Exhibit No.:
Issue: Traffic Termination; Costs and Rates
Witness: W. Craig Conwell
Type of Exhibit: Direct
Case No.: TO-2006-0147
Date Testimony Prepared: January 6, 2006

BEFORE THE PUBLIC SERVICE COMMISSION
STATE OF MISSOURI

In the matter of the Petition for Arbitration of Unresolved Issues in a Section 251(b)(5) Agreement with T-Mobile USA, Inc.	))))	Case No. TO-2006-0147, et al. Consolidated

DIRECT TESTIMONY

OF

W. CRAIG CONWELL

ON BEHALF OF T-MOBILE USA, INC. AND CINGULAR WIRELESS

****Denotes Information Deemed to be Proprietary by Petitioners****

Filed January 6, 2006

DIRECT TESTIMONY OF W. CRAIG CONWELL
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INTRODUCTION

Personal Background

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 T-Mobile USA ("T-Mobile") and Cingular Wireless ("Cingular").

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 over 30 years of experience with cost analysis in the telecommunications industry. From 1974 to 1979, I was employed by South Central Bell Telephone Company, now part of BellSouth, where I prepared cost studies for the pricing of telephone services. From 1979 to 1987, I worked for AT&T in New York and Northern New Jersey. Initially, I participated in operations reviews of service costing and ratemaking procedures across the Bell Operating Companies (BOCs). In 1981, I was promoted to division manager as a member of the AT&T planning and financial management staff that analyzed business plans for AT&T's Office of the Chairman. Later, I served as a division controller in AT&T Information

Systems and a division manager in AT&T General Business Systems responsible for marketing and sales channel support.

From 1989 to 1996, I was with Arthur Andersen & Co. in its telecommunications consulting practice in New York and Atlanta. I served as a firm-wide expert in telecommunications cost accounting, and I managed or provided advice on domestic and international consulting projects for telephone companies. These projects included:

- Performing cost studies for pricing telecommunications services.
- Designing cost accounting systems and databases for measuring service costs.
- Developing cost performance measures for cellular and wireline carriers.
- Performing reviews of cost models for regulators.
- Benchmarking service costs among telephone companies.

I managed two important cost reviews for regulators while at Arthur Andersen. One was a comparison of U.S. and Canadian toll costs for the Canadian Radio-television and Telecommunications Commission (CRTC), and the other was a review of Bellcore's Switching Cost Information System (SCIS) for the Federal Communication Commission (FCC).

While with Arthur Andersen, I developed and taught for six years a course in service costing for the United States Telephone Association (USTA) given to telephone company employees, regulatory staff and others. I have been an independent consultant since late 1996.

Q. PLEASE DESCRIBE YOUR WORK AS AN INDEPENDENT CONSULTANT.

A. From 1997 to 2001, much of my work was in assisting the SBC local exchange companies – Southwestern Bell, Pacific Bell, Nevada Bell and Ameritech – in developing and supporting cost studies for unbundled network elements, collocation and reciprocal compensation. My role was to analyze cost models produced by competitive local exchange carriers (CLECs), to perform ad hoc analyses to address specific cost issues and to assist in cost model development. In recent years, I have developed cost models for new data services, including digital subscriber line (DSL) service, Voice over Internet Protocol (VoIP) and others. More recently, I have begun reviewing for Commercial Mobile Radio Service (CMRS) Providers the cost studies of smaller incumbent LECs for compliance with the FCC's Total Element Long Run Incremental Cost (TELRIC) requirements and assisting them in negotiations or arbitrations of proposed reciprocal compensation rates. I have testified as a cost witness in California, Nevada, Texas, Arkansas, Kansas, Oklahoma, Missouri, Ohio, Wisconsin and Tennessee on UNE costing, collocation costs or costs for reciprocal compensation.

Q. HAVE YOU PARTICIPATED IN OTHER ARBITRATIONS BETWEEN INCUMBENT LECS AND CMRS PROVIDERS?

A. Yes, I was the cost witness for CMRS Providers in two arbitrations in Oklahoma (Cause Nos. PUD 200200150 and PUD 200300771), an arbitration in Tennessee (Docket No. 03-00585), and an arbitration in Missouri (Case No. IO–2005-0468).

I now am involved in cases in Missouri, Tennessee and Michigan. In each case, my role is to review ILEC cost studies, their methods and input data to determine whether they meet the FCC requirements for establishing reciprocal compensation rates.

Q. WHAT IS YOUR CONSULTING ENGAGEMENT WITH T-MOBILE AND CINGULAR WIRELESS IN THIS CASE?

A. I was engaged to review the transport and termination cost studies produced by the ILEC Petitioners in this arbitration. The purpose of the review is to determine whether the studies meet the FCC requirements for establishing transport and termination rates. The review determines whether the study results fairly represent the Petitioners' *forward-looking economic costs* to transport and terminate telecommunications traffic originated by T-Mobile and Cingular customers – that is, mobile-to-land traffic.

Summary of Testimony

Q. PLEASE SUMMARIZE THE MAIN POINTS OF YOUR TESTIMONY.

A. As the cost witness for Cingular and T-Mobile, my testimony will review the requirements of the Communications Act with respect to reciprocal compensation. I will describe the rules the FCC has established to implement the Act's requirements, especially those for establishing cost-based rates for the transport and termination of traffic exchanged between carriers. These rules relate to the determination of an incumbent LEC's Total Element Long Run Incremental Costs (TELRIC). The FCC rules are not new or unfamiliar to this Commission. But they determine the appropriate compensation each Petitioner is permitted to

receive for transporting and terminating my clients' mobile-to-land traffic. The FCC's rules, therefore, deserve careful consideration.

On a superficial level, this arbitration is similar at first blush to the earlier *Alma* arbitration between T-Mobile and four rural ILECs in Missouri, IO-2005-0468. Just as in the previous arbitration, the Petitioners have proposed a uniform rate of $0.035 per minute. They contend that this rate does not exceed their forward-looking economic costs, as required by the FCC rules. And they support this contention based on cost studies produced using the HAI Model, version 5.0a.

