STATE OF SOUTH DAKOTA

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

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DIRECT TESTIMONY OF W. CRAIG CONWELL ON BEHALF OF WWC LICENSE L.L.C.

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INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, business address and employer.

A. My name is W. Craig Conwell. My business address is 405 Hammett Road, Greer, South Carolina. I am self employed as an independent consultant, specializing in telecommunications cost analysis.

Q. On whose behalf are you testifying in this case?

A. I am testifying as the cost witness for WWC License L.L.C. ("Alltel") in connection with the Petition for Arbitration filed by seven local exchange carriers ("the Golden West Companies" or "the Petitioners") with the South Dakota Public Utilities Commission ("the Commission") against Alltel on May 3, 2006.[1]

Q. Please describe your educational background.

A. I have a Bachelors degree (1972) and Master of Science degree (1974) in Industrial Engineering from Auburn University in Auburn, Alabama.

Q. Please describe your work background.

A. I have included as Exhibit WCC-1 a copy of my current resume. I have over 30 years of experience in the telecommunications industry, with a broad background in telecommunications costs analysis as an employee of the Bell System, with

[1] The Golden West Companies include Armour Independent Telephone Co., Bridgewater-Canistota Telephone Co., Golden West Telecommunications Cooperative, Kadoka Telephone Co., Sioux Valley Telephone Co., Union Telephone Co., and Vivian Telephone Co.

Arthur Andersen & Co. in its telecommunications consulting practice, and for the past ten years as an independent consultant.

In recent years, I have been extensively involved in negotiations and arbitrations of reciprocal compensation rates between incumbent local exchange carriers (ILECs) and wireless carriers. I have analyzed numerous ILEC cost studies for compliance with the FCC rules for Total Element Long Run Incremental Costs (TELRIC), and I have testified as an expert cost witness on behalf of wireless carriers in one or more arbitrations in five states.

I also was involved on behalf of the AT&T (previously SBC) local exchange carriers in the arbitrations establishing rates for unbundled network elements and collocation. I have provided expert testimony on one or more occasions in 12 states. Over the years, I have developed cost models, participated in the design of telecommunications cost accounting systems, and taught service cost courses for the United States Telephone Association and telephone company staffs.

Q. What are the other arbitrations between incumbent LECs and wireless carriers in which you participated?

A. I was the cost witness for wireless carriers in two arbitrations in Oklahoma (Cause Nos. PUD 200200150 and PUD 200300771), an arbitration in Tennessee (Docket No. 03-00585), two arbitrations in Missouri (Case Nos. IO–2005-0468 and TO-2006-0147), two arbitrations in Michigan (Case Nos. U-14678 and U-14889) and an arbitration in California (A.06-02-028–038, 040). In each case, my role has been to review incumbent LEC cost studies and their results to determine whether they meet the FCC requirements for establishing reciprocal compensation rates.

Q. What is your consulting engagement with Alltel in this case?

A. Alltel engaged me to review the cost studies and supporting documentation produced by the Golden West Companies, which are intended to measure their *forward-looking economic costs* to transport and terminate traffic originated on Alltel's network and terminated on their networks – that is, mobile-to-land traffic. The purpose of the review is to determine whether the Petitioners have met the FCC requirements for computing forward-looking economic costs as the basis for establishing transport and termination rates and, if they have not, to provide an assessment of what these costs should be.

SUMMARY OF TESTIMONY AND RECOMMENDATIONS

Q. Please summarize the main points of your testimony.

A. My testimony will address the following points.

- The Golden West Companies have not properly computed forward-looking economic costs of transport and termination according to FCC Rules 51.505 and 51.511. As a result, their cost estimates ranging from $0.0088 to $0.0253 per minute are overstated.

- I have identified 14 primary adjustments that must be made to the Petitioners' cost studies in order for the studies and their results to comply with FCC rules. These include the following:

1. The usage-sensitive portion of end office switching costs recoverable in transport and termination rates must reflect only the costs of switch trunk equipment.
2. The forward-looking weighted average cost of capital should be 9.9 percent.
3. The economic life for switching should be ten years.
4. The normalization of deferred income taxes should be recognized in calculating capital costs, if applicable to Petitioners.
5. A direct expense factor for switching of six percent should be used.
6. Forward-looking engineering fill for switching should be 94 percent.
7. Petitioners' interoffice cable lengths should reflect forward-looking, efficient network configurations.
8. The shorter interoffice transport distances for mobile-to-land traffic should be used in determining transport cable costs.
9. Forward-looking utilization levels for transport should reflect efficient utilization.
10. Transport utilization should be measured in DS1 equivalents rather than "paths."
11. Transport costs must recognize that mobile-to-land traffic involves multiple Petitioner networks.
12. An alternative method for computing transport cable costs should be used.
13. An alternative method for computing transport transmission equipment costs should be used.
14. Petitioners' forward-looking economic costs for transport and termination must be corrected, after adjusting for the items above.

I will describe each adjustment or correction to the studies and its importance in determining valid costs. I request that the Hearing Examiner and the Commission consider each modification and adopt the recommendations put forth herein. This will enable forward-looking economic costs to be determined in compliance with FCC rules and cost-based reciprocal compensation rates to be established.

- I replicated the cost study and results for Vivian Telephone. The same methodology is used by all Petitioners, and I will use the Vivian Telephone study as an example. This should provide a good understanding of how Petitioners estimated their costs, the basis for the adjustments that I have made and the rationale for making them.
- Finally, I have corrected the Petitioners' transport and termination cost studies using available information. When the cost studies are corrected, Petitioners' transport and termination costs range from $0.0006 to $0.0014 per minute. Costs in this range would be the maximum transport and termination rates that can charged to Alltel per FCC 51.505(e).

THE ROLE OF ILEC COST STUDIES AND THE ILEC BURDEN OF PROOF

Q. Why are the incumbent LEC cost studies important in this arbitration proceeding?

A. FCC Rule 51.705(a)(1) specifies that an "incumbent LEC's rates for transport and termination of telecommunications traffic shall be established" on the basis of the "forward-looking economic costs of such offerings, using a cost study pursuant to Sec. 51.505 and 51.511." FCC Rule 51.505(e), in turn, provides:

> An incumbent LEC must prove to the state commission that the rates for each element it offers do not exceed the forward-looking economic cost per unit of providing the element, using a cost study that complies with the methodology set forth in this section and Sec. 51.511.

Q. Are there parts of Rule 51.505(e) that merit highlighting?

A. Yes. Three parts of this rule should be emphasized. First, an incumbent LEC's rates for transport and termination must "not exceed" its forward-looking economic cost of providing transport and termination. Second, it is the incumbent LEC that has the burden of proof. Each Petitioner in this arbitration has the burden to demonstrate that its proposed rate for transport and termination does "not exceed the forward-looking economic cost" of providing transport and termination. As the FCC has stated, "Given the likely asymmetry of information regarding network costs, we conclude that, in the arbitration process, incumbent LECs shall have the burden to provide the specific nature and magnitude of these forward-looking common costs."[2] Third, under FCC Rule 51.505(e), the Petitioners must meet their burden of proof through use of "a cost study that complies with the methodology set forth in this section and Sec. 51.511."

Q. Do FCC rules require LECs to file their cost studies in the record of this proceeding?

A. Yes, FCC Rule 51.505(e)(2) states: "The record of any state proceeding in which a state commission considers a cost study for purposes of establishing rates under this section shall include any such cost study."

Q. What are the Commission's obligations in developing a rate for transport and termination?

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[2] *Local Competition Order,* 11 FCC Rcd 15499, 15852 ¶ 695 (1996).

A. As noted above, FCC Rule 51.505(e) specifies that an incumbent LEC's reciprocal compensation rate must "not exceed" its forward-looking economic costs of transport and termination. To make this determination, FCC Rule 51.505(e)(2) specifies that the Commission shall create "a written factual record that is sufficient for purposes of review."

Q. What documentation must an incumbent LEC include in its cost study?

A. The FCC has held that an incumbent LEC cost study "must explain with specificity why and how specific functions are necessary to provide network elements and how the associated costs are developed."[3] An incumbent LEC "must prove to the state commission the nature and magnitude of any forward-looking costs that it seeks to recover in the prices of interconnection and unbundled network elements."[4] In the Virginia Arbitration Cost Order, the FCC stated:

> [A] cost model must include the capability to examine and modify the critical assumptions and engineering principles. Underlying data must be verifiable, network design assumptions must be reasonable, and model outputs must be plausible. All data, formulas, and other aspects of the models must be made available to other parties for their evaluation. In other words, a cost model must be transparent and verifiable.
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> Virginia Arbitration Cost Order, 18 FCC Rcd 17742-43 ¶ 38, 17747 ¶ 48 (2003).

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[3] *Local Competition Order*, 11 FCC Rcd at 15850 ¶ 691.

[4] *Id.* at 15847 ¶ 680. *See also id.* at 15852 ¶ 695 ("[I]n the arbitration process, incumbent LECs shall have the burden to prove the specific nature and magnitude of these forward-looking common costs.").

Thus, the cost study documentation must include (1) an electronic copy of the cost model used to produce the study and (2) documentation containing source documents, supporting analyses or computations, *etc.* used to arrive at the assumptions and input data used in the model. The documentation should be organized so that it is not burdensome or costly to review the cost study.

Q. Have the Petitioners filed their cost studies in this proceeding or provided them to Alltel?

A. It is my understanding that as of the date of my direct testimony, the Golden West Companies have not filed their cost studies in this proceeding. The Companies have provided in response to Alltel requests for information electronic copies of the cost model used to compute their claimed costs of transport and termination. Petitioners also have responded, in part, to requests for information on cost study assumptions, input data, *etc.*

Q. Have you reviewed the electronic cost model and cost support provided, and if so, do you consider the cost study documentation to be adequate for review?

A. I have reviewed the electronic cost model and the cost-related materials provided in response to Alltel's requests for information. The information provided does not represent what I consider to be cost study documentation. Cost study documentation consists of descriptions of methods, work papers, supporting analyses used to derive input values and source documents collected in an organized document. The Petitioners did not provide this. Instead, Alltel had to request this information by making specific requests. The responses were not organized in the form of documentation; and more importantly, the responses in many cases were incomplete or unclear.

For example, one of the key determinants of transport cable costs is the interoffice route mileage from Petitioners' end office switches to the meet point with the transit carrier delivering mobile-to-land traffic. This route mileage determines the required cable investment and costs. The Petitioners provided "route miles to meet point(s)" and a high level explanation of the mileages. However, I have not been able to piece together the network diagrams, descriptions of fiber rings, cable route mileage data, *etc.* to verify the accuracy or reasonableness of these "route miles to meet point(s)" values.

The situation is analogous to reviewing the cost estimate for building a new house. To do a complete review, you would expect a set of building plans, a list of materials and labor showing quantities of each and their calculation, and source documents for materials, labor and other costs. The Petitioners have provided piecemeal and incomplete information on interoffice network design, the basis for interoffice distance, routes traveled by mobile-to-land traffic, sources of cost data, *etc.* This makes the review process more difficult, and in some cases, it is not possible to verify key assumptions and input values.

Q. Have you been able to draw any conclusions regarding the validity of Petitioners' cost estimates from the information provided?

A. Yes, in spite of the poorly organized and incomplete information, I found significant flaws in the cost studies. These flaws cause the Petitioners' transport and termination cost estimates to be much too high. Consequently, I have adjusted the cost studies to correct for the flaws, resulting in revised estimates of their forward-looking economic costs to transport and terminate Alltel's mobile-to-land traffic.

Q. In your opinion, have the Petitioners met their burden of proof that the transport and termination rates they propose do not exceed their forward-looking economic costs?

A. No, they have not. The Petitioners have not provided adequate documentation for review. More importantly, as I describe the adjustments necessary to the cost studies, it should be clear that the Petitioners transport and termination costs are based on methods, assumptions and input values, in key instances, that do not comply with FCC Rules 51.505 and 511.

FCC REQUIREMENTS FOR TRANSPORT AND TERMINATION RATES

Q. What are the requirements for cost-based reciprocal compensation rates?

A. FCC Rule 51.705(a)(1) permits an incumbent LEC to charge reciprocal compensation to recover the costs for two elements involved in handling traffic originating on other carriers' networks: (1) transport, and (2) termination.

Transport and termination rates are to be based on forward-looking economic costs, which the FCC defines in Rule 51.505 as the sum of total element long-run incremental cost ("TELRIC") and a reasonable allocation of forward-looking common costs. As also noted earlier, FCC Rule 51.505(e) imposes on the incumbent LECs the burden of proving that their rates for transport and termination do "not exceed the forward-looking economic cost per unit" of providing each of these elements.

Q. How does the FCC define transport?

A. The FCC defines transport in Rule 51.701(c) as "the transmission and any necessary tandem switching of telecommunications traffic subject to section 251(b)(5) of the Act from the interconnection point between the two carriers to the terminating carrier's end office that directly serves the called party, or equivalent facility provided by a carrier other than an incumbent LEC." Since Alltel and the Petitioners interconnect indirectly, transport includes the interoffice cable and transmission equipment connecting the LECs' end offices to the "meet point" where they connect to a transit carrier's network.[5]

Q. How does the FCC define termination?

A. The FCC defines termination in Rule 51.701(d) as "the switching of telecommunications traffic at the terminating carrier's end office switch, or

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[5] FCC rules define a "meet point" as "a point of interconnection between two networks, designated by two telecommunications carriers, at which one carrier's responsibility for service begins and the other carrier's responsibility ends." 47 C.F.R. § 51.5.

equivalent facility, and delivery of such traffic to the called party's premises." Congress has specified that incumbent LECs may recover in their transport and termination rates only "the additional costs of terminating such calls." 47 U.S.C. § 252(d)(2)(A)(ii). The FCC has interpreted this "additional cost" standard as limiting recovery to usage-sensitive costs. Thus, the portions of an end office switch that are not usage-sensitive are not recoverable in transport and termination rates, and an incumbent LEC must recover these non-usage sensitive switch costs from other sources (*e.g.*, end user customers).[6] In addition, the costs of loops from the end office to a customer's premises are not usage-sensitive and therefore are not recoverable in reciprocal compensation.[7]

Q. What are the specific requirements for determining the TELRIC of transport and termination and a reasonable allocation of forward-looking common costs?

