSA's complaints regarding DC power plant charges against Qwest in Colorado, Iowa, Utah and Washington.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to report the amount of monthly collocation power charges that McLeodUSA seeks to recoup from Qwest should the Arizona Corporation Commission agree with McLeodUSA that Qwest should be billing McLeodUSA for DC Power on a usage basis under the 2004 amendment.

Q. ARE YOU FAMILIAR WITH BILLINGS FOR COLLOCATION POWER BY QWEST TO MCLEODUSA?

A. Yes. My organization is responsible for reviewing all collocation billings, including the billings for the 28 collocations McLeodUSA currently has operating in Qwest central offices in the State of Arizona. Of those 28 collocations, 9 are cageless, and the remaining 19 are caged collocations.

Q. ARE YOU FAMILIAR WITH THE PARTIES' INTERCONNECTION AGREEMENT ("ICA") AND THE *DC POWER MEASURING AMENDMENT* THAT MCLEODUSA SIGNED WITH QWEST REGARDING COLLOCATION POWER CHARGES IN 2004?

A. Yes, I am generally familiar with the ICA and have specifically reviewed the *DC Power Measuring Amendment*. It is my understanding that the amendment was a form amendment that Qwest provided to McLeodUSA in July 2004.

Q. ARE YOU FAMILIAR WITH THE TESTIMONY OF MICHAEL STARKEY OF QSI CONSULTING, INC. FILED IN THIS PROCEEDING?

A. Yes, I have reviewed Mr. Starkey's testimony.

Q. HAVE YOU CALCULATED THE AMOUNT OF DC POWER CHARGES THAT MCLEODUSA PAID QWEST IN EXCESS OF CHARGES THAT WOULD HAVE BEEN OWED QWEST HAD THE DC POWER PLANT CHARGE BEEN BILLED ON A USAGE BASIS?

A. Yes, through March 2006, I estimate that Qwest charged McLeodUSA $728,925.97 more than should have been billed for DC Power if Qwest had properly applied the 2004 amendment to the DC Power charge. This amounts to $39,807.25 in excess monthly operating costs that McLeodUSA should not have to pay Qwest for DC Power that McLeodUSA is not using.

Q. PLEASE EXPLAIN THE BASIS OF YOUR CALCULATION?

A. I used the amps that Qwest measured for each collocation and applied the DC Power Plant rate to calculate how much McLeodUSA should have been billed based on the amount of power its collocated equipment actually used. I subtracted this amount from the amount that Qwest actually billed for each collocation to determine the overcharge.

Q. DOES YOUR FIGURE REFLECT A REDUCTION IN POWER CHARGES FOR ALL MCLEODUSA COLLOCATIONS IN ARIZONA?

A. No, the 2004 amendment contains a 60-amp minimum for each collocation before DC Power will be billed on a usage – or "as consumed" basis. Or, in other words, the 2004 amendment calls for Qwest to bill McLeodUSA for DC power on a usage basis for collocations wherein McLeodUSA ordered power distribution cables greater than 60 amps in size. McLeodUSA collocations with power distribution cables less than or equal to 60 amps will continue to be billed by Qwest on an "as ordered" basis.[1] Therefore, my

[1] DC power distribution cables are described in detail in the direct testimony of Sidney Morrison, on behalf of McLeodUSA.

calculation does not reflect any claim to recoup excess power charges at the one collocation in Arizona where we ordered 60 amps or less.

Q. DID MCLEODUSA WITHHOLD PAYMENTS BILLED BY QWEST RELATED TO THIS DISPUTE?

A. Yes, once our audit revealed that Qwest was continuing to bill McLeodUSA for the DC Power charge on an "as ordered" basis rather than "as consumed" basis, we began short paying the Qwest invoice in September 2005. A total amount of $192,254.09 was withheld before an agreement between McLeodUSA and Qwest was reached to no longer withhold payments from the December 2005 invoices forward. Although the collocation power charges are currently being paid by McLeodUSA in full, the issue is certainly not resolved, and McLeodUSA continues to consider the difference between the "as ordered" amount and the "as consumed," as it relates to the DC power plant charge, as disputed charges.

Q. IS THE DISPUTED DC POWER PLANT CHARGE SIGNIFICANT TO MCLEODUSA OPERATIONS?

A. Yes, collocation power charges paid to Qwest represent a significant operating cost to McLeodUSA in providing facilities-based competitive services. The excess DC Power charges billed by Qwest represents 57% of the total monthly cost of collocation. These power charges can significantly impact the decision to enter or exit a particular wire center using a facilities-based offering requiring collocation at the central office.

Q. CAN YOU EXPRESS THIS MONTHLY IMPACT OF EXCESS DC POWER COSTS OF $39,807.25 ON A PER LINE BASIS?

A. Yes. Based on McLeodUSA's approximately ***BEGIN CONFIDENTIAL [redacted] END CONFIDENTIAL*** UNE-L lines in service as of December 2005 in its 28 collocations in Qwest's Arizona central offices, the excess DC Power charges costs McLeodUSA an average of ***BEGIN CONFIDENTIAL [redacted] END CONFIDENTIAL*** per line per month. This excess charge clearly impacts the margin McLeodUSA can achieve on its services. I should point out that the per-line impact would vary widely among individual collocations.

Q. DOES THIS CONCLUDE YOUR PREPARED DIRECT TESTIMONY?

A. Yes, it does.