There are, however, important differences between this arbitration and the *Alma* case. In this proceeding, Cingular and T-Mobile charged me to examine the Petitioners' claimed costs in much greater detail than in the *Alma* proceeding, and the CMRS Providers acquired much more detailed information by submitting more extensive data requests (although the Petitioners still have not responded fully to all of the requests).

We received the most information from Cass County Telephone Company. Accordingly, in my testimony, I use Cass County as a concrete example to illustrate the types of problems with the Petitioners' cost studies. The Petitioners' cost expert acknowledged at his December 12, 2006 deposition that he used for all Petitioners the same HAI model input values and assumptions that he used for Cass County.

There are numerous flaws in the Petitioners' cost studies, and my testimony addresses nine of the most important, which are identified below in the issues table. Several of the flaws involve the Petitioners' use of default input values in the HAI 5.0a model, which was developed in 1998 and which derived its plant and other cost data from the mid-1990's. I demonstrate in my testimony that these outdated values for certain key data bear little relationship to today's technology and costs, or to the reality of small ILECs in Missouri and the Petitioners in particular. By using these default values, the Petitioners are able to grossly overstate their claimed forward-looking costs of transport and termination. Other more fundamental flaws deal with the HAI 5.0a model itself. After extensive analysis of the model, its methods and assumptions, it is clear that the model does not accurately represent the network architectures and costs of small ILECs in Missouri.

As I discuss below, FCC Rule 505(e) is clear that 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." The FCC has further ruled that all assumptions in an ILEC cost study must be "verifiable" and based on "objective data" – that is, "[a]ny data used to estimate costs should either be derived from public sources, or capable of verification and audit without undue cost or delay." *Virginia Arbitration Cost Order*, 18 FCC Rcd 1772 at ¶¶ 37, 48 and 515 (2003). The ILEC Petitioners here have utterly failed to meet their burden of proof under these governing standards, and the Commission

should accordingly reject the Petitioners' costs studies for not being TELRIC-compliant.

In discussing each of the nine flaws I identify, I also propose more realistic cost estimates or methods that the Commission can use to ensure that the Petitioners' reciprocal compensation rates do not exceed their respective forward-looking economic costs. I propose corrected transport and termination costs for twenty Petitioners, and corrected switching and signaling costs (but not transport costs) for the remaining seven companies. These costs are consistent with TELRIC methodology. At present, seven Petitioners have not produced enough data for me to make accurate corrections of their transport costs. Cingular and T-Mobile are endeavoring to obtain the necessary data from these Petitioners, as well as more complete information from others. In my rebuttal testimony, I will propose transport and termination costs for each Petitioner (based upon the total data available to me at that time). These costs will be suitable for establishing transport and termination rates consistent with FCC Rules. In the meantime, the costs provided for twenty Petitioners represent sound measures of their costs and are representative of the other Petitioners, for whom full corrections cannot yet be made.

Nine Petitioner Cost Study Issues and Proposed Corrections

Issue	*Description*	*Proposed Correction*
1. Overstatement of the current cost to purchase and install new switches.	Petitioners have inflated their forward-looking termination costs by using an unsupported value for the investment per line they claim they would incur today to place new switches. The proposed per-line investment defies cost trends in the industry; is unsubstantiated by any vendor or other bona fide switch price data; is based on an incorrect comparison to embedded investments; and is contradicted by switch cost data produced by the FCC and the Rural Utility Service.	Modify Petitioners' switching investments using FCC cost data (in current dollars).
2. Overstatement of usage-sensitive portion of switching.	Petitioners have overstated the portion of switching costs that are caused by usage (70%) versus the costs that are not usage sensitive (30%). They base this on outdated assumptions in the 1998 HAI 5.0a model. Newer versions of the model assume 0% usage-sensitive switching. Moreover, the FCC and several state commissions in recent years have decided end office switching is non-usage sensitive, based on changes in technology and vendor pricing. These changes in technology and pricing dramatically lower termination costs.	Treat only the portion of end office switching costs associated with interoffice trunks as usage-sensitive. Lower all Petitioner end office switching costs to approximately $0.0012 / minute.
3. Excessive land and building space requirements.	HAI 5.0a's default value assumes floor space for switches generally much greater than those actually required by the Petitioners, resulting in inflated central office building and land costs.	Replace HAI 5.0a's default value with space requirements that reflect the Petitioners' actual floor space usage directly attributable to switching.
4. Overstatement of interoffice cable length.	HAI 5.0a assumes a network design for the Petitioners that is completely unrealistic; substantially overstates the lengths of cabling connecting their switches; and inflates transport costs. HAI 5.0a measures cable lengths as though, on a forward-looking basis, the Petitioners would construct cable routes from each of their switches to the nearest Bell Operating Company switch, and have no direct connections within their own networks. This completely ignores the fiber ring technology employed today by many small LECs in Missouri.	Measure interoffice cable lengths based on most efficient network design for each Petitioner. This is assumed to be the existing Petitioner network architectures with one or more fiber rings, or point-to-point interoffice links, as necessary.
5. Oversized interoffice cable.	HAI 5.0a assumes 24 fiber cables for all interoffice cables, even though a	Efficiently size interoffice cables