A. FCC Rules 51.505(b) and (c) define TELRIC and forward-looking common costs. The FCC has described specific requirements related to calculating these costs including the following:

- *Plant is to reflect forward-looking technology and costs.* The costs of switching, transmission and cable plant are to reflect currently available equipment, at current vendor prices and company-specific discounts. FCC Rule 51.505(d)(1) specifically prohibits the use of embedded or historical

[6] *Local Competition Order*, 11 FCC Rcd at 16025 ¶ 1057.

[7] Loop plant capacity and costs are determined by the number of access lines or other local channels required to provide connections between customer premises and serving wire centers.

costs. For example, the cost study should reflect today's cost to construct a new end office switching system, representing the prices the incumbent LEC would currently pay its switch vendor to engineer, furnish and install the new switch. The study should not reflect switch costs that are either outdated or based on the original cost of existing switches.

- *End office switching costs must reflect only the usage-sensitive portion of switching plant.* The LEC must determine the portion of the costs of purchasing and installing new switching systems caused by the minutes of use, or call attempts, handled by the switches. This requires analyzing the hardware, software and other charges for new switches, identifying fixed charges versus charges affected by the volume of demand (lines, interoffice minutes of use, etc.), and categorizing the charges accordingly. Only the portion of the total cost of a new switch attributable to usage may be included in end office switching costs; the portion of switch costs that does not vary with usage may not be included in reciprocal compensation rates.

- *Plant capacity is to reflect an efficient network configuration.* FCC Rule 51.505(b)(1) specifies that the transport and termination technologies in the cost study should use "the most efficient telecommunications technology currently available and the lowest cost network configuration, given the existing location of the incumbent LEC's wire centers." In addition, the capacities of switching, transmission and cable plant in the study should be sized for efficient forward-looking utilization. Transmission equipment and cables used for interoffice transport, for example, should not be sized so large in the cost study as to produce excessive spare capacity and costs. This would cause transport costs to exceed forward-looking economic costs, which Rule 51.505(e) prohibits.

- *Support asset costs and operating expenses are to be forward-looking, efficiently sized and directly attributable to transport and termination.* Support assets include land, buildings, power equipment and other plant used to house and operate switching systems and transport equipment. In a TELRIC study, these assets are to be sized to support today's technologies, rather than representing existing land, buildings and other assets acquired to support operations and plant in the past. At the same time, support asset costs are to reflect current, rather than embedded land, building and other costs. Similarly, operating expenses for repair and maintenance of switching and transport equipment, engineering, network administration, *etc.* are to reflect today's business processes, productivity and labor costs. To the extent support assets or various workgroups are employed in producing other products, their costs should be attributed to those products and not to transport and termination. [47 C.F.R. §51.505]

- *Common costs are to be forward-looking and efficiently incurred.* Common costs typically include executive, legal, accounting and other general and administrative costs. These costs may be shared among all products and services. FCC rules call for a reasonable allocation of these costs to be added to the TELRIC of transport and termination in setting reciprocal compensation rates. [47 C.F.R. §51.505].

REVIEW OF PETITIONERS' COST STUDIES AND PROPOSED RATES

Q. How have you organized your testimony regarding the Petitioners' cost studies and proposed rates?

A. This portion of my testimony has four parts. First, I describe the results of the Petitioner cost studies and their proposed rates. Second, I will describe the methodology, key assumptions and input data used to compute switching or termination costs and identify specific instances in the cost calculations where they do not comply with the FCC rules. I also recommend changes to the studies to comply with these rules. In the third part, a similar description of transport costs will be given along with the necessary adjustments related to these costs. Fourth, I will provide corrected transport and termination costs for each Petitioner. The corrected costs should be used to establish the reciprocal compensation rates.

Cost Study Results and Proposed Rates

Q. What are the results of the Petitioners' cost studies and the resulting transport and termination rates?

A. Table 1 shown below summarizes the Petitioners' claimed transport and termination costs. I understand the values in the "Total" column are their proposed rates.

Q. Please describe the cost study results.

A. The total transport and termination costs estimated by the Petitioners range from 0.9 cents per minute for Union Tel. and Sioux Valley Tel. to 2.5 cents per minute for Bridgewater – Canistota Tel. The costs of the other companies range from 1.1 cents to 1.7 cents per minute. The Petitioners' transport and termination costs consist of four components. *Transport–IO electronics* and *transport–IO plant* correspond to "transport," and the *switch trunk* and *switch processor/matrix* correspond to "termination."

The *switch trunk* component represents the capital costs and operating expenses associated with the portion of switch equipment used to terminate incoming and outgoing interoffice traffic, which would include incoming mobile-to-land traffic.[8] This is a usage-sensitive component of switching that is recoverable in transport and termination rates. The Petitioners' claimed costs range from 1/10th to slightly less than 3/10th of a cent, before necessary corrections.

The *switch processor/matrix* costs include capital costs and operating expenses for portions of the switch associated with the switch central processor, memory, the switch matrix used to provide connections between subscriber lines or between lines and interoffice trunks, and other elements. The Petitioners have treated switch processor/matrix costs as usage-sensitive. This is not correct given today's switch technology and pricing. I will explain later why these costs are not usage-sensitive, and therefore, are not recoverable in reciprocal compensation per the FCC rules. Because they are not usage-sensitive 2/10th to 7/10th of cent of claimed costs should be removed from the proposed reciprocal compensation rate.

Mobile-to-land traffic is carried among the Golden West Companies' switches over interoffice transport systems, consisting of fiber cables and transmission equipment at each central office used to "add" or "drop" circuits to the transport system.[9] *Transport–IO electronics* refers to the capital costs and operating expenses of the interoffice (IO) transmission equipment, and *transport–IO plant*

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[8] Capital costs include depreciation expense for the recovery of plant investment, the cost of capital and income taxes.

[9] The Golden West Companies' cost studies assume on a forward-looking basis the use of Synchronous Optical Networking (SONET). In addition to transporting mobile-to-land traffic, the interoffice transport system carries local, Extended Area Service and toll traffic, as well as a wide array of dedicated special circuits including cable TV, DSL and other broadband applications.

refers to the costs of fiber cable. When properly determined, these costs are recoverable in reciprocal compensation. The Petitioners claim these costs combined to be in the range of 0.5 to 1.7 cents. These costs are substantially overstated, and corrections are required for these costs.

Q. What cost model did the Golden West Companies use to produce their cost studies?

A. The Companies used an Excel-based model called the FLEC Telephone Model 3.7.1, which I understand was developed by TELEC Consulting Resources, Inc., the same consultants who performed the cost studies on Petitioners' behalf.[10] I was provided an electronic copy of the model and Excel files containing model input data for each of the Petitioners. I ran the model to reproduce the cost study results shown in Table 1.

Q. What was your impression of the FLEC Model?

A. While it was possible to trace cost calculations from cost model input data to model output, the calculation of transport and termination costs could be performed more clearly and concisely. There are fifty spreadsheets in the model, and the majority of these are not used to compute transport and termination costs. For the spreadsheets actually used, the calculations could be laid out more efficiently, in terms of not having to trace calculations across several spreadsheets; and, the calculations could be presented in a more logical fashion.

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[10] FLEC is assumed to represent Forward-Looking Economic Costs.

I prepared Excel spreadsheets to replicate the Petitioners' transport and termination cost calculations and consolidate the key calculations in three spreadsheets – one each for switching, transport cable and transport termination equipment. I did this to confirm my understanding of the cost calculations, to provide a basis for more easily explaining the methodology used and errors that I found, and to simplify the corrections. I will start by describing the methodology, key assumptions and input data used to compute switching costs.

Switching Costs

Q. Please describe how the Petitioners calculated switching costs?

A. Exhibit WCC-2 contains a copy of the spreadsheet prepared to replicate the Petitioners' cost calculations for switching. I will be using Vivian Telephone as the example. Column and row headings are provided for reference.

Rows 6 through 23 of the spreadsheet show the calculations for the forward-looking switch investment for each of five switch clusters and the Custer standalone switch. A switch "cluster" is a host switch and one or more subtending remote switches. For example, the Freeman cluster includes a host switch in Freeman, SD and remote switches in Marion, Lesterville, Avon, Springfield, Scotland and Menno. The total switch investment in cell C23 is intended to represent the current cost to purchase and install a new host switch and six new remote switches.

Rows 25 through 35 show the annual costs attributable to switching. Annual costs include capital costs and operating expenses associated with the switching systems, as well as land, buildings and other assets supporting switch plant. Corporate operations expenses also are included (row 34).[11] The FLEC Model computes switching annual costs in total, rather than by individual switch cluster, so annual costs appear in the "Total" column (column I).

The next step in the calculations is important. Rows 37 through 44 specify the portion of switch investment and annual costs that the Petitioners assumed to be attributable to the switch processor/matrix and switch trunk components of the switch. The Petitioners consider these switch components to be usage-sensitive and recoverable in transport and termination rates. The percentages in cells I38 and I39 are each multiplied by the total switch annual costs (cell I35) to determine usage-sensitive annual costs (cells I43 and I44). To obtain the switch processor/matrix cost per minute of use (MOU) (cell I53), the switch processor/matrix annual costs (cell I43) are divided by total annual minutes of use handled by the switches (cell I50), which includes local, Extended Area Service (EAS) and toll. To obtain the switch trunk cost per MOU, the switch trunk annual costs (cell I44) are divided by only the interoffice minutes or traffic that utilizes

[11] Corporate operations expenses include the costs of Executive, Finance, Legal and other functions "common" to ILEC services. After removing any portion of corporate operations expenses attributable to retail services or specific services, these expenses usually represent the forward-looking common costs added to TELRIC to produce forward-looking economic costs. See FCC Rule 51.505(a), (b) and (c).

switch trunk equipment, which is the sum of EAS and toll minutes of use (cells I48 and I49). This traffic includes some Commercial Mobile Radio Service (CMRS) traffic.

Adjustment 1: Usage-sensitive portion of end office switching costs

Q. Please describe the first adjustment or correction necessary for switching costs?

A. I will start with the most important issue, which relates to the portion of the current cost to purchase and install a new standalone, host or remote switch that is usage-sensitive. The Petitioners' cost studies assume that 70 percent of switch investment is usage sensitive, of which two percent is attributed to Vertical Services and 68 percent is attributed to local, EAS and toll calling (cell I40 of Exhibit WCC-2). The two percent of switch investment for Vertical Services is not included in transport and termination costs; however, 68 percent of switch investment and annual costs are included in the calculation of these costs.

FCC Rule 51.505(1) in defining the "efficient network configuration" requirement of forward-looking economic costs requires costs to "be measured based on the use of the most efficient telecommunications technology currently available_...". The investment in currently available digital switches is driven almost entirely by lines, not usage. The Petitioners assumption of 70% usage-sensitive switching is outdated and results in usage-sensitive switching costs that are grossly overstated.

Q. Why is the usage-sensitive portion of end office switching costs important?

A. Section 252(d)(2)(A)(ii) of the Communications Act permits an incumbent LEC to recover in its reciprocal compensation rates "the additional costs of terminating [mobile-to-land] calls." As noted earlier, the FCC has held that under this "additional cost" standard, incumbent LECs may recover in reciprocal compensation only the usage-sensitive portion of their end office switch costs (and not the non-traffic sensitive costs).[12] This means that Petitioners' transport and termination rates may recover only those costs of a new switch that are caused by usage. Any new switch costs that remain the same regardless of usage cannot be recovered through Petitioners' transport and termination rates. Accordingly, the Petitioners have the burden of demonstrating what portion of new switch costs would be attributable to usage.

Q. What was the basis for the Petitioners' assumption of 70 percent usage-sensitive switching?

A. In response to an interrogatory, the Petitioners gave the following explanation for their split of switching investment:

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[12] *See Local Competition Order,* 11 FCC Rcd 15499, 16025 ¶ 1057 (1996)("We conclude that such non-traffic sensitive costs should not be considered 'additional costs' when a LEC terminates a call that originated on the network of a competing carrier. For the purposes of setting rates under section 252(d)(2), only that portion of the forward-looking, economic costs of end-office switching that is recovered on a usage-sensitive basis constitutes an 'additional cost' to be recovered through termination charges."); *Local Competition Reconsideration Order,* 11 FCC Rcd 13042, 13045 ¶ 6 (1996)("[T]he 'additional cost' to the incumbent LEC of terminating a call that originates on another network includes only usage-sensitive costs . . . but not the non-traffic sensitive costs . . . . Such non-traffic-sensitive costs, by definition, do not vary in proportion to the number of calls terminating over the LEC's facilities and, thus, are not 'additional costs.'").

> Response 8h: The switch investments are split into several components. The split was made primarily to allow for the elimination of the non-traffic sensitive line portion of the switch from the study. The switch components were split based on knowledge of typical small company switches. The components are line (30%), trunk (10%), matrix (23%) and processor (37%). The 30% line portion is consistent with the FCC's MAG order. 47 C.F.R. Sec. 69.306(d)(2).[13]

Q. Did the Petitioners provide any analysis of switch engineering on which their "knowledge of typical small company switches" was based?

