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]** XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXX.

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[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 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 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%

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 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 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]** XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXX **[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. <u>A BASIC UNDERSTANDING OF POWER REQUIREMENTS EXPLAINS WHY SBC'S PROPOSAL IS NOT REVENUE OR COST NEUTRAL.</u>

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.

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[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) <u>The Authoritative Dictionary of IEEE Standards Terms</u> (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

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[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) <u>and</u> 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.

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[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.

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[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.