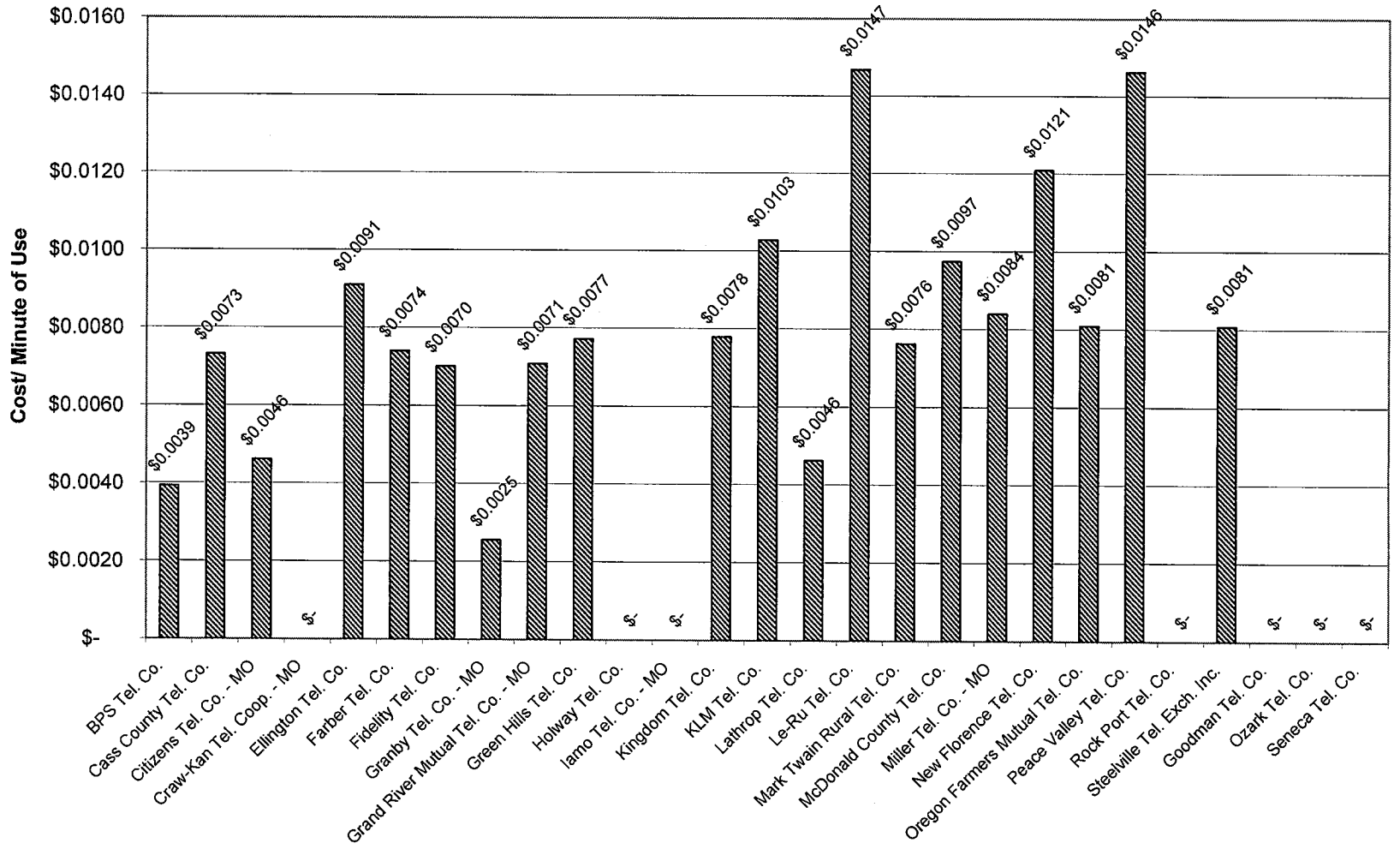
	Petitioner's capacity requirements may be far less and do not justify such a large cable.	reflecting a mix of 8, 12 and 24 fiber cable based on each Petitioner's anticipated demand for fibers.
6. Failure to reflect sharing of interoffice cable.	HAI 5.0a assumes that interoffice cables are used solely for interoffice transport of voice traffic and dedicated circuits. It fails to recognize that the Petitioners use of portions of these same cables for other purposes, including digital loop carrier systems and lease of fibers to other carriers. The Petitioners thus ignore the economies they realize by sharing interoffice cables.	Per FCC Rule 51.511, compute transport cable costs based on total demand for interoffice fibers and the fiber capacity consumed by interoffice transport systems and trunks in service (DS0 equivalents including dedicated circuits).
7. Oversized Transmission Equipment and Costs.	HAI 5.0a assumes sizes and quantities of transmission equipment (e.g. OC-48 add/drop multiplexers, digital cross connect systems and optical regenerators) that are unnecessary for small Missouri ILECs. This results in the transport transmission equipment costs of the small Petitioners being substantially overstated.	Size transmission equipment to meet the interoffice transport requirements of individual Petitioners.
8. Unnecessary Inclusion of Dedicated Transport Costs.	The Petitioners include two different transport cost elements from HAI 5.0a – common transport and dedicated transport. Doing this is unnecessary and duplicative.	When transport cable costs are correctly calculated (Issues 4, 5 and 6), the resulting costs will accurately represent the costs of the Petitioner. Dedicated transport costs should be excluded.
9. Overstatement of signaling link costs.	HAI 5.0a overstates the number of signaling links required by the Petitioners, except those few companies with a single switch. It also overstates signaling link costs by making the same errors identified in Issues 4, 5 and 6.	Use the actual, current charges paid by the Petitioners for SS7 interconnection to compute signaling link costs, assuming a lower cost alternative is not available to the Petitioner.

Q. HAVE YOU PREPARED A SUMMARY OF THE CORRECTED TRANSPORT AND TERMINATION COSTS FOR THE PETITIONERS?

A. Yes, the graph on the following page shows the transport and termination costs per minute for twenty of the Petitioners, after corrections to their studies were made for the nine issues I described in the table above.[1] The resulting costs range from $0.0046 per minute for Granby Tel. Co. to $0.0147 per minute for Le-Ru Tel. Co. It is important to note that the proposed rate of $0.035 per minute exceeds the forward-looking economic cost of each company, which is not permitted by FCC Rules. When I have more complete cost data for the other Petitioners, I will correct their cost studies and add them to the graph. I expect their costs, though, to be in the range of these companies. This concludes my summary. I will now describe the requirements for reciprocal compensation and follow this with my analysis of the Petitioners' cost studies.

[1] See Exhibit WCC-1 for details of the corrected transport and termination costs.