A. No, they did not. The important parameters in switch engineering are the number of subscriber lines terminated on the switch, the peak or busy hour (BH) call attempts per line, and the BH call duration in minutes or hundred call seconds (CCS) per line. The switch processors and switch matrices of modern digital switches have more than ample capacity to handle BH call attempts and BH CCS loads, such that the switch exhausts due to line limitations. The Petitioners offered no evidence that in developing the 70 percent usage-sensitive assumption they contacted switch manufacturers to determine current switch capacity limitations and drivers of exhaust. Instead, it appears they relied upon outdated "rules of thumb" about switch components and the parameters that cause their exhaust.

Q. Does FCC Rule 69.306(d)(2) substantiate the use of 70 percent as the usage-sensitive portion of today's switch technology?

A. No. FCC Rule 69.306(d)(2) states as follows:

[13] "Golden West Companies' Objections and Responses to First Set of Interrogatories and Requests for Production of Documents Propounded to Golden West Companies," response to interrogatory 8h.

> (2) Beginning January 1, 2002, for non-price cap local exchange carriers, line-side port costs shall be assigned to the Common Line rate element. Such amount shall be determined after any local switching support has been removed from the interstate Local Switching revenue requirement. Non-price cap local exchange carriers may use thirty percent of the interstate Local Switching revenue requirement, minus any local switching support, as a proxy for allocating line port costs to the Common Line category.

The FCC Rules in Part 69, including §61.306(d)(2), deal with the allocation of <u>embedded costs</u> for purposes of establishing <u>interstate access charges</u>. The rules are not intended to provide methods or input data for use in computing forward-looking economic costs, which are governed by rules in §§51.505 and 51.511. In addition, the FCC has specifically found that "[n]either the interstate access charges described in part 69 of this chapter nor comparable intrastate access charges shall be assessed by an incumbent LEC on purchasers of elements that offer telephone exchange or exchange access service." 47 C.F.R. §51.515(a).

Q. In your opinion have the Petitioners met their burden of proof with respect this issue?

A. No, they have not. The Petitioners have provided no information on current switch component capacities, especially switch processors and switch matrices, nor have they demonstrated that component capacities are exhausted by usage, rather than lines. Secondly, the FCC rules for establishing interstate access charges are not relevant in determining the cost basis for transport and termination rates.

Q. Has the FCC taken a position on usage-sensitive switching in the context of forward-looking economic costs or a TELRIC study?

A. The most recent FCC decision is the 2003 *Virginia Arbitration Cost Order*. The FCC ruled that none of the "getting started" costs of today's modern switches are usage sensitive:[14]

> We conclude . . . that the "getting started" cost of the switch is a fixed cost, meaning that it does not vary with the number of ports or the level of usage on the switch. We find here that the "getting started" costs of the switch should be recovered on a per line port basis. "Getting started" costs are incurred for capacity that is shared among subscribers. Verizon incurs these costs to be ready to provide service upon demand. Given the record evidence that modern switches typically have large amounts of excess central processor and memory capacity, the usage by any one subscriber or group of subscribers is not expected to press so hard on processor or memory capacity at any one time as to cause call blockage, or a need for additional capacity to avoid such blockage. Thus, no one subscriber or group of subscribers is any more or any less causally responsible for the processor or memory capacity costs. Principles of cost causation, therefore, support a per line port cost recovery approach because, more than any other approach, it spreads getting started costs to carriers in a manner that treats equally all subscribers served by a switch.[15]

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[14] "The 'getting started' cost of the switch, also known as the 'first cost,' represents the costs of the central processor, memory, maintenance, administrative, test, and spare equipment, and other common equipment. Similarly, "getting started" investment refers to investment for such equipment, and 'getting started' equipment refers to this equipment." *Virginia Arbitration Cost Order,* 18 FCC Rcd 17722, 17871 n.988 (2003).

[15] *Virginia Arbitration Cost Order,* 18 FCC Rcd at 17903-04 ¶463. *See also id.* at 17877-78 ¶ 391 ("We agree with AT&T/WorldCom that . . . the 'getting started' costs are fixed costs. That is, they are costs that do not vary with the number of lines, trunks, or usage on the switch. Verizon agreed with AT&T/ WorldCom that switch manufactures today design switches that are limited only in the number of lines that they can serve."); *id.* at 17904 ¶ 465 ("Principles of cost causation do not, therefore, support a per MOU price. . . .").

The FCC similarly ruled that software right-to-use (RTU) costs do not vary by usage and should not be recovered on a per-minute basis.[16]

Q. How have State commissions addressed this subject in recent years?

A. In 2003, the Minnesota Public Utilities Commission set an incumbent LEC's rate for termination at zero because it had determined in an earlier UNE docket that modern switches have no usage-sensitive component that impacts the cost of the switch:

> Reciprocal compensation rates must be set "on the basis of a reasonable approximation of the additional costs of terminating such calls." * * * The Commission sees no justification for retaining reciprocal compensation rates that reflect clearly outdated cost estimates. … The Commission will therefore adjust the end-office switching component of reciprocal compensation rates based on the new unbundled network element rate for that function. … This results in a new zero rate for one element of reciprocal compensation, due to the adoption of flat-rate pricing for the local switching element. … Flat-rate pricing, and the resulting zero rate for end-office switching, are just and reasonable. …[17]

The Eighth Circuit Court of Appeals recently affirmed the Minnesota Commission's order, noting that "if no additional costs are incurred, there is nothing to pay":

> Under federal law, the MPUC was to base the RCR [reciprocal compensation rate] on "a reasonable approximation of the additional costs" of termination. . . . The MPUC thus had reason to believe in the RCR proceeding that the costs of modern end-office switching did not vary significantly with usage. Multiple parties in the earlier [UNE] proceeding had introduced evidence consistent with that supposition. On this record the MPUC

[16] *See id.* at 17907 ¶¶ 472. *See also id.* at 17906 ¶ 471 (EPHC costs also do not vary by usage).

[17] *Investigation into Reciprocal Compensation Rates,* Docket No. P-421/CI-03-384, 2003 Minn. PUC LEXIS 99 (Sept. 24, 2003). *See also id.,* 2003 Minn. PUC LEXIS 144 (Dec. 24, 2003) (MPUC denies CLEC reconsideration petition).

> reasonably concluded that the additional costs of terminating a telephone call were approximately zero.[18]

It should be noted that other State commissions have made similar determinations regarding end office switching costs.

Q. The decisions you have discussed so far involved large incumbent LECs. Are there State commission decisions involving rural ILECs and the portion of usage-sensitive costs for the switches they would use?

A. Yes. In a recent arbitration between seven rural LECs and Verizon Wireless in Illinois, the LECs argued that 70 percent of their switching costs are usage-sensitive and as a result should be included in transport and termination costs. Earlier this year, the Illinois Commerce Commission rejected this argument and held that none of the costs of rural LEC switches are traffic sensitive:

> The Commission is of the opinion that the record is lacking clear evidence that the switch costs at issue here are usage sensitive, sufficient to have us alter our view expressed in the SBC [UNE] case that, in general, switching costs are not traffic sensitive. . . . That being the case, we see insufficient reason to depart from our reasoning in the SBC UNE case, 00-0700, and the analysis of the 8th Circuit Court of Appeals [in *Ace Telephone*]. Accordingly, we determine that this input should be set at 0%.[19]

The Missouri Public Service Commission reached the same result four months ago, in a case involving Cingular Wireless and T-Mobile USA, in rejecting the rural LEC proposal to treat 70 percent of switching costs as usage-sensitive:

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[18] *Ace Telephone* v. *Koppendrayer*, 432 F.3d 876, 880-81 (8th Cir. 2005). The Eighth Circuit reversed the decision of the district court that had held the MPUC had erred. *See Ace Telephone* v. *Koppendrayer*, No. 04-154, 2004 U.S. Dist. LEXIS 24632 (D. Minn., Dec. 6, 2004).

[19] *Hamilton County Telephone Co-op/Verizon Wireless Arbitration Order*, Docket 05-644 *et. al*, at 38, 2006 Ill. PUC LEXIS 5 *94-95 (Jan. 25, 2006).

> **Issue No. 4 – What is the appropriate value for the usage-sensitive portion of Petitioners forward-looking end office switching cost?**
>
> **Petitioners** – The HAI [5.0a] Model's input value assigns 70% of switch costs to usage sensitive costs. This is consistent with the FCC's Tenth Report and Order in CC Docket 96-45 and the FCC's "MAG Order."
>
> **T-Mobile/Cingular** – Usage-sensitive costs for switches have fallen dramatically. The current version of HAI [5.3] uses a 0% end office, non-port fraction. No additional costs are appropriate except interoffice trunk equipment. No more than $18.33 per line should be used as a flat, monthly rate.
>
> **Commission Decision:** Consistent with the Arbitrator's Final Decision, the Commission adopts T-Mobile/Cingular's position. The "MAG Order" allows, but does not require, an input value of 70%, but also does not preclude a 0% input value. The Commission agrees that switching costs are no longer traffic sensitive.[20]

Note in the Missouri arbitration, the Missouri Commission specifically addressed the MAG Order, stating the order "allows, but does not require, an input value of 70%, but also does not preclude a 0% input value. The Commission agrees that switching costs are no longer traffic sensitive."

Q. What is your position on the usage-sensitive portion of end office switching?

A. I agree with the findings of the FCC and State commissions that I have cited. Based on my research on this issue, switch processors, switch matrices and other getting started components of modern digital electronic switches are sized with sufficient capacity such that the BH call attempts and BH minutes of use or CCS per line in normal, and even high-use situations, do not cause exhaust. Rather, the

[20] *BPS Telephone Company/Cingular Wireless/T-Mobile Arbitration Order,* Case No. TO-2006-1047, at 7, 2006 Mo. PSC LEXIS 342 (March 23, 2006).

quantity of lines terminating on the switch determines the exhaustion of switch capacity, and therefore, is the causer of switch investment. The exception to this is the switch trunk equipment that provides the interface to interoffice trunks for outgoing and incoming traffic to other switches. The volume of peak traffic over interoffice trunks affects the number of trunk ports required on the switch and the investment in interoffice trunk equipment. I regard these switch components and their investment to be usage-sensitive. Based on my analysis of switches of varying sizes, the usage-sensitive trunk equipment investment typically is 10 percent or less of total end office switch investment.

Q. **Have the Petitioners provided information that supports your position?**

A. Yes. The switch investments shown in rows 7-21 of Exhibit WCC-2 were obtained from the Petitioners' response to Interrogatory 23 in Alltel's first set of discovery requests. The response consisted of worksheets showing the development of switch investments. For example, Exhibit WCC-3 shows the switch investment calculations for the Freeman cluster shown in column C of Exhibit WCC-2.

The first four line items (two levels of COE startup costs, the cost of the switch controller/server and the cost of LAMA / billing software) are fixed costs per switch. These are costs the FCC in the *Virginia Arbitration Cost Order* called "getting started costs" and concluded were not usage-sensitive. These switch investments represent 40 percent of total switch investment for the Freeman cluster.

The next two line items are for DS1 trunk units used to interface with interoffice and host-remote transport systems.[21] The quantity of DS1 trunk units is determined by the volume of interoffice traffic, so the investment for these switch components is usage-sensitive. In this case, switch trunk investment is six percent of total switch investment.

All of the remaining line items, except the single CLASS/Intercept Announcement Unit, are associated with digital, analog and VoIP line ports, which are not usage-sensitive. Together, the line port investment is 44 percent of total switch investment. (The CLASS/Intercept Announcement Unit is two percent of total switch investment.)

Therefore, only six percent of the Freeman switch investment is usage-sensitive, not the 70 percent assumed in the Vivian Tel.'s cost study. The same situation applies to all Vivian Tel. switch clusters, with the usage-sensitive switch trunk investment running from five to seven percent of total switch investment.

Q. What change do you recommend to correct the cost studies?

[21] A DS-1 trunk unit has the capacity for 24 voice trunks.

A. I recommend that only switch trunk investment be treated as usage-sensitive. This change can be made in the switching cost spreadsheet shown in Exhibit WCC-2 by changing the switch processor / matrix percentage in cell I38 to zero percent and the switch trunks percentage in cell I39 to the percentage derived by dividing the sum of cells I11 and I12 by cell I23. This represents the actual switch trunk portion of total switch investment. For Vivian Tel. the usage-sensitive percentage is 6.1 percent.

Adjustment 2 – Forward-looking weighted average cost of capital

Q. What is the weighted average cost of capital, and how does it affect Petitioners' costs?

A. The cost of capital is the return requirement on debt and equity capital. It reflects a weighting of the forward-looking cost of debt (interest on long term bonds) and cost of equity (return required by stockholders through dividends and stock price appreciation). The weighting is based on the expected proportions of debt and equity capital invested in the Petitioners' businesses. The cost of capital is included in transport and termination costs as a return requirement on the plant investment in switches, cable, transmission equipment and other assets.

Q. What assumptions do the cost studies make with respect to capital mix and the costs of debt and equity?

A. The cost studies assume that Petitioners will have no long-term debt and a forward-looking cost of equity of 11.25 percent. Since they assumed no debt, there is no cost of debt in the studies. The weighted average cost of capital is 11.25 percent after tax, and 17.05 percent before tax.[22]

These assumptions are questionable, because in a response to Alltel's first request for information, Golden West Telecommunications Cooperative indicated that in 2004 it had $64.7 million in long term debt, which represented 38 percent of its long term debt and equity capital.[23] The Petitioners also provided no basis for the 11.25 percent cost of equity assumption. This value actually appears to be somewhat low.

In a decision earlier this year based on an extensive record on telephone company costs of capital, the California Public Utilities Commission (CPUC) adopted a 12.3 percent cost of equity for Verizon.[24] In that same decision, the CPUC noted a previous cost of equity it had set for SBC of 11.78 percent. The CPUC also adopted for Verizon a 33.56 percent ratio of debt to total investor-supplied capital and a 6.15% cost of debt.

Q. What is your recommendation for the weighted average cost of capital to use in the studies?

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[22] 17.05% = 11.25 percent equity return requirement after tax / (1 – 34% effective income tax rate).