Corrected Petitioner Transport and Termination Costs



REQUIREMENTS FOR RECIPROCAL COMPENSATION

Requirements of Federal Law

Q. WHAT ARE THE FEDERAL LAW REQUIREMENTS FOR RECIPROCAL COMPENSATION?

A. Congress, in Section 251(b)(5) of the Communications Act, imposed on "each local exchange carrier" the "duty to establish reciprocal compensation arrangements for the transport and termination of telecommunications."

Q. ARE THERE OTHER REQUIREMENTS OF THE COMMUNICATIONS ACT THAT ARE RELEVANT TO RECIPROCAL COMPENSATION?

A. Yes, there are three statutes. The first is Section 252(d)(2) which establishes how incumbent LECs and State commissions are to set reciprocal compensation rates. This statute provides in pertinent part:

> (A) For the purposes of compliance by an incumbent local exchange carrier with section 251(b)(5) of this title, a State commission shall not consider the terms and conditions for reciprocal compensation to be just and reasonable unless –
>
> (i) such terms and conditions provide for the mutual and reciprocal recovery by each carrier of the costs associated with the transport and termination on each carrier's network facilities of calls that originate on the network facilities of the other carrier; and
>
> (ii) such terms and conditions determine such costs on the basis of a reasonable approximation of the additional costs of terminating such calls.

The second relevant statute is Section 252(c), where Congress specified that in arbitrating an interconnection dispute, "a State commission shall – "

> (1) ensure that such resolution and conditions meet the requirements of section 251 of this title, including the regulations prescribed by the [FCC] pursuant to section 251 of this title; [and]

(2) establish any rates for interconnection, services, or network elements according to subsection (d) of this section.

The third statute is Section 251(d)(1), where Congress directed the FCC to adopt rules implementing these provisions of the Communications Act.

Q. HAS THE FCC ADOPTED IMPLEMENTING RULES?

A. Yes, it adopted rules in 1996 in an order in Docket No. 96-98. See *Local Competition Order,* 11 FCC Rcd 15499 (1996). These rules are codified in Part 51 of the FCC Rules.

Q. HAVE THE FCC RULES BEEN CHALLENGED ON APPEAL?

A. Yes, incumbent LECs challenged the rules on appeal, but were unsuccessful. In 1999, the U.S. Supreme Court ruled that the FCC has "jurisdiction to design a pricing methodology." *AT&T* v. *Iowa Utilities Board*, 525 U.S. 366, 384 (1999). In 2002, the Supreme Court "reverse[d] the Eighth Circuit's judgment insofar as it invalidated TELRIC as a method for setting rates under the Act." *Verizon Communications* v. *FCC*, 535 U.S. 467, 523 (2002).

FCC Rules

Q. ARE YOU FAMILIAR WITH THE FCC RULES RELATED TO RECIPROCAL COMPENSATION AND THE COSTS TO BE USED IN DETERMINING COST-BASED RECIPROCAL COMPENSATION?

A. Yes, I have worked extensively with the FCC rules related to reciprocal compensation in the past several years. I also have worked with the FCC rules for TELRIC consistently since they were adopted over nine years ago.

Q. ARE RECIPROCAL COMPENSATION RATES SUPPOSED TO BE SYMMETRICAL?

A. FCC Rule 51.711(a) specifies that reciprocal compensation rates "shall be symmetrical" unless the competitive carrier submits its own cost study. Symmetrical rates are defined in Rule 51.711(a)(1) as "rates that a carrier other than an incumbent LEC assesses upon an incumbent LEC for transport and termination of telecommunications traffic equal to those that the incumbent LEC assesses upon the other carrier for the same services." Accordingly, wireless carriers use for land-to-mobile traffic the same rate that an incumbent LEC uses for terminating mobile-to-land traffic.

Q. HOW DO THE FCC RULES DEFINE "TRANSPORT AND TERMINATION" AS REFERRED TO IN SECTION 251(B)(5) OF THE COMMUNICATIONS ACT?

A. FCC Rule 51.701(c) defines transport as "the transmission and any necessary tandem switching of local 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 wireless carriers and the Petitioners interconnect indirectly, transport includes the interoffice cable and transmission equipment connecting a Petitioner's end office to the "meet point" where it connects to a transit carrier's network.[2] The

[2] 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.

Petitioners in this case do not provide tandem switching in transporting telecommunications traffic.

FCC Rule 51.701(d) defines termination as "the switching of local telecommunications traffic at the terminating carrier's end office switch, or equivalent facility, and delivery of such traffic to the called party's premises."

Q. SECTION 252(D)(2)(A)(II) OF THE ACT STATES THAT AN ILEC'S RECIPROCAL COMPENSATION CHARGES ARE TO BE BASED ON "A REASONABLE APPROXIMATION OF THE ADDITIONAL COSTS OF TERMINATING SUCH CALLS." HOW DO THE FCC RULES ADDRESS THIS REQUIREMENT?

A. The FCC has held that the "additional cost" standard in Section 252(d)(2)(A)(ii) should use the same "forward-looking economic cost-based pricing standard that we are establishing for interconnection and unbundled elements." *Local Competition Order*, 11 FCC Rcd at 16023 ¶ 1054.

The FCC also held that under the "additional cost" standard, only usage-sensitive costs may be recovered and that non-traffic sensitive costs (such as the cost of the local loop) may not be included in reciprocal compensation rates:

> [T]he "additional cost" to the LEC of terminating a call that originates on a competing carrier's network primarily consists of the traffic-sensitive component of local switching. The network elements involved with the termination of traffic include the end-office switch and local loop. The costs of local loops and line ports associated with local switches do not vary in proportion to the number of calls terminated over these facilities. 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. Local Competition Order, 11 FCC Rcd at 16025 ¶ 1057.

Q. WHAT IS THE SPECIFIC FCC RULE GOVERNING RECIPROCAL COMPENSATION?

A. The rule governing ILEC transport and termination rates is provided at 47 C.F.R. § 51.705(a):

> (a) An incumbent LEC's rates for transport and termination of telecommunications traffic shall be established, at the election of the state commission, on the basis of:
>
> > (1) the forward-looking economic costs of such offerings, using a cost study pursuant to §§ 51.505 and 51.511 of this part;
> >
> > (2) default proxies, as provided in § 51.707 of this part; or
> >
> > (3) a bill-and-keep arrangement, as provided in § 51.713 of this part.

Transport and termination rates, if cost-based, are to be based on forward-looking economic costs, which the FCC defines in Rule 51.505(a) as "the sum of: (1) The total element long-run incremental cost of the element, as described in paragraph (b); and (2) A reasonable allocation of forward-looking common costs, as described in paragraph (c)." Rule 51.505(e) states that ILEC rates shall not exceed forward-looking economic costs:

> (e) *Cost study requirements*. 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 §51.511 of this part.

The FCC's forward-looking economic cost rules are commonly referred to as the TELRIC rules.

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 total element long-run incremental cost and forward-looking common costs. The FCC has described specific requirements related to calculating transport and termination costs. Among these are 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 costs. For example, the cost study should reflect today's cost to construct a new end office switching system, representing the prices the ILEC 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. This requirement is especially relevant in light of declining switch costs over the past ten years.

- *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.

- *Common costs allocated to transport and termination are to be forward-looking and costs that are efficiently incurred.* Common costs typically include executive, legal, accounting and other general and administrative costs. These costs are 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.

Q. SHOULD TRANSPORT AND TERMINATION RATES REFLECT COMPANY-SPECIFIC COSTS?

A. Yes, rates should be based on each ILEC's forward-looking economic costs, determined by a company-specific cost study. The study should reflect its unique serving area, forward-looking network architecture, business processes and current resource costs.

Q. DOES THIS MEAN THAT EACH PETITIONER SHOULD ESTABLISH ITS OWN SEPARATE TRANSPORT AND TERMINATION RATE IN THIS PROCEEDING?

A. Yes. Under FCC regulations, a "blanket rate" for multiple carriers is not permitted.

Burden of Proof and Effect of Baseball Arbitration

Q. WHO HAS THE BURDEN OF PROVING THAT PROPOSED RECIPROCAL COMPENSATION RATES DO NOT EXCEED FORWARD-LOOKING ECONOMIC COSTS?

A. FCC rules are very clear that the burden of proof lies with the ILEC. FCC Rule 51.505(e) provides unequivocally that 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 § 51.511 of this part."

Q. HOW IS THE BURDEN OF PROOF AFFECTED BY THE USE OF "BASEBALL ARBITRATION"?

A. The burden of proof is not affected. The FCC uses "final offer" arbitration in the arbitrations it conducts. Under FCC Rule 51.807(f), each "final offer shall":

> (1) Meet the requirements of section 251, including the rules prescribed by the Commission pursuant to that section; [and]
>
> (2) Establish rates for interconnection, services, or access to unbundled network elements according to section 252(d) of the Act, including rules prescribed by the Commission pursuant to that section.

The Missouri Commission's rules are to the same effect. 4 CRS 230.040(5)(D) provides:

> Each final offer submitted by the parties to the arbitrator shall:
>
> 1. Meet the requirements of section 251 of the Act, including the rules prescribed by the commission and the [FCC] pursuant to that section; [and]
>
> 2. Establish interconnection, services, or access to unbundled network elements according to section 252(d) of the Act, including rules prescribed by the commission and [FCC] pursuant to that section.

If the Petitioners make a final offer that exceeds their forward-looking economic costs, the Commission has no choice but to reject their proposed rate.

Commission Rule 4 CRS 230.040(5)(E) gives the Arbitrator a second alternative:

> If a final offer submitted by one (1) of the parties fails to comply with the requirements of this section . . . , the arbitrator has discretion to take steps designed to result in an arbitrated agreement that satisfies the requirements of section 252(c) of the Act, including requiring the parties to submit new final offers within a time frame specified by the arbitrator, or adopting a result not submitted by any party that is consistent with the requirements of section 252(c) of the Act, and the rules prescribed by the [FCC] pursuant to that section.

Q. FCC RULE 51.505(E) REQUIRES INCUMBENT LECS TO SUBMIT "A COST STUDY THAT COMPLIES WITH THE [TELRIC] METHODOLOGY." WHAT DOCUMENTATION MUST AN ILEC INCLUDE IN ITS COST STUDY?

A. FCC Rule 51.505(e) requires an incumbent LEC to submit "a cost study that complies with the methodology set forth in this section and Sec. 51.511" – in order words, a cost study that complies with the TELRIC rules. The FCC has held that such a study "must explain with specificity why and how specific functions are necessary to provide network elements and how the associated costs are developed." *Local Competition Order*, 11 FCC Rcd at 15850 ¶ 691. Specifically, 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." *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.").

Q. WHAT ARE THE COMMISSION'S OBLIGATIONS IN DEVELOPING A RATE FOR TRANSPORT AND TERMINATION?

A. As noted above, FCC Rule 51.505(e) specifies that an ILEC reciprocal compensation rate "not exceed" its forward-looking economic costs of transport and termination. In addition, FCC Rule 51.505(e)(2) specifies that the Commission shall create "a written factual record that is sufficient for purposes of review." The cost study and its documentation must be sufficient for the CMRS Providers to verify that the study results represent a company's forward-looking economic costs. Consequently, the documentation must show that the requirements I described earlier are met – namely, costs are company-specific, forward-looking, reflective of current technology and efficient plant utilization, directly related to transport and termination, and include a reasonable allocation of common costs.

OVERVIEW OF THE ANALYSIS OF PETITIONER COST STUDIES

Q. WHAT WAS THE PURPOSE OF YOUR ANALYSIS OF THE PETITIONERS' COST STUDIES?

A. My analysis was to determine whether the Petitioners' cost studies produced reasonable estimates of their forward-looking economic costs of transport and termination as defined by the FCC Rules and to determine whether their proposed rate of $0.035 per minute exceeds these costs.