[23] [redacted]

[24] *Opinion Establishing Unbundled Network Element Rates and Price Floors for Verizon California and Modifying Decision 99-11-050 Regarding Monopoly Building Blocks,* Rulemaking, D.06-03-025, 03/15/06, p. 58-61.

A. I recommend a 38 percent debt ratio. This is the actual debt ratio of the Golden West Telecommunications Cooperative at the end of 2004, and the value is within 4.4 percentage points of the debt ratio determined by the CPUC earlier this year.

For the cost of debt, a 6.0 percent cost of debt should be used. This is consistent with the interest rates the Golden West Companies currently pay, based on their response to Alltel's second request for information and in line with the CPUC finding in D.06-03-025.[25] For the cost of equity, a 12.3 percent cost of equity is appropriate. This is the value determined by the CPUC and is 1.05 percentage points higher than in the Petitioners' cost studies.

These parameters result in a 9.9 percent weighted average cost of capital after tax, and 13.8 percent cost of capital before tax.[26]

Adjustment 3 – Economic life for switching

Q. How do economic lives affect transport and termination costs?

A. One component of transport and termination costs is the depreciation expense used to recover capital investment in telephone plant over the life of the plant. Economic lives are used to compute depreciation expenses for switching, cable, transmission equipment and other plant.

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[25] "Golden West Companies' Objections and Responses to Alltel's Second Set of Interrogatories and Requests for Production of Documents Propounded to Golden West Companies," 07/31/06, response to Interrogatory 33.

[26] 9.9% = 38% X 6% + (1 – 38%) X 12.3%. 14.2% = 38% X 6% + (1 – 38%) X (12.3% / (1 – 34% effective income tax rate)).

Q. What did the Petitioners assume for the economic life of switches?

A. The cost studies assume an eight year life for digital electronic switching. From reviewing the cost studies and the responses to Alltel's requests for information, I have not found any substantiation for this assumption.

Q. Is eight years a reasonable estimate for the switching economic life?

A. No, it is too short. Expected lives for switching equipment have declined in recent years. The life assumption in the FCC's *USF Inputs Order* (Appendix A) from 1999 was 16.17 years.[27] In the Verizon case in California that I described earlier, the CPUC adopted Verizon's current financial reporting life for switching of 12 years. Previously, it adopted SBC's financial reporting life of 10 years.[28] The eight year life assumed by the Petitioners, though, is 20 percent shorter than the shortest of these lives.

In discussing the basis for its decision to adopt Verizon's proposal for a 12 year switching life, the CPUC noted the following:

> According to Verizon, the asset lives it proposes consider current network modernization strategies, the impact of technology and competition, regulatory commitments, state demographics, and wear and tear. (Verizon/Sovereign, 11/3/03. p.9) Verizon asserts that competition spurs technological development, shortens the economic life of existing assets, and makes them obsolete.

[27] *In the Matter of Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, *Forward-looking Mechanism for High Cost Support for Non-Rural LECs*, CC Docket No. 97-160, Tenth Report and Order, adopted 10/21/99.

[28] *Id.*, pp.58-59.

> Further, facilities-based competition diverts traffic from the ILEC's network to competitive local carriers' (CLCs) networks. (*Id.*, p. 11.) Verizon compares its proposed asset lives to those forecast by Technology Futures Inc. (TFI), an independent research organization that specializes in technology market forecasts. Verizon indicates that its proposed lives fall within the range of lives proposed by TFI. (*Id.*, pp.20-21.)

Thus, Verizon considered a 12 year life as taking into consideration factors such as modernization, competition, *etc.*

Q. What is the recommended life for switching?

A. I recommend a 10 year economic life for switching. This is the same as the CPUC found for SBC in D.04-09-063.

Adjustment 4 – Recognizing the normalization of deferred income taxes in calculating capital costs

Q. Please explain this adjustment.

A. In my experience, telephone companies use accelerated tax depreciation for income tax purposes. The depreciation amounts used to compute taxable income are based on shorter lives than book depreciation lives and accelerated depreciation formula, compared to straight-line book depreciation. This results in lower income taxes in the early years of an asset's life. Rather than "flow-through" the benefits of lower income taxes, telephone companies "normalize" the effects of deferred taxes by reporting taxable income and net income as though tax depreciation was effectively at book depreciation amounts. The deferred income taxes are available for capital investment, thus reducing investor-supplied capital requirements and the cost of capital. In the later years of the assets life the effect is reversed, as tax depreciation amounts are less than book depreciation.

Typically in TELRIC studies, capital costs are computed to reflect the benefits of deferred income taxes due to accelerated tax depreciation. It results in lower capital costs and income taxes. The Petitioners' cost studies do not take this benefit into consideration. If the Petitioners use accelerated tax depreciation and normalize the deferred income taxes, their capital costs should be reduced accordingly.

Q. In correcting Petitioners' switching costs, have you reduced capital costs and income taxes for the effect of normalized deferred income taxes?

A. Yes. The capital cost factor for switching (depreciation, cost of capital and income taxes) computed by the Petitioners is 24 percent (23.8%) (cell J26, Exhibit WCC-2). Assuming normalized deferred income taxes, this value becomes 20.6 percent. The capital cost factor is 16.4 percent after further adjusting for the recommended cost of capital and economic life. This is the value that I used in correcting the Petitioners' switching costs. While I did not change the economic lives for cable plant and transmission equipment, I did correct the capital cost factors for these types of plant for the cost of capital and the effect of normalized deferred income taxes.

Adjustment – Direct expense factor for switching

Q. What are direct switching expenses?

A. These are the expenses incurred in maintaining, repairing and rearranging switch plant. They are charged to account 6212. The expense factor represents the ratio of expenses in account 6212 to the embedded switching investment in account 2212. Vivian's direct expense factor for switching [redacted] The other Petitioners' factors are as follows:

- Armour – [redacted]
- Bridgewater Canistota – [redacted]
- Golden West – [redacted]
- Kadoka – [redacted]
- Sioux Valley – [redacted]
- Union – [redacted]

Q. What are benchmarks for the expense factor?

A. The ratio of digital electronic switching expenses to investment for Qwest – South Dakota in 2005 was only 2.2 percent.[29] Similarly, the *alternative CO switching factor* from the FCC *USF Inputs Order* (Appendix A) was 2.69 percent.

Q. Is it reasonable for the Petitioners' expense factors to be so much higher than the benchmarks?

[29] From ARMIS 43-03 Report, Qwest Corporation, South Dakota, 2005. 2.2% = $3,027,000 account 6212 / $138,788,000 account 2212.

A. I would expect their switching expenses per dollar of investment to be somewhat higher than those of Qwest in South Dakota, but not as much as 4.6 times higher. One of the reasons for Petitioners' expenses, other than Sioux Valley, being so high is that account 6212 includes not only recurring maintenance and repair expenses (recoverable in transport and termination rates), but also non-recurring service provisioning expenses. The latter are largely for retail services and should not be attributed to transport and termination. A second reason, depending on the Petitioners' accounting practices, is that account 6212 also may include software expenditures that are expensed. These software expenditures are non-recurring and would cause a Petitioners' expense factor to be high in the year they are incurred. The Petitioners apparently did not analyze their digital switching expenses to remove retail service provisioning expenses and to adjust for one-time software expenditures, if any.

Q. What do you recommend for the direct expense factor for switching?

A. I recommend a factor of six percent be used for all Petitioners. This will increase switching expenses for Sioux Valley. The expenses for Armour and Bridgewater Canistota will change very little. And, the expenses of the other four Petitioners will be reduced to what is closer to a forward-looking level of switch maintenance and repair.

Adjustment 6 – Forward-looking engineering fill for switching

Q. What is switch engineering fill?

A. This is the ratio of lines in service to lines of equipped capacity for the line peripheral equipment of switches (primarily line cards). It is sometimes referred to as the *switch port administrative fill*. Switch line equipment is normally added as line growth occurs. Because line peripheral equipment is relatively easy to augment, the engineering fill factor normally can be maintained at a fairly high level. A factor of 94 percent is a good benchmark.[30]

Q. How does engineering fill affect Petitioners' cost study results?

A. Switch investments for line equipment are determined by the amount of equipped line capacity. If too much equipped capacity is provided, switch investments and costs will be higher than necessary, resulting in higher termination costs than permitted by the FCC rules. The switch investments on lines 15, 17 and 19 of Exhibit WCC-2 are based on total equipped lines for Vivian of [redacted] lines. Vivian's assigned lines (lines in service) total [redacted], so the engineering fill reflected in the model is 87 percent. This is the same for all Petitioners.

Q. What is your recommendation for switch engineering fill?

A. The engineering fill or *switch port administrative fill* ordered by the FCC in the *USF Inputs Order* of 94 percent should be used in the cost studies. This will lower the equipped line capacity and lower switch investments and costs.

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[30] FCC *USF Inputs Order*, paragraph 330.

Q. Based on the recommendations for switching, have you corrected Vivian's switching costs as shown in Exhibit WCC-2?

A. Yes. After correcting Vivian's switching costs for Adjustments 2-6, the switch costs per minute of use decrease from $0.0032 to $0.0018. Removing switch processor/matrix costs, which are not usage-sensitive, for Adjustment 1 further reduces switch costs to $0.0004 per minute of use. The corrected cost calculations for Vivian are shown in Exhibit WCC-8. (The final, corrected cost of $0.0004 per minute is in cell I54.)

<u>Transport Costs</u>

Q. Please describe again the network elements required for transport?

A. Transport in the Petitioners' studies consists of two elements – interoffice (IO) plant and IO electronics. IO plant is the fiber cabling connecting switches throughout the Golden West Companies' networks and connecting to meet points with Qwest and the South Dakota Network (SDN) tandem switch. (Alltel mobile-to-land traffic does not use the SDN tandem). IO electronics is the transmission equipment at each central office or network node used to add and drop circuits to the interoffice transport systems, to convert electrical to optical signals and provide other functions. I will describe each element separately, beginning with the IO plant or what I will call transport cable costs.

Q. Did you prepare an Excel spreadsheet to replicate the Petitioners' transport cable cost calculations?

A. Yes, Exhibit WCC-4 shows the transport cable cost calculations for Vivian Telephone. This spreadsheet displays the method, assumptions and input data used to compute $0.0060 per minute for Vivian's claimed IO-plant costs shown in Table 1.

Q. Please describe the method used to compute transport cable costs?

A. Vivian indicates that it has 78 interoffice cable routes throughout its network used by interoffice transport systems. I show the first ten of these cable routes for illustration in rows 7 through 16.[31] For each cable route, a fiber cable investment (column D) is computed based on the route miles of cable and an installed fiber cable cost of $2.21 per foot.

Cables sizes vary by the number of fibers in the cable. Column E shows that for the first ten cable routes, sizes range from eight to 20 fiber cables. These fibers are used for interoffice transport systems, carrying local, EAS, toll and mobile traffic, as well as digital loop carriers, cable TV and other uses ("Special"). In any cable, a portion of the cables are not in service or "Dark." In column L, the average cable investment per fiber in service is computed, and then in column M the cable investment attributable to transport systems is determined based on the product of the average cable investment per fiber and the fibers used by transport systems (column F). For example, the total fiber cable investment for "Bonesteel to Fairfax" is [redacted] (based on [redacted] miles of cable), and [redacted] is attributed to

[31] For ease of presentation, the other 68 cable routes are not shown on the spreadsheet, although their route mileages and cable investments are included in the total amounts shown on row 105.

IO transport. The remaining [redacted] of investment is attributable to loops, CATV, *etc.* The latter investment is not recoverable in transport and termination rates.

Q. Which variables are important in determining the transport cable investment?

A. Cable route mileages are important. FCC Rule 51.505(b)(1) requires that cable routes reflect "the lowest cost network configuration." The Petitioners have used existing cable route distances, which may be a practical measure; however, a forward-looking design likely would result in more efficient cable routing, shorter cable lengths and lower costs. Vivian has 548 miles of interoffice cable installed over 78 cable routes.

Cable cost per foot is another important variable. In my experience, $2.21 per foot for installed fiber cable is not unreasonable for the cable sizes expected for rural ILECs.

The sharing of cables is important. Overall, the Vivian cost study estimates that 64.48% of fiber-miles in service (cell N105) are used by interoffice transport and the remainder by digital loop carriers, CATV and other uses. This is key variable in the cost calculations. FCC Rule 51.511 deals with the sharing of network elements. The rule states as follows:

> The forward-looking economic cost per unit of an element equals the forward-looking economic cost of the element, as defined in §51.505, divided by a reasonable projection of the sum of the total number of units of the element that the incumbent LEC is likely to provide to requesting telecommunications carriers and the total number of units of the element that the incumbent LEC is likely to use in offering its own services, during a reasonable measuring period. (*emphasis added*)

The Petitioners based the 64.48% of total interoffice cable investment assigned to transport on today's uses of fibers in service, rather than a "reasonable projection" of total demand "during a reasonable measuring period." Thus, if the demand for fibers grows for digital loop carriers, CATV, *etc.*, as might be expected, in comparison with transport systems carrying voice traffic and special circuits, then the 64.46% would be reduced. The cable investment attributable to the transport system of $4.1 million (cell M105) would be reduced as would the transport cost.

Q. Continue describing the calculation of Vivian's transport cable cost per minute,

A. Rows 108 through 116 show the annual capital costs and operating expenses associated with the portion of interoffice cable used for transport. Annual cost factors are computed in column N, rows 108-117. These are simple ratios of each annual cost to the total transport cable investment. The overall annual cost factor is 25.4 percent of investment, which includes corporate overheads or "common costs."

The next step also is important. As I described earlier, transport consists of two elements – the transport cable and the transmission equipment. Transmission equipment capacity and costs are driven by the quantity of circuits and bandwidth of the circuits (DS1, DS3, OC3, *etc.*).[32] Forward-looking economic costs per unit according to FCC Rule 51.511 are calculated by dividing the forward-looking costs of transmission equipment by the total demand for bandwidth, consuming the capacity of the equipment. Transport cable costs per unit also are based on total demand for bandwidth.[33]

It is my understanding based on responses to Alltel information requests that cells M120-M122 represent the total demand served by Vivian over its interoffice transport systems.[34] This consists of 3,594 voice trunks and 298 special circuits.[35] The voice trunks are equivalent to DS0 circuits (64,000 bits per second), and the special circuits range in bandwidth from DS0 to OC3. The Petitioners count each circuit as one "path" regardless of bandwidth. A DS0 special circuit and an OC3

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[32] DS1, DS3, OC3, *etc.* refer to different levels of bandwidth. A DS1 circuit is for transmission of approximately 1.5 million bits per second. A DS3 is the equivalent of 28 DS1s, and an OC3 is the equivalent of three DS3s or 84 DS1s.

[33] Transport cable forward-looking economic costs per unit are computed in two stages. In the first stage, the total investment and costs of fiber cable is divided by total fibers in service to compute a *cost per fiber*, which is the driver of cable capacity. In the second stage, the total investment and costs of fiber cable attributable to the transport system is computed by multiplying the *cost per fiber* times four fibers typically required for a transport system. The transport system cable cost is divided by the total bandwidth in service on the transport system.

[34] The title on page GWD020206 of Vivian's response to Alltel's first data request states, " Interxchange Special Circuits Using Vivian Telephone Facilities."

[35] Special circuits are circuits providing a dedicated transport channel of a particular bandwidth. Special circuits are not equivalent to voice grade trunks in purpose or consumption of network resources. Subscribers use these circuits for private lines and special access.

special circuit each count as one path, even though the OC3 circuit has the capacity of 2,016 DS0s.

The Petitioners' cost model allocates the total transport annual costs (cell M117) between switch trunks and special circuits based on their portions of "paths." To better illustrate the underlying assumptions and input values, I have shown the calculations differently, although the method is algebraically the same. The total transport annual costs are divided by "total paths" (cell M122) to compute a transport cable annual cost per path. This cost is next divided by Vivian's annual minutes of use per switch trunk (cell M126) to arrive at the transport cable cost per minute of $0.0060.

Q. Do Petitioners' methods, assumptions and input data for computing transport cable costs comply with the FCC rules?

A. No, they do not comply with the FCC rules in several important aspects.

- Petitioners have not demonstrated that current interoffice cable lengths reflect an efficient network configuration. To the extent existing cable lengths might be shortened by redesigning cable routes, this would result in lower transport cable investment and costs.
- Petitioners cost studies do not recognize the shorter transport distances to Qwest's tandem switches for mobile-to-land traffic versus transport distances to the SDN tandem switch. This causes transport cable costs to be overestimated.

- Petitioners have not projected demand for fibers over a reasonable future period, likely overstating the proportion of transport cable costs attributable to the interoffice transport system versus other users. These other users include digital loop carriers, cable TV and special circuits (columns G-I). As total demand for fibers grows, the cable investment per fiber will decline, resulting in lower cable investment and costs attributable to the transport system carrying mobile-to-land traffic (column M).
- The utilization level for switch trunks is low in terms of the average annual minutes of use per switch trunk. This causes transport cable and transmission equipment costs per minute to be high. The utilization levels for the transport systems (OC12, OC48 and OC192 sized systems) and DS1 trunks also are likely to be low.
- The method used by Petitioners to measure total demand for transport is incorrect. Their method causes too much of transport cable and transmission equipment costs to be attributed to switch trunks and too little of these costs attributed to special circuits. The costs of special circuits are not recovered in transport and termination rates.
- The transport of mobile-to-land traffic appears to often involve multiple Petitioner networks, such that the transport cable and transmission equipment costs computed for individual Petitioners are not valid. To determine the cost of transporting a mobile-to-land call from the meet point with the transit carrier to the terminating end office requires computing costs for the transport cables and transmission equipment across these networks.

To varying degrees, the Petitioners have failed to meet their burden of proof by substantiating the methods, assumptions and input values related to each of these issues. They have not shown that interoffice cable lengths reflect efficient network design. The studies do not reflect the fact that mobile-to-land traffic travels shorter transport distances than other traffic. The Petitioners have not demonstrated that utilization levels – fibers in service to fiber capacity, DS1s in service to transport system capacity, switch trunk DS0s in service to DS1 capacity and minutes per switch trunk DS0 – are forward-looking and reasonable. They have not demonstrated that "paths" is an accurate measure of capacity consumption and cost causation. And, the Petitioners have not explained why transport cable and transmission costs for each Petitioner apparently are limited to its portion of the transport route that a mobile-to-land call travels.

Adjustment 7 – Forward-looking interoffice cable lengths

Q. What do you recommend with respect to interoffice cable lengths?

A. The Petitioners have used their current interoffice cable lengths connecting existing network nodes. The concern is that some of the cable routes used in the study may not be used by mobile-to-land traffic, or perhaps may no longer be in service, causing interoffice cable lengths to be longer than necessary. The Petitioners have provided network diagrams illustrating their network layouts and information on cable routes. However, I have not been able to use this information to trace mobile-to-land call routes, to identify any cable routes not used by mobile-to-land traffic, or cable routes, if any, not in service. The Petitioners should augment their network diagrams showing their fiber rings, the cable routes making up each ring and the routing of mobile-to-land calls. Also, if any cable routes are no longer in service, these should be identified. Then, interoffice cable lengths should be adjusted, as necessary. In the meantime, I have adjusted interoffice cable lengths to reflect the shorter distance traveled by mobile-to-land traffic (Adjustment 8).

Adjustment 8 – Reflecting the shorter interoffice transport distances for mobile-to-land traffic

Q. Could you provide more background on this issue?

A. In reviewing Petitioners' calculation of transport cable costs, I showed that total transport cable costs (cell M117, Exhibit WCC-4) are divided by total paths (cell M122). In effect, the cost of a circuit of average length is being calculated. However, the cable route mileage required for a mobile-to-land call from a Qwest tandem is much shorter than a call to or from the SDN tandem. In response to Alltel's second data request, the Petitioners provided information on these distances for each end office. The distances are summarized in the following table:

Transport Distances

	Distance (miles) to:		
End Office	Qwest Tandem	SDN Tandem	% Difference
Armour			
Armour	214.47	346.25	61%
Bridgewater			
Bridgewater	146.38	278.16	90%
Canistota	146.38	278.16	90%
Golden West			
Hot Springs	196.23	660.78	237%
Philip	196.23	660.78	237%
Pine Ridge	196.23	660.78	237%
Wall	196.23	660.78	237%
Kadoka			
Kadoka	-	1,135.17	NA
Union			
Hartford	7.30	278.16	3710%
Wall Lake	7.30	278.16	3710%
Sioux Valley			
Dell Rapids	6.00	139.08	2218%
Plankinton	5.40	139.08	2476%
Vivian			
Burke	114.21	717.07	528%
Custer	260.43	660.78	154%
Freeman	-	938.94	NA
Mission	184.25	787.11	327%
Rosebud	205.16	808.02	294%
Winner	57.92	660.78	1041%

Note that in two offices, Kadoka and Freeman, the Qwest meet point actually is located in the central office. This means the mobile-to-land transport distance is zero, or no more than the length of an intra-office cable. The distances to the SDN tandem for these same offices is over 900 miles (ring route miles). There are four other Petitioner offices that are less than ten miles from the meet point with Qwest, and their distances to the SDN tandem range from 139.08 to 278.16 miles. In every case, the distance to the SDN tandem is substantially greater than the transport distance for mobile-to-land traffic. Transport cable costs should be computed specifically for the distances applicable to this traffic. Otherwise, the transport rate charged to Alltel will be subsidizing other services, which is specifically prohibited by FCC Rule 51.505(d)(4).

Q. How do you plan to address this issue?

A. Later in my testimony, I will recommend an alternative method for computing transport cable costs. The method specifically addresses this issue and others.

Adjustment 10 – Correct utilizations levels for transport

Q. Are there several utilization levels involved in computing transport costs?

A. Yes. There are four utilization levels that are important in the transport cable cost studies. These include:

- *Fiber utilization.* This is the forward-looking average number of fibers in service per cable. Fiber utilization affects transport cable costs per fiber and subsequently transport cable costs per minute.
- *Interoffice transport system utilization.* The Petitioners have assumed forward-looking transport system sizes of OC12, OC48 and OC192. These are large systems capable of transporting significant volumes of switch trunks, special circuits and others. The Petitioners cost studies do not explicitly identify forward-looking utilization levels in terms of DS1 equivalents in service.
- *DS1 utilization.* Switch trunks carrying mobile-to-land traffic are normally transported on DS1 circuits. The cost studies do not indicate the utilization level or average number of switch trunks per DS1.

- *Annual minutes of use per switch trunk.*

Q. Do you question the utilization levels in the Petitioners cost studies?

A. Yes. In the case of Vivian, its average fiber utilization level is 47.9 percent. Utilization levels for the other Petitioners range from 25 to 63 percent. This is based on current fiber-miles in service. FCC Rule 51.511(a) requires in this case that total demand for fibers be projected over a reasonable period, so that if Vivian expects additional demand above current levels, the per-unit transport cable costs reflect higher utilization. Also, if the growth is in usage by digital loop carriers, cable TV, *etc.*, this will result in a smaller portion of costs being assigned to the interoffice transport systems carrying mobile-to-land traffic.

The Petitioner cost studies do not identify their transport system and DS1 utilization levels, though I suspect these utilization levels are low given the size of the assumed transport systems (OC12, OC48 and OC192). The alternative method that I am recommending for computing transport cable costs requires specific estimates of these utilization levels, so that they can be verified as being reasonably efficient. Finally, the annual minutes of use per trunk are low.

Q. How did you conclude that annual minutes of use per trunk are low?

A. For Vivian, I divided the EAS and toll annual minutes used to determine per-minute transport costs by the number of switched trunks. Vivian indicated its EAS and toll minutes are approximately 58 and 103 million per year (Exhibit

WCC-2, cells I48 and I49). The total annual minutes of approximately 161 million were divided by 3,594 switch trunks (Exhibit WCC-4, cell M120) to calculate an average of 44,705 annual minutes per switch trunk.[36]

Q. Is this an efficient level of utilization?

A. Trunk utilization of 44.7 thousand minutes per year is low. Trunks are sized to handle BH usage. To approximate the BH usage associated with 44,705 annual minutes of use, I used several traffic parameters from the FCC's *USF Inputs Order* (Appendix A). I divided the annual minutes of use by 270, which is the *annual to daily reduction factor*. This yields 165.6 minutes per day. This figure is multiplied times a 10 percent *busy hour (BH) fraction of daily use*, resulting in 16.56 minutes per trunk during the busy hour.

Traffic is measured in units of 100 call seconds (centum call seconds or CCS), so I next multiplied 16.56 minutes times 60 seconds per minute, and divided by 100 seconds per CCS. This indicated busy hour traffic of 9.93 BH CCS. Assuming 27.5 BH CCS as the *maximum trunk occupancy*, again from the FCC *USF Inputs Order* (Appendix A), the average trunk utilization would be only 36 percent. This means that spare capacity for Vivian's average switch trunk is 64 percent. While

[36] Vivian indicated that it also has 237,975,921 local minutes per year; however, no portion of these minutes were identified as minutes transported over trunks or used in the calculation of transport costs per minute. To the extent that a portion of these minutes may be host-to-remote traffic or interoffice local traffic, which would be over switch trunks, this would increase the annual minutes per switch trunk. However, it would correspondingly lower the transport cost per minute.

some switch trunks would have higher utilization, others would be lower than 36 percent. This is not efficient utilization.

Q. What are the transport minutes per switch trunk for the other Petitioners?

A. These are shown in the table below. The range of annual minutes per trunk is 33,405 to 58,586, with an average of 47,766 or approximately the same level as Vivian.

Q. What is a reasonable benchmark for annual minutes per trunk?

A. FCC Rule 51.513(c)(4) recommends a loading factor of 9,000 minutes per month per voice-grade circuit for computing proxy-based rates for shared transmission facilities between tandem switches and end offices. This equates to 108,000 annual minutes per trunk (= 12 X 9,000 minutes per month). Using the same methodology as before, the average trunk utilization given 108,000 annual minutes per trunk would be 87 percent. This would be a more efficient level of utilization.[37]

Q. What is the effect on Vivian's transport cable cost per minute of using the more efficient level of utilization recommended by the FCC?

A. Annual minutes of use per switch trunk of 108,000 would be substituted for 44,705 in cell M126. The transport cable cost per minute would be reduced from $0.0060 to $0.0025.

Q. What is your recommendation regarding transport utilization levels?

A. I will provide a recommendation for each of the four utilization levels when I describe the alternative method for computing transport cable costs.

Adjustment 10 – What is the correct utilization measure for transport?

Q. Please describe the flaw you found in the studies with respect to how transport utilization is measured.

A. Petitioners measure demand for transport capacity or utilization in terms of "paths," where a path is one circuit regardless of its bandwidth. A DS0 circuit would be counted as one path, and an OC3 circuit with the bandwidth of 2,016 DS0 circuits would be counted as another path. This is an incorrect measure of transport capacity consumption and cost causation. It understates the transport system capacity consumed by special circuits, which include OC3 circuits and

[37] With respect to footnote 36, using 108,000 annual minutes of use per trunk would apply irrespective of whether a portion of Petitioners' local minutes are interoffice traffic.

other high-bandwidth circuits, and results in an overstatement of the transport cable and transmission equipment costs per minute underlying Petitioners' proposed reciprocal compensation rates.