Q. WHAT COST STUDY DOCUMENTATION WAS PROVIDED TO THE CMRS PROVIDERS ON WHICH TO BASE YOUR ANALYSIS?

A. T-Mobile and Cingular were each provided a computer disk containing several items of cost information, which I understand was included as an Attachment to the Arbitration Petition. These items of information included a summary of the

Petitioners' transport and termination costs and an average transport and termination cost. HAI 5.0a model results used to prepare the summaries also were provided. The computer disk contained copies of the HAI 5.0a model, model documentation and other related material. In addition to this material, T-Mobile obtained responses by the Petitioners to data requests, which I used in analyzing the cost studies and later in making corrections to the studies.[3]

Q. DID YOU ATTEMPT TO INSTALL AND RUN THE HAI MODEL?

A. Yes. However, I was not able to successfully install the model. HAI 5.0a was developed and released in 1998 and runs on outdated versions of Microsoft Excel and Access software. The model does not readily install and run on current versions of the Microsoft software. I had to abandon attempts to run the model and instead analyzed work files provided by the Petitioners' cost expert, Mr. Schoonmaker, and the model documentation. While this made the analysis more difficult and time-consuming, I was able to reproduce the HAI model cost calculations and perform the necessary detailed analysis of costs for one of the Petitioners, Cass County Telephone Company ("Cass County"). The use of Cass County as an illustration of the shortcomings of the Petitioners' cost justification is particularly relevent, as that company has been managed since March 2005, by the GVNW consulting firm of which the Petitioners' cost witness, Robert Schoonmaker, is president.

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[3] "Respondent's Discovery / Data Requests to Petitioners," T-Mobile USA, Case No. TO-2006-0147, 10/17/05.

Q. YOU SAY YOU ANALYZED THE COSTS OF CASS COUNTY. CAN YOU FURTHER EXPLAIN THIS?

A. I wanted to analyze the Petitioners' cost studies using HAI 5.0a at a very detailed level in order to understand how costs were being determined. Normally, in a cost study produced using Excel or a similar spreadsheet model, it is relatively straightforward to trace cost calculations from the model input to the output. The HAI model uses Excel and other software; however, it is not a simple matter to trace calculations through the model, even when the model can be installed and run. The model is not transparent. For this reason, I selected Cass County, which is a Petitioner to both T-Mobile and Cingular, to analyze the HAI model calculations. Since the same methodology and, with a few exceptions, the same input data are used for all Petitioners, the findings for Cass County applied to all the companies. As I describe the HAI model and the Petitioners' cost studies produced using the model, I will use Cass County to illustrate the issues with the studies.

Q. PLEASE DESCRIBE THE APPROACH YOU USED TO ANALYZE THE PETITIONERS' COST STUDIES?

A. I used the following approach:

- Identify most important cost components. I first identified the most important components of the Petitioners' transport and termination costs. These included end office switching, common transport and dedicated transport. Signaling – specifically, ISDN User Part (ISUP) messages over a Signaling System No. 7 (SS7) network – is a relatively small cost item. Common

transport costs have two important sub-components – cable costs and transmission equipment costs.

- Reproduce HAI 5.0a cost calculations for Cass County. For each cost component, I replicated the cost calculations used by HAI 5.0a to produce Cass County's costs. This enabled me to understand the assumptions made by the model regarding network configuration and the methods used to compute plant investments, capital costs and operating expenses.
- Identify issues. I identified several severe flaws in HAI 5.0a as used by the Petitioners. These are instances in which the model is unrealistic in accurately representing the Petitioners' networks. I also identified methods and cost data that led to the Petitioners' costs being dramatically overstated and failing to comply with FCC Rules for TELRIC and forward-looking economic costs.
- Make corrections. I corrected Cass County's transport and termination costs for the major issues. I believe the results more accurately represent the Company's current cost to transport and terminate mobile-to-land traffic. The results also satisfy the FCC rules. These costs are significantly lower than those claimed by Cass County.
- Develop recommendations for correcting the costs of all Petitioners. Finally, I developed recommendations for correcting the cost studies of the other Petitioners. The corrections do not involve elaborate cost model development or extensive data gathering. I also corrected the transport and termination costs for twenty Petitioners.

In the remainder of my testimony, I will describe my analysis of the Petitioners' transport and termination costs. I will identify nine fundamental issues in the cost studies that cause the Petitioners' transport and termination costs to be overstated and not TELRIC-compliant. I will begin with the analysis of end office switching costs.

ANALYSIS OF END OFFICE SWITCHING COSTS OF THE PETITIONERS

Description of Costs

Q. WHAT TERMINATION COSTS MAY THE PETITIONERS RECOVER IN RECIPROCAL COMPENSATION?

A. Section 252(b)(5) of the Act and FCC Rule 51.701 call for reciprocal compensation to recover the costs of transporting and terminating telecommunications traffic exchanged between a LEC and a CMRS Provider. The FCC defines termination in Rule 51.701(d) as "the switching of local telecommunications traffic at the terminating carrier's end office switch, or equivalent facility, and the delivery of such traffic to the called party's premises." However, Section 252(d)(2)(A)(ii) limits cost recovery to "a reasonable approximation of the additional costs of terminating calls." The FCC has interpreted the "additional cost" standard of Section 252(d) as limiting recovery to the usage-sensitive costs. In the case of end office switching, these are the costs of switch components whose capacity is determined by the quantity of calling, or minutes of use, handled by the switch. The portions of the switch that are not usage-sensitive are not recoverable in transport and termination rates, and an

ILEC must recover these non-usage sensitive switch costs from other sources (e.g., end user customers). 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.[4]

Q. PLEASE GIVE AN EXAMPLE OF END OFFICE SWITCHING.

A. **_____

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Q. WHAT DO FCC RULES FOR TELRIC AND FORWARD-LOOKING ECONOMIC COSTS REQUIRE IN COMPUTING END OFFICE SWITCHING COSTS?

A. FCC Rules 51.505 and 51.511 require the following for properly computed end office switching costs:

- Switch investments are supposed to reflect the cost today to purchase and install switches using currently available technology and at current prices. In Cass County's cost study, the costs to purchase and install a new switch to replace the Peculiar host and each of its remotes are supposed to be determined based on a specific switch vendor and available switches.

[4] 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.