Q. Would you illustrate the problem?

A. Suppose a school bus, which is a form of transport, costs $10,000 per year to operate, and suppose there are 20 children who ride the bus.[38] The annual cost per rider would be $500 ($10,000 divided by 20 *children*). If the school district charged for bus transportation, each household would be expected to pay <u>$500 per child</u>.

Suppose instead that demand for seats on the bus was measured in terms of households, and suppose there are 15 households with children riding the bus, ten households with one child and five households with two children. The <u>cost per household is $666</u> ($10,000 divided by 15 *households*). However, households do not consume the capacity of the bus; capacity is consumed by children requiring seats. But using households as the method of measurement, the cost per child in the ten single-children households is $666, whereas the per-child cost in the five dual-children households is $333. Most families would regard this methodology as unfair, not to mention inconsistent with the way capacity is consumed and costs caused. This is the methodology used by the Petitioners.

[38] The bus has 40 seats, but total demand at the present time is 20 children occupying 20 seats of capacity.

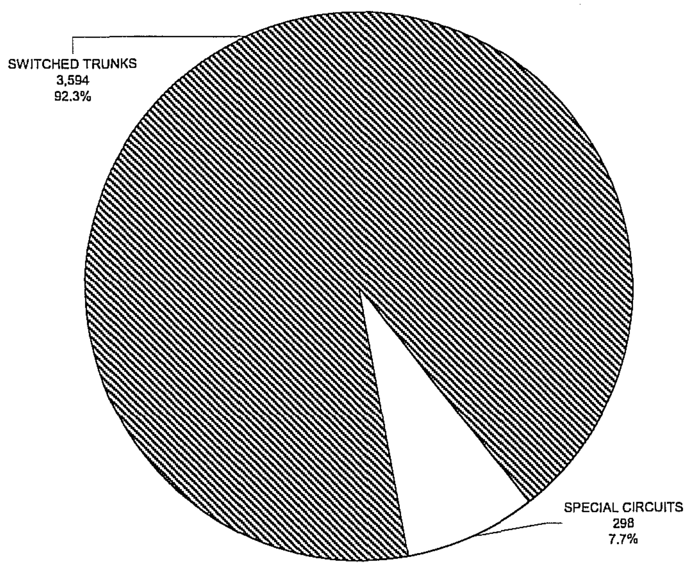
Q. How does the Petitioners' methodology do this?

A. In computing total "paths" (cell M122), Vivian adds the quantity of switch trunks, 3,594, to the quantity of special circuits, 298. The switch trunks are voice channels equivalent to a transmission speed of 64 kilobits per second or a DS0 circuit. The following table shows a breakdown of the 298 special circuits in terms of their transmission speeds and the equivalent number of DS0 circuits.

The 298 special circuits consume more of the transport system capacity than indicated in the "path" measurement used by the Petitioners. Counting one circuit, regardless of bandwidth, as one path is analogous to measuring households rather than children requiring seats on the bus. Under the Petitioners method, 92 percent of the total transport cable cost is attributed to switch trunks, with only eight percent going to special circuits.[39] This is illustrated in the graph below.

[39] 92% = 3,594 switch trunks / (3,594 switch trunks (DS0 equivalents) + 298 special circuits).

Path Count Method



Q. What is the effect on Vivian's transport cable cost per minute, if a consistent measure of transport system capacity consumption is used?

A. Substituting 22,879 DS0 equivalents for the 298 special circuit quantity (cell M121) results in total DS0 equivalents of 26,473. The transport cable cost per DS0 becomes $39.75, and the transport cable cost per minute becomes $0.0009 rather than $0.0060. As in the "children" versus "households" analogy, this gives a more consistent measure of capacity consumption and a more fair measure of unit costs. The Petitioners method is wrong and dramatically overstated transport cable costs per minute.

Q. Do you recommend using DS0 equivalents as the common measure of transport system capacity consumption?

A. No. DS1 equivalents, rather than DS0 equivalents, is a better common measure of transport system capacity consumption. I say this for two reasons. First, while a switch trunk is the equivalent of a DS0 circuit, trunks are combined in DS1 circuits for transport to other switches. Referring to Exhibit WCC-3, note that "trunking/toll" and "host-remote" equipment is purchased in units with DS1 capacity. Second, based on information provided by the Petitioners in response to Alltel requests for information, the OC12 and OC48 SONET transmission equipment used by the Petitioners receive interoffice transport circuits at DS1 level or higher, not at DS0 level. So, the measure of bandwidth consumption for switch trunks should be DS1s.

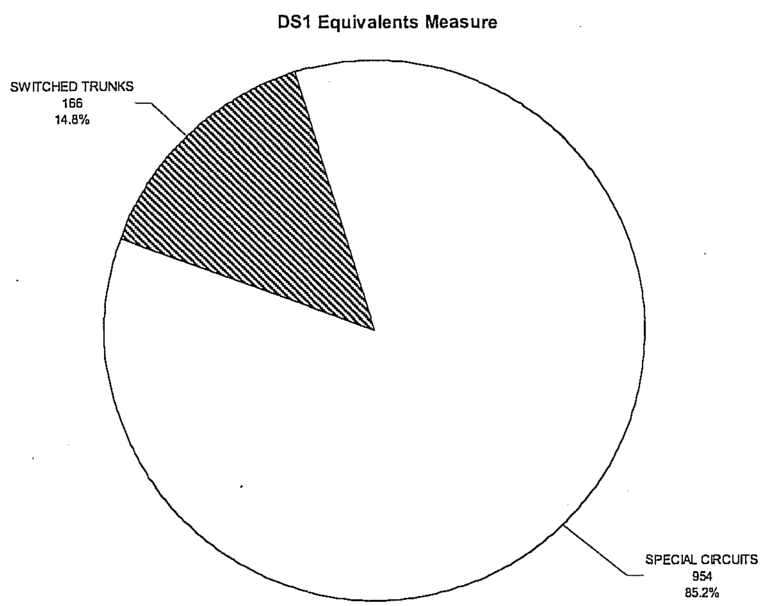
In the Vivian example, the 3,594 switch trunks should be divided by the quantity of DS0s per DS1. Rather than use the full 24 DS0s per DS1, I have used the 90% *maximum trunk fill* from Appendix A of the FCC's *USF Inputs Order* multiplied times 24 DS0s per DS1. This results in approximately 166 DS1 circuits for switch trunks (= 3,594 switch trunks / (90% fill X 24 DS0 / DS1)).

Q. If DS1s are used as the "common denominator" for switch trunks and special circuits, rather than paths, what would be Vivian's transport cable cost per minute?

A. The switch trunk DS1s would be 166, and the special circuit equivalent DS1s would be 954.[40] This results in a total of 1,120 DS1 equivalents. The transport

[40] 954 = (55 DS0s / 21.6 DS0s per DS1) + 223 DS1s + 17 DS3s X 28 DS1s per DS3 + 3 OC3s X 84 DS1s per OC3.

cable cost per DS1 would be $940. This figure would be divided by 21.6 switch trunks per DS1 and 44,705 minutes per trunk, resulting in a corrected transport cost per minute of $0.0010 or 1/6th the value in Vivian's cost study. Using DS1s as the common measure of transport system capacity consumption correctly results in a substantial portion of transport costs being assigned to special circuits as illustrated in the following graph.



Q. Is this approach you recommend for Adjustment 10?

A. Yes. Rather than use "paths" as the measure of capacity consumption, equivalent DS1s should be used. This is consistent with the purchase of switch trunk equipment and the consumption of transport transmission equipment. It also is consistent with FCC Rule 51.511(a).

Adjustment 11 – Recognizing that mobile-to-land traffic involves multiple Petitioner networks

Q. Please describe this issue.

A. Earlier I gave the FCC definition of transport in §51.701(c) as "the transmission and any necessary tandem switching of telecommunications traffic ... from the interconnection point between the two carriers to the terminating carrier's end office that directly serves the called party, or equivalent facility provided by a carrier other than an incumbent LEC." Transport for the Petitioners includes the interoffice cable and transmission equipment from the meet points with the transit carrier to the end offices serving their customers.

In many cases, it appears that a single Golden West Company does not own all transport cable and transmission equipment from the meet point with Qwest to the terminating end office. For example, in the case of Vivian, Alltel traffic is delivered by Qwest at three meet points – near Presho, SD, at Skyline Drive in Rapid City and in the Freeman central office building. Vivian's Custer switch receives Alltel originated traffic beginning at the Qwest meet point at Skyline Drive in Rapid City. From there the traffic travels over a ring to Hot Springs, a Golden West Telecom wirecenter, and then over another ring to Custer. Portions of the ring plant appear to be owned by Vivian and Golden West Telecom. Vivian also shares rings with Armour Telephone, Union Telephone, Sioux Valley Telephone and Bridgewater/Canistota Telephone.

When Vivian computes the transport cable cost per minute shown in Exhibit WCC-4, it appears the cable routes are only cables owned by Vivian, and the total paths are only switch trunks and special circuits using Vivian facilities. The transport cable cost per minute would not include costs of cables owned by other Petitioners. If my assessment is accurate, then the transport cable cost per minute computed by Vivian does not accurately measure the cost of transporting mobile-to-land traffic from Qwest meet points to Vivian's end offices.

Q. How should transport cable costs be calculated in order to address this issue?

A. The following approach should be used:

- For each Petitioner end office, the cable route mileage from the Qwest meet point to the end office should be determined. This should be the route traveled by mobile-to-land traffic following a least-cost route. The distance would be the length of the overall route. This may involve intermediate cable routes owned by one or more Petitioners. This step should incorporate Adjustments 7 and 8.
- Forward-looking transport cable costs per minute of use should then be computed for each end office based on the route mileage, cable cost per foot and the various forward-looking utilization levels of the interoffice transport system, DS1 circuits carrying switch trunks and the trunks themselves. This step should address Adjustments 9 and 10.

- Finally, weighted transport cable costs per minute – for an individual Petitioner or all Golden West Companies – should be computed using lines in service at each end office as the weighting factor.

This approach is consistent with the FCC's definition of transport and the computation of forward-looking economic costs per FCC Rules 51.505 and 51.511.

Q. Do you have the data necessary to compute transport cable costs as you described?

A. Yes, sufficient information is available to make reasonable estimates of forward-looking transport cable costs. As I go through the calculations for Vivian, I will point-out instances in which the calculations might be refined, although I do not believe the results would change materially.

Q. Should transport costs be computed for each company?

A. Company-specific transport and termination costs and rates are required by the FCC rules.[41] It is my understanding that the Golden West Companies effectively are one company in terms of corporate ownership and the sharing of transport facilities. My recommendation would be to compute transport cable and transmission equipment costs for the companies combined. This yields a single rate that recognizes that transport actually involves a mixture of Petitioners' plant

[41] Incumbent LECs with different transport and termination costs may use the same rate as long as the rate does not exceed the costs of the individual companies. (FCC 51.505(e))

and costs. Nevertheless, individual company costs may be computed and different rates set for each Petitioner. I have computed corrected transport cable costs for each company.

Adjustment 12 – Proper method for computing transport cable costs

Q. Please describe the method you recommend for computing transport cable costs.

A. Exhibit WCC-5 shows the approach that I recommend and have used to correct Petitioners' cost studies. The calculations begin with a fiber cable installed cost per foot of $2.18 (row 7). This is the average cable cost for all Petitioners, though the range of cable costs is just $2.15-$2.25 per foot (with the exception of Kadoka which has only 0.5 miles of cable). This cost is converted to an investment per mile by simply multiplying by 5,280 feet. The investment is converted to a fiber cable annual cost per mile by multiplying the investment times a 23.6 percent annual cost factor. This factor reflects adjustments to cable capital costs for the cost of capital and normalization of deferred income taxes. The result of $2,706.16 (row 12) is the annual capital costs and operating expenses (including common costs) for one mile of cable.

I computed an average of 14.7 fibers per cable for Petitioners' existing cable routes and entered this on row 14. I also calculated the current, average utilization of cable fibers. The figure is 52.8 percent, indicating that on average a cable has 7.8 fibers in service.

Q. Is it appropriate to use the current fiber utilization level?

A. The fiber utilization level should be forward-looking. As I explained earlier, it should reflect the total demand for fibers projected over a reasonable period of time as the demand for fiber grows. I recommended that the Petitioners make estimates of their anticipated demand for fibers. One way to do this would be for the Petitioners to provide a forward-looking value for fiber utilization to substitute for the existing utilization level on row 15.

Q. What is the next step in the calculations?

A. The fiber cable annual costs per mile are divided by 7.8 fibers in service per cable to calculate $348.22 per year as the cost per fiber-mile. This figure is multiplied times four fibers per IO transport system – one to transmit, one to receive and two for back-up. This value is typically used for SONET transport systems and is contained in Appendix A of the FCC *USF Inputs Order*. This gives a figure of $1,392.90 per mile for the annual costs of fiber used by the transport system.

The next step is to compute per-unit costs for the fiber cable in a manner consistent with FCC Rule 51.511. This is done in three steps. First, the fiber cable cost per DS1 in service is calculated. This is the cost per unit of capacity in service for the transport system. Second, the cable cost per switch trunk (DS0) is computed based on forward-looking utilization of DS1 circuits carrying voice traffic. Third, the cost per minute of use is calculated based on 108,000 annual minutes per switch trunk (DS0). The key variables in these calculations are the forward-looking utilization levels for the transport system, the DS1 circuits carrying switch trunks and the switch trunk.

Q. What value did you use for transport system utilization?

A. The cost studies and information provided in response to Alltel's data requests did not provide current utilization levels (DS1s in service per system) or forward-looking estimates of utilization. I made a very conservative estimate of utilization. I assumed that forward-looking utilization would be at least the level necessary to justify the use of a particular transport system. For example, to justify an OC12 transport system demand equal to at least an OC3 is needed, otherwise it would be more cost effective to place an OC3 system. For the OC12 transport system, I assumed forward-looking utilization of one OC3 of capacity - 25% of OC12 system capacity. One OC3 is equivalent to 84 DS1 circuits shown in cell B26.[42] The DS1s in service for OC48 and OC192 systems are computed in a similar manner.

Q. Do you believe forward-looking utilization levels are higher than 25 percent?

A. Yes, assuming such large transport systems are justified in the first place. If the Petitioners believe their forward-looking networks will have demand for switched and non-switched circuits to justify such large systems, the utilization levels should be greater than 25 percent. The problem comes when large transport

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[42] 84 DS1 = 3 DS3 / OC3 X 24 DS1 / DS3.

systems are placed and demand does not reach efficient utilization levels. The result is higher costs per minute for both transport cable and transmission equipment. For this reason, it would be inappropriate to use anything less than 25 percent; and, to meet their burden of proof and comply with the FCC rules, Petitioners should demonstrate that forward-looking demand justifies the sizes of transport systems used in the study and determine utilization levels to substitute for the 25 percent figure.

Q. Please explain the calculations leading up to the fiber cable costs per minute-mile.

A. The $1,392.90 fiber cable annual costs per transport system are divided by the forward-looking DS1s in service for each transport system size (row 26). This gives annual costs per DS1-mile ranging from $16.58 to $1.04 (row 28). I then made a second, conservative assumption; *i.e.*, that switch trunk utilization of DS1s would be 60 percent or 14.4 switch trunks (DS0) per DS1. Using this value, the fiber cable annual costs per switch trunk-mile are computed to be $1.15 to $0.07 (row 34). Finally, the fiber cable costs per minute-mile are calculated using the 108,000 annual minutes per switch trunk from FCC Rule 51.513(c)(4). The resulting fiber cable costs per minute-mile can be used with distances from each Qwest meet point to Vivian end offices to compute transport cable costs per minute. The same method can be used for other Petitioners to compute transport cable costs reflecting their particular transport distances for mobile-to-land traffic.

Q. Where did you obtain the distances from meet points to end offices?

A. In response to Alltel's second data request (Interrogatory 32), the Petitioners provided a schedule of "route miles to meet point" for each end office. The mileages provided were indicated to be "ring route miles," which appear to be the distance around each ring between the meet point and end office.[43] This would be a longer distance than the direct distance that traffic would travel, because traffic would not go around the full length of each ring. However, since Exhibit WCC-5 is using total demand for a transport system operating on the ring, using the ring route distance would be consistent.

Q. How was the ring route mileage used to compute transport cable costs per minute?

A. I used ring route miles for Vivian's six standalone and host switches to compute fiber cable costs per minute for each. For example, the Burke end office is located 114.1 ring route miles from the Qwest meet point near Presho, SD. This consists of 56.29 miles to Winner, SD, and 57.92 from Winner to the Qwest meet point.

The Petitioners also provided information describing their fiber rings, the end offices located on the rings and the transport system size.[44] Burke and Winner are on an OC48 ring, so I assumed 56.29 miles of fiber cable to be carrying an OC48 transport system. In all cases, I made the assumption that the ring(s) closer to the

[43] The mileages for Sioux Valley and Union were expressed in "route miles."

meet point is an OC48 ring. Thus, row 41 shows 114.21 ring route miles for an OC48 system. This distance is multiplied times the fiber cable costs per minute-mile for an OC48 system to determine the per-minute transport cable cost for Burke of $0.00036. The same procedure is used for the other five offices, although Freeman has no transport cable cost. As I mentioned before, the Qwest meet point is in the Freeman central office. In the last step, I computed the weighted average cost of $0.0003 per minute. This is significantly lower than the original cost estimate of $0.0060 per minute.

Q. Are there any modifications you would make to these calculations?

A. There is one other potential modification, although Petitioners did not provide the information needed to make the modification. Also, I do not believe it will materially affect the results.

The ring route mileages provided by the Petitioners are from meet points to standalone and host switches. If the remote switches subtending host switches are located on one of the rings included in the mileages, no modification is needed. On the other hand, if another ring is required for transport to the remote, the additional ring route mileages should be added. The additional cost of the extra mileage would be weighted by the proportion of total lines represented by the remotes on the additional rings. These should be small weightings.

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[44] Exhibit I-3, pp. GWR030001-GWR030003.

Q. Is the method that you are recommending for computing transport cable costs a more straightforward approach for making Adjustments 7-11 than the method used in Petitioners' cost studies?

A. Yes. The recommended method makes explicit interoffice cable lengths applicable to transport circuits carrying mobile-to-land traffic. It requires specific forward-looking estimates of the four utilization levels. The method relies on a proper measure of transport system utilization – DS1 equivalents rather than "paths." And, it develops costs for transport from the Qwest meet point to serving end offices consistent with the definition of transport. Modifying the Petitioners cost studies to address these issues can be done, but it will be difficult.

Q. Is the method consistent with FCC rules?

A. Yes, it satisfies the requirements of §§51.505 and 51.511.

Q. Must Adjustments 7-11 still be made should the Hearing Examiner decide to adopt the Petitioners' methodology for computing transport cable costs?

A. Absolutely. It is clear than mobile-to-land traffic travels a shorter distance than traffic to the SDN tandem, causing less transport cable cost. In some cases, such as the Freeman and Kadoka central offices, there are no transport cable costs. The Petitioners' cost study must recognize these lower costs for mobile-to-land traffic. The "path" measurement scheme should not be used, because it inaccurately measures transport system capacity consumption. DS1s, rather than DS0s, should be used as the common measure of capacity consumption, and the quantity of special circuits of various bandwidths should be expressed in terms of DS1 equivalents. The annual minutes per trunk are too low to represent efficient utilization. Even using the Petitioners' cost model, the annual minutes per trunk should be increased to 108,000. Finally, the Petitioners cost model does not measure the costs of transport as defined by FCC 51.701(c). If Petitioners' methodology is to be used, then average transport cable and transmission costs for all Petitioners should be computed, recognizing that transport involves multiple Petitioners' networks.

Q. Let's shift to transport transmission equipment costs. Have you replicated the Petitioners' calculation of these costs?

A. Yes, Exhibit WCC-6 shows the calculation of transport transmission equipment costs per minute for Vivian. The Petitioners refer to this cost as transport IO-electronics. I will refer to it as transport transmission equipment.

Q. What is transport transmission equipment in the Petitioners' cost studies?

A. This is electronic equipment located in central offices used to add and drop interoffice circuits to and from the fiber cable rings connecting the central offices or "nodes" in the Petitioners interoffice network. In response to information requests by Alltel, the Petitioners provided details of the equipment components and investment necessary to construct transmission equipment at each network node.[45]

Q. Please explain the cost calculations in Exhibit WCC-6.

A. As I described earlier, Petitioners share interoffice transport rings. To compute transport transmission equipment costs, each Petitioner identifies the number of nodes it owns on the rings it utilizes and the transport system size (OC12, OC48 or OC192) at each node. Rows 7-27 of Exhibit WCC-6 show the quantities of transport transmission equipment at each Vivian central office. For example, the Winner central office appears to have two OC48 rings passing through the central office, so the quantity of OC48 nodes is two (cell C17). Generally, the quantity is one.

The total number of switch nodes by transport system size is accumulated on row 30, and these quantities are multiplied times the Petitioners' estimate of the current investment required to place transmission equipment (row 32). The total transport transmission equipment investment is shown in row E33. Annual capital costs and operating expenses for the transmission equipment are shown in cells E36-E45. As with transport cable, I have computed the ratio of annual costs to total investment for each cost item, with a total annual cost factor shown in cell F45. The remaining calculations are the same for transport transmission

[45] "Golden West Companies' Objections and Responses to First Set of Interrogatories and Requests for Production of Documents Propounded to Golden West Companies," pp. GWD020152-164.

equipment as transport cable. Total annual costs are divided by total "paths" and annual minutes of use per switch trunk to arrive at the cost shown in Table 1 of $0.0022 per minute.

Q. Do the adjustments to the cost studies identified for transport cable apply to transport transmission equipment?

A. Some of these apply to transport transmission equipment. Adjustment 9 as it relates to low utilization of the interoffice transport system, DS1 utilization and annual minutes of use per switch trunk affects transmission equipment costs. Adjustment 10 (relating to the proper utilization measure for the interoffice transport system) and Adjustment 11 (relating to Alltel traffic involving multiple Petitioner networks) apply to transport transmission equipment costs. Adjustment 7 having to do with interoffice cable length does not directly affect these costs. Adjustment 8 may affect transport transmission equipment costs, because mobile-to-land traffic to Qwest tandem switches may involve fewer transport terminations than traffic to the SDN tandem switch. I am recommending an alternative method for computing transport transmission equipment costs, as I did for cable costs, so that these adjustments can be made explicitly.

Q. Do any of the adjustments identified for switching apply to transport transmission equipment?

A. Yes, Adjustments 2 and 4 apply. These related to the cost of capital and whether the accumulated deferred income tax reserve should be included in calculating capital costs. As I describe the recommended method for computing transport transmission equipment costs, I will recommend an alternative capital cost factor that will make Adjustments 2 and 4 for transmission equipment.

Adjustment 13 – Proper method for computing transport transmission equipment costs

Q. Please describe the method you recommend?

A. Exhibit WCC-7 shows the method for computing transport transmission equipment costs. This spreadsheet is for OC48 transmission equipment, which is the predominant transport system size reflected in Petitioners' cost studies (62 percent of ring nodes were at OC48 level).

The calculations use the same investment amounts reflected in the Petitioners' cost studies. On rows 7-13 are the investments required for basic system components – bay and shelf equipment, power equipment, the OC48 optical interface to the SONET ring, *etc*. These components are shared by the DS1 and OC3 circuits that are added or dropped from the SONET system at the central office or network node. The investment for these components totals $26,608.70 (cell D14).

Rows 17 and 18 contain the investments required for the tributary interfaces where DS1 or OC3 circuits are connected. The Petitioners have configured the system for three interfaces – one for 84 DS1 circuits and two OC3 circuits. The remaining rows contain investments in minor items, such as connector kits, cables and others. The total transmission equipment investment is $40,099, the same amount in cell C32 of Exhibit WCC-6.

Q. Is this a good point to comment on the rationale for using DS1s as the measure of transport system capacity utilization, rather than paths?

A. Yes, it is. Note that the OC48 system has three tributary interfaces – one slotted with a DS1 DSM module (row 17) and two slotted with OC3s (row 18). Each module is consuming 1/3rd the capacity of the shared components of the transmission equipment. Note that the DS1 DSM module has the capacity for 84 DS1s. This is equal to the capacity on an OC3 (OC3 = 3 DS3 X 24 DS1 / DS3 = 84 DS1s).

So, a DS1 consumes 1/84th of an OC3's consumption of the shared components, and an OC3 consumes 84 times a DS1's consumption of shared components. Using "paths" does not accurately reflect this. If one attempted to apply Petitioners' rationale, the OC48 transmission equipment would be exhausted with three DS1s, each representing a path. Or, the equipment would be exhausted with two DS1s and an OC3, again each representing a path. This makes no sense whatsoever.

Q. What is the next step in the cost calculations?

A. The next step is to compute per-unit transmission equipment costs according to FCC Rule 51.511(a). First, the total investment attributable to a DS1 DSM module is calculated. This is the sum of 1/3rd the shared investments (cell D34), plus the cost of the DS1 tributary interface and cabling (cells D36 and D37). The result is $15,848.57 per interface (84 DS1s).

Absent information from the Petitioners, I have assumed DS1 DSM interface utilization (row 41) and switch trunk utilization (row 47) of 60 percent. The Petitioners should provide projected utilization levels that reflect efficient utilization, or costs can be computed using the conservative levels assumed in Exhibit WCC-7. Based on these utilization levels, the investment per switch trunk-termination of $21.84 is calculated.[46]

In the Petitioners' cost study, they computed annual costs resulting in an average annual cost factor of 36.8 percent, including common costs. I adjusted this factor for the recommended cost of capital and to reflect the normalization of deferred income taxes. This resulted in a 32.0 percent annual cost factor that I used in cell D52. Annual costs per switch trunk-termination are $6.98.

The next question is how many terminations are likely to be required for a mobile-to-land call. A call to a subscriber served by the Freeman and Kadoka

[46] Costs are expressed per-switch trunk-termination because transmission equipment resources are consumed each time a circuit is added or dropped from the SONET transport system. A mobile-to-land call is "dropped" at the end office interfacing the Qwest meet point. It then may be added to a ring for subsequent transport to other end offices, and so on.

offices should have just one OC48 termination, because the Qwest meet point is located in their central offices. A call to a subscriber served by a remote switch subtending Freeman is likely to have three terminations – one on the incoming Freeman trunk interface from Qwest, one on the Freeman host-to-remote interface and one at the remote switch. Since mobile-to-land calls may traverse more than one ring to reach the serving end office, I have assumed there will be terminations at the interfaces between rings as well. To simplify the method, I have assumed a typical configuration as shown on row 56-60. The configuration assumes one termination for the interface to Qwest, two interfaces allowing for transiting between two rings, another termination for the host end office, and two additional interfaces (one at the host and one at the remote) for 60 percent of lines served by remotes.[47] The result is 5.2 terminations, which is probably liberal given that some calls terminate at the first end office after the Qwest meet point or only one ring is required.

Q. Can each Petitioner determine the average quantity of terminations per mobile-to-land call as a substitute for the 5.2 figure?

A. Yes, based on their knowledge of the rings involved in transport and the percentages of lines in service at each end office, it would be straightforward to calculate average terminations for each company.

Q. Please complete your description of the cost calculations.

---

[47] Vivian's mix of 40 percent lines served by standalone/host switches and 60 percent served by remote switches was used as a "typical configuration."