- Switch investments may not consider an ILEC's embedded costs of existing switches. End office switching costs may not be calculated in order to produce a termination rate that recovers past investments in existing switch hardware and software or the costs of operating outdated switching technology.
- End office switches are to be sized to reflect total demand for switched lines, trunks and other variables affecting switch capacity. Demand must be current or at levels expected over a reasonable planning period.
- End office switching costs must reflect only the usage-sensitive portion of switching plant. The ILEC 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. The portion of the total cost of a new switch attributable to usage is included in end office switching costs.
- The ILEC is obliged to show that these requirements are met. It does this by taking reasonable steps to obtain necessary information on current switching technology, current vendor pricing and installation charges, the cost structure of switches, etc.

Q. IS IT PRACTICAL FOR SMALL ILECS TO MEET THESE REQUIREMENTS?

A. Yes, it is. In order to meet these requirements, a Petitioner would obtain a valid vendor quote to purchase and install a new switch. Typically, the vendor quote is based on a specification of the quantity of lines to be served, interoffice trunk requirements, software requirements and other. The quote provides a breakdown of hardware and software, quantities, material prices, and estimates of charges for vendor engineering, installation and other items. These details can be used to determine the usage-sensitive portion of total switch costs. Some vendors provide software that enables telephone company engineers to develop their own estimates for budgetary purposes. I expect the Petitioners or their engineering consultants have these capabilities.

Q. WHAT WERE THE PETITIONER COST STUDY RESULTS FOR END OFFICE SWITCHING?

A. Exhibit WCC–2 shows the end office switching cost per minute for each Petitioner. They range from $0.0077 to $$0.0131 per minute. The average for the T-Mobile Petitioners is $0.0092 per minute. I have shaded Cass County's end office switching cost of $0.0091 per minute. I will show how HAI 5.0a calculates this cost and describe the three fundamental issues related to the Petitioners' claimed end office switching costs.

Q. WHAT ARE THESE THREE ISSUES?

A. First, the Petitioners have failed to determine the current costs they would incur to purchase and install new end office switches. Instead, they based their switching investment and costs on an incorrect analysis of embedded switch investment. This results in an overstatement of the current cost of switching.

Secondly, the Petitioners have failed to demonstrate that any portion of the costs they would incur today for new switches are usage-sensitive. They did not analyze current switching costs, but instead based the usage-sensitive portion of switching (70%) on the default value of the HAI model and on assumptions used during the FCC's Universal Service Fund proceedings. The FCC has since ruled that little, if any, of end office switching is usage-sensitive, as have several state commissions.

Third, the Petitioners have reflected excessive land and building space requirements in the studies, by simply using the default values of the HAI model rather than using their own anticipated space usage.

Primarily because of these three issues, the Petitioners have failed to meet their obligation to determine their forward-looking costs of switching per the FCC rules.

Switching Issue No. 1: Overstatement of Current Cost to Purchase and Install New Switches

Q. HOW DID THE PETITIONERS OVERSTATE THE COST OF NEW SWITCHES?

A. The Petitioners used an inflated value for a key input variable in the HAI model. The input variable, called the "*constant EO switching investment term*," is used by the model to calculate the current cost to purchase and install end office switches. The Petitioners increased the model's default input value by 25 percent – from $416.11 to $520.14.

Q. WHY DO YOU CLAIM THAT THIS INPUT VALUE USED BY PETITIONERS IS INFLATED?

A. There are three factors causing the input value to be inflated. First, the Petitioners increased by 25 percent the HAI 5.0a default value, which is based on switch costs from 1995. It is generally recognized that switch prices have declined dramatically over the past decade, so the Petitioners should have lowered, rather than raised the default value.[5] Secondly, the $520.14 value was developed by the Petitioners based on its relationship to their embedded investment in switching plant; and the analysis was incorrectly performed. Third, there is publicly available information on switch costs produced by the FCC that indicates the current cost to purchase and install switches is significantly lower than that estimated by the Petitioners. The FCC's information was partially based on switch cost data for rural telephone companies produced by the Rural Utility Service of the U.S. Department of Agriculture.

Q. WHAT ESTIMATE DO YOU BELIEVE WOULD BE REASONABLE FOR END OFFICE SWITCHING?

A. The Petitioners' end office switching investments should be based on current estimates of the cost to purchase and install new switches for the switch vendors and switch types they would use in place of their existing switches. Since the Petitioners have not sought vendor quotes or similar information, I recommend

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[5] Default values refer to user-adjustable input values in the HAI model that the developers used as generally representative of ILEC costs at the time the model was released in 1998. Model users may modify the default values with more current or company-specific data.

the switch cost data developed by the FCC during the USF proceedings be used, adjusted to a current cost basis.

Q. PLEASE DESCRIBE IN MORE DETAIL THE THREE REASONS FOR CONCLUDING THE PETITIONERS HAVE OVERSTATED CURRENT SWITCH COSTS?

A. I will start by explaining why increasing the HAI model input value for the *constant EO switching investment term* from $416.11 to $520.14 contradicts trends in switch prices over the past decade.

Increasing the HAI Model Switching Investment Per Line is Contrary to Cost Trends

Q. BEFORE DESCRIBING THE SWITCHING INVESTMENT PER LINE, PLEASE SUMMARIZE HOW HAI 5.0A COMPUTES END OFFICE SWITCHING COSTS?

A. I reproduced the cost calculations for Cass County's end office switching cost of $0.0091 per minute in Exhibit WCC-3. Following are the main steps in the model calculations:

- The calculations begin by determining the current investment that would be required to replace each of Cass County's six switches. Investments are expressed on a per-line basis.
- To determine the current switch investment per line, the model uses the *constant EO switching investment term* for small independent telephone companies. This is the input variable that has a default value of $416.11, which the Petitioners increased to $520.14.