A. The quantity of terminations is multiplied times the annual costs per switch trunk-termination to determine the transport transmission equipment cost per switch trunk. This figure is divided by 108,000 annual minutes per trunk. The result is $0.0003 per minute. This compares with the original transport transmission equipment cost of $0.0022 per minute. Unless the Petitioners provide revised forward-looking utilization levels and termination quantities specific to their companies, I recommend using $0.0003 per minute as the transport transmission equipment cost.

Adjustment 14 – Corrected forward-looking economic costs for transport and termination

Q. Have you prepared corrected transport and termination costs for the Petitioners reflecting the recommendations you have made?

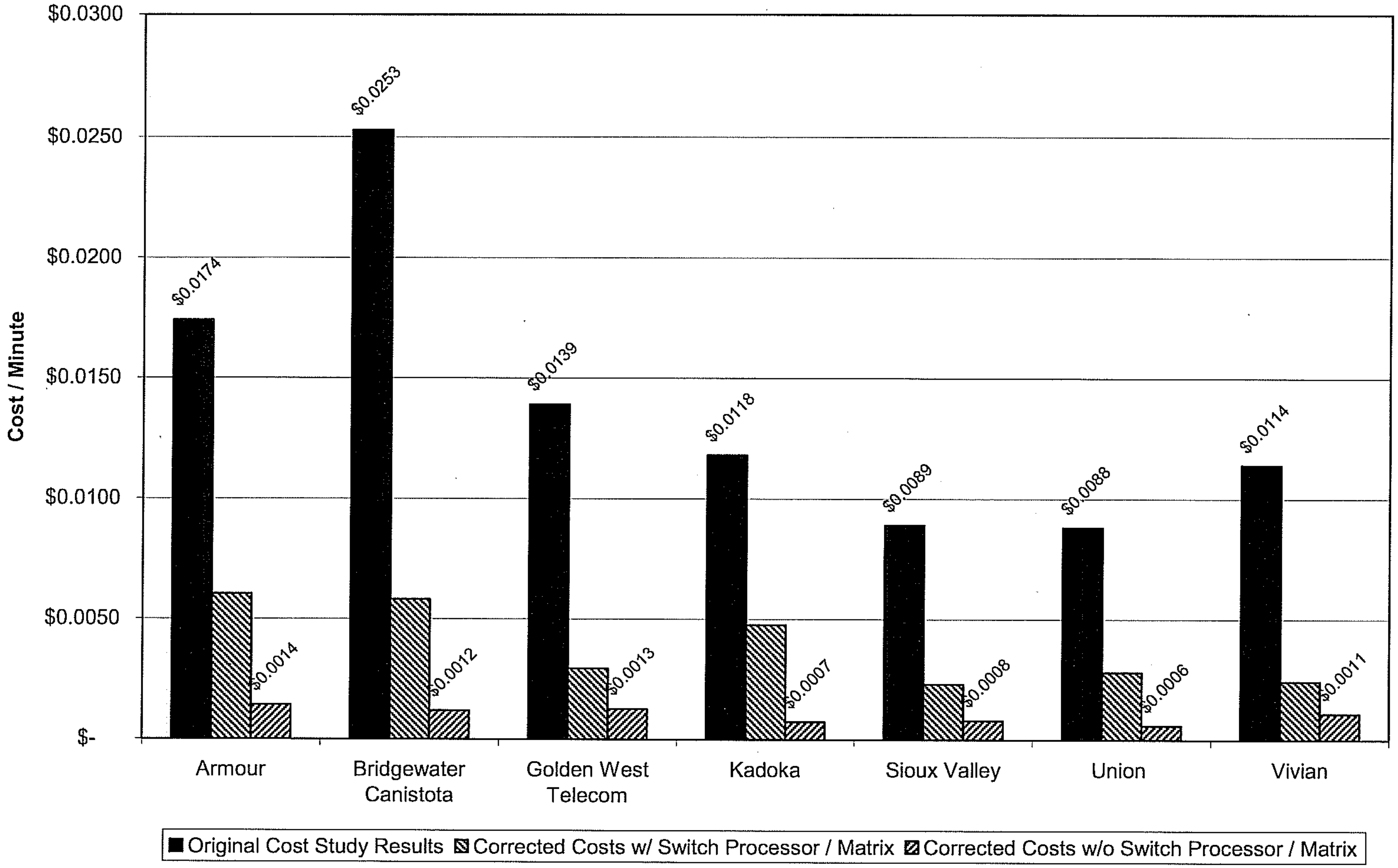
A. The table below contains forward-looking economic costs for transport and termination after Adjustments 1-13 are made. Per FCC Rule 51.505(e) the reciprocal compensation rate charged to Alltel by the Petitioners cannot exceed the total costs shown.

Table 3 - Corrected Petitioner Transport and Termination Costs

	Costs After Corrections for Issues				
Petitioners	Switch Trunk	Switch Processor / Matrix	Transport - IO Electronics	Transport - IO Plant*	Corrected Costs w/o Switch Processor / Matrix
Armour	$ 0.0005	$ -	$ 0.0003	$ 0.0006	$ 0.0014
Bridgewater Canistota	$ 0.0005	$ -	$ 0.0003	$ 0.0004	$ 0.0012
Golden West Telecom	$ 0.0004	$ -	$ 0.0003	$ 0.0005	$ 0.0013
Kadoka	$ 0.0004	$ -	$ 0.0003	$ -	$ 0.0007
Sioux Valley	$ 0.0004	$ -	$ 0.0003	$ 0.00002	$ 0.0008
Union	$ 0.0002	$ -	$ 0.0003	$ 0.00002	$ 0.0006
Vivian	$ 0.0004	$ -	$ 0.0003	$ 0.0003	$ 0.0011
Minimum	$ 0.0002	$ -	$ 0.0003	$ -	$ 0.0006
Maximum	$ 0.0005	$ -	$ 0.0003	$ 0.0006	$ 0.0014

These cost study results recognize that only the interoffice trunk portion of end office switching is usage-sensitive and recoverable in termination rates. The transport IO plant and transport IO electronics costs are based on the methods that I have recommended. The graph on the following page shows the original cost study results produced by the Petitioners and corrected costs. Corrected costs are provided with switch processor/matrix costs included and without. Since switch processor/matrix costs in modern digital electronic switches are not usage-sensitive, the "Corrected Costs w/o Switch Processor / Matrix" are the appropriate costs for establishing the reciprocal compensation rate.

Petitioners' Transport and Termination Costs



CONCLUSION

Q. Please summarize the main points you believe the Hearing Examiner and Commission should take from your testimony?

A. The Petitioners have failed to meet their burden of proof per FCC Rule 51.505(e). They have not shown that their proposed rates do not exceed forward-looking economic costs. Furthermore, there are fundamental errors in the studies. When corrected, the studies indicate costs well below those claimed.

Petitioners have overstated switching costs by assuming too many switching costs are usage-sensitive. The FCC, several State commissions and a federal court have all come to the conclusion that little, if any, switch costs are usage-sensitive. The Petitioners have computed transport costs that overestimate the transport distances of mobile-to-land traffic,; skewed transport costs toward switched trunks rather than special circuits by using the incorrect "path" measurement, and inflated costs by reflecting low levels of utilizations.

I encourage the Hearing Examiner and Commission to adopt the recommendations given in my testimony and to establish transport and termination rates based on the corrected cost studies and results shown in Table 3 above.

Q. Does this conclude your direct testimony?

A. Yes, although I would like the opportunity to supplement in my rebuttal testimony for any additional findings with respect to Petitioners' cost studies and their results, if additional information becomes available prior to the hearing.

Exhibit WCC-1

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Independent Consultant **1996 - 2006**

Mr. Conwell provides professional services related to telecommunications cost analysis. These services include the following:

- Supporting wireless carriers in negotiations and arbitrations of reciprocal compensation rates with incumbent local exchange carriers (ILEC). This involves reviewing ILEC cost studies for compliance with FCC rules for reciprocal compensation and giving expert testimony before state regulatory commissions.

- Performing cost studies and financial analyses used by ILECs in the valuation of their telephone plant for tax purposes.

- Performing cost studies for telecommunications services, such as Digital Subscriber Line (DSL), hosted Voice over Internet Protocol (VoIP), Frame and Asynchronous Transfer Mode (ATM) services and others. The studies are used in product planning, pricing and cost management.

- Providing analytical support and advice to wireless carriers on the establishment of state Universal Service Funding mechanisms.

- Providing advice and assistance to telephone companies on the development of cost models for estimating plant investments, capital costs and operating expenses.

In addition, Mr. Conwell has taught courses in telecommunications cost analysis.

Arthur Andersen & Co. **1989 - 1996**

Mr. Conwell served as a firm-wide expert on telecommunications cost accounting and provided advice to consulting teams working for telephone companies in the US and overseas on cost-related projects. These projects included the following:

- Reviewing Bellcore's Switching Cost Information System (SCIS) for the FCC in its Open Network Architecture proceeding. SCIS was used by the regional Bell Operating Companies (RBOCs) to develop switching element costs.

- Performing a benchmark comparison of US - Canadian toll costs and testifying before the Canadian Radio and Telecommunications Commission (CRTC) on differences between US and Canadian toll costs.

- Developing a "value driver" approach for identifying key performance measures using activity-based costing. The approach was used in consulting projects with telephone companies to improve performance measurement.

- Advising on the design of telephone company cost accounting systems used to measure service costs.

- Developing and teaching for six years a service cost course sponsored by the United States Telephone Association. The course was attended by students from telephone companies, regulatory bodies and other companies in the telephone industry.

Volt Delta Resources **1988 - 1989**

Mr. Conwell worked for the President of Volt Delta Resources and assisted in planning and business development for database services offered to telephone companies. He also participated in the development of a new cost accounting system for a Bell Operating Company.

South Central Bell / AT&T **1974 - 1987**

Mr. Conwell began work with South Central Bell in 1974 in Engineering where he produced cost studies for pricing telephone services. In 1979, he was promoted to district manager and transferred to AT&T where he participated in operations reviews of service costing and ratemaking procedures across the Bell Operating Companies.

In 1981, Mr. Conwell was promoted to division manager as member of the AT&T planning and financial management staff that analyzed business plans for AT&T's Office of the Chairman. Subsequently, he served as a division controller in AT&T Information Systems and division manager in AT&T General Business Systems responsible for marketing and sales channel support.

Education

Bachelor of Industrial Engineering from Auburn University (1972). Masters of Science in Industrial Engineering (Operations Research) from Auburn University (1974).

	A	B	C	D	E
1	**Corrected Transport Cable Costs Per Minute**				
2					
3	**Vivian Telephone**				
4		Interoffice Transport System Size			
5		OC12	OC48	OC192	Total
6	**IO transport system fiber cable investment and annual costs / mile**				
7	Fiber cable installed cost / foot	$ 2.18	$ 2.18	$ 2.18	
8	Feet / mile	5,280	5,280	5,280	
9	Fiber cable investment / mile	$ 11,489.38	$ 11,489.38	$ 11,489.38	
10					
11	Fiber cable annual cost factor (including common costs)	23.6%	23.6%	23.6%	
12	Fiber cable annual costs / mile	$ 2,706.16	$ 2,706.16	$ 2,706.16	
13					
14	Average fibers / cable	14.7	14.7	14.7	
15	Average % utilization	52.8%	52.8%	52.8%	
16	Average total demand for fibers / cable	7.8	7.8	7.8	
17					
18	Fiber cable annual costs / fiber-mile	$ 348.22	$ 348.22	$ 348.22	
19					
20	Fibers / interoffice transport system	4	4	4	
21	Fiber cable annual costs / mile for interoffice transport system	$ 1,392.90	$ 1,392.90	$ 1,392.90	
22					
23	**Per-unit fiber cable annual costs**				
24	DS1 capacity / IO transport system	336	1,344	5,376	
25	Percent utilization - forward-looking DS1s in service / DS1 capacity	25.0%	25.0%	25.0%	
26	DS1s in service / IO transport system	84	336	1,344	
27					
28	Fiber cable annual costs / DS1-mile	$ 16.58	$ 4.15	$ 1.04	
29					
30	DS0s / DS1	24	24	24	
31	Percent utilization - forward-looking switch trunk DS0s in service / DS1	60%	60%	60%	
32	Switch trunk DS0s in service / DS1	14.4	14.4	14.4	
33					
34	Fiber cable annual costs / switch trunk DS0-mile	$ 1.15	$ 0.29	$ 0.07	
35					
36	Annual minutes / switch trunk DS0	108,000	108,000	108,000	
37	Fiber cable costs / minute-mile	$ 0.0000107	$ 0.0000027	$ 0.0000007	
38					
39	**Standalone / host switches**				
40	Burke				
41	Ring route miles to meet point	-	114.21	-	
42	Fiber cable costs / minute	$ -	$ 0.00030	$ -	$ 0.00030
43	Custer				
44	Ring route miles to meet point	$ -	260.43	-	
45	Fiber cable costs / minute	$ -	$ 0.00069	$ -	$ 0.00069
46	Freeman				
47	Ring route miles to meet point	-	-	-	
48	Fiber cable costs / minute	$ -	$ -	$ -	$ -
49	Mission				
50	Ring route miles to meet point	$ -	184.25	-	
51	Fiber cable costs / minute	$ -	$ 0.00049	$ -	$ 0.00049
52	Rosebud				
53	Ring route miles to meet point	20.91	184.25	-	
54	Fiber cable costs / minute	$ 0.00022	$ 0.00049	$ -	$ 0.00071
55	Winner				
56	Ring route miles to meet point	$ -	57.92	-	
57	Fiber cable costs / minute	$ -	$ 0.00015	$ -	$ 0.00015
58					
59	**Percent of lines in service**				
60	Burke				18%
61	Custer				18%
62	Freeman				26%
63	Mission				6%
64	Rosebud				8%
65	Winner				24%
66	Total				100%
67					
68	Average transport fiber cable cost / minute				$ 0.0003

CONFIDENTIAL

[1]