- A series of calculations is made from rows 11 to 53 to obtain a switch investment per line for each switch. These range from $437.32 for the Peculiar host switch to $476.34 for Creighton, the smallest of the remotes.
- Total switch investments are calculated by multiplying the lines per switch times the unit investments. Additional investments in buildings, power plant and land are determined in rows 60 – 70.
- Next, annual capital costs (depreciation, cost of capital and income taxes) and operating expenses (including common overheads) are computed and summed in cell H112. The amount shown in the spreadsheet is supposed to represent the total annual costs Cass County would incur today, if it replaced its existing switches with current technology, at current prices.
- HAI 5.0a then assumes that 70% of these costs are usage-sensitive. It refers to this amount as the *end office non-port fraction.*[6] Seventy percent (70%) is multiplied times the total annual costs to obtain the usage-sensitive portion, and this amount is divided by Cass County's total switched minutes of use to compute $0.0091 per minute as its cost to terminate mobile-to-land calls.

Q. YOU INDICATED THE PETITIONERS INCREASED THE HAI 5.0A DEFAULT VALUE FOR SWITCHING INVESTMENT PER LINE. HOW WAS THIS DEFAULT VALUE IN HAI 5.0A DEVELOPED?

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[6] Ports refer to line terminations on an end office switch. Line terminating equipment is considered by HAI 5.0a to not be usage sensitive, because the amount of line equipment is determined by the number of switched lines, rather than the amount of calling on the lines. The *end office non-port fraction* is supposed to represent the portion of switch costs that are usage sensitive.

A. According to the HAI model documentation, $416.11 is an average value for standalone, host and remote switches, based on typical switch prices in the 1995 timeframe.[7] This value represents small telephone companies like the Petitioners.

Q. HOW HAVE SWITCH PRICES CHANGED OVER THE PAST DECADE?

A. They have declined. One indicator of this decline is the CA Turner Price Index for digital electronic switching, which measures changes in the cost to reproduce switches over time. Based on the testimony of a Sprint cost witness in the Tennessee arbitration in which I participated, switch prices have declined approximately 30% since the $416.11 default value was determined for HAI 5.0a.[8]

Q. DOES THE PETITIONERS' COST EXPERT RECOGNIZE THAT SWITCH COSTS HAVE DECREASED OVER TIME?

A. Yes. In his December 12, 2005 deposition, Mr. Schoonmaker was asked a series of questions on this issue, and he agreed that, in general, switching hardware costs have declined by 10 or possibly 20 percent over the past 10 to 15 years.

> Q. Are you familiar in your business with the costs of digital switching and digital switching costs, generally?
>
> A. Generally.
>
> Q. How would you describe, in general terms, what happened to digital switching costs in the last 10 to 15 years?

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[7] See "HAI Model Release 5.0a – Inputs Portfolio," section 4.1.9, 01/27/98. The documentation states that "The switching cost surveys were developed using typical per-line prices paid by BOCs, GTE and other independents as reported in the Northern Business Information (NBI) publication, "U.S., Central Office Equipment Market: 1995 Database," compared to switch size and data from the ARMIS 43-07 report."

[8] "Supplemental Consolidated Direct and Rebuttal Testimony," Talmage O. Cox, III, Sprint PCS, Tennessee Regulatory Authority, Docket 03-00585, 07/27/04.

A. Well, for smaller companies the costs of the hardware has decreased somewhat. The cost of the software – a portion of it has probably increased somewhat and – I mean, overall it's probably decreased a little bit, but certainly not as much for small companies as it may have for larger companies.

Q. You would agree with me that the hardware costs have definitely decreased even for smaller companies?

A. Somewhat.

Q. When you say –

A. Maybe not necessarily all smaller companies, but in general I would agree with that.

Q. Let's try to be a little more specific as we can – if we can about the term "somewhat." Can you give me a percentage figure – recognizing that it's just an estimate – what digital hardware switching costs are in the last 10 to 15 years, in your experience?

A. My impression is in the area of maybe 10 to possibly 20 percent, depending on the specific circumstances and so forth. Schoonmaker Dep. at 12-13.

Q. MR. SCHOONMAKER INDICATED THAT THE COST OF SOFTWARE, OR A PORTION OF IT, "HAS PROBABLY INCREASED SOMEWHAT." DO YOU AGREE WITH HIS OBSERVATION?

A. His response is not specific. Small ILECs have spent considerable amounts in recent years on software upgrades to their existing switches and for capabilities, such as Local Number Portability, Number Pooling, CALEA and new calling features. These types of software expenditures are not attributable to termination because most (if not all) of this software is not used in terminating mobile-to-land calls. To the extent Mr. Schoonmaker is referring to these types of software costs, they are irrelevant to the determination of termination costs. Furthermore, over the past decade there has been a shift in the accounting for switch software with a

greater portion of software costs being expensed rather than capitalized. A significant portion of software expenditures are no longer included in switch investment.

Q. WHAT IS THE IMPACT OF USING $520.14 PER LINE RATHER THAN THE $416.11 DEFAULT VALUE?

A. The Petitioners' cost expert acknowledged that using the higher, $520.14 estimate "would have the impact of increasing the [Petitioners' reciprocal compensation] rate." *See* Schoonmaker Dep. at 11. By increasing the input value from $416.11 to $520.14, Cass County was able to raise its estimate of forward-looking economic costs for end office switching by 30 percent, from $0.0070 to $0.0091 per minute.

Q. PLEASE SUMMARIZE YOUR FIRST REASON FOR DISPUTING THE PETITIONERS' SWITCHING INVESTMENT INPUT TO THE HAI MODEL?

A. By changing the *constant EO switching investment term* from $416.11 to $520.14, the Petitioners have overstated their claimed cost to purchase and install new switches. The change is contrary to trends in declining switch prices, supported by the Turner Price Index and the opinion of the Petitioners' own cost expert.

Petitioners Lack Any Basis for the Increase

Q. WHAT DID THE PETITIONERS OFFER AS EVIDENCE TO SUPPORT THE $520.14 INPUT VALUE?

A. In response to T-Mobile's data requests No. 9 and 21, the Petitioners provided a comparison of the switching investment for small companies as reported in their

2003 annual reports to the Missouri Commission with HAI model results using the $416.11 default value and results using the $520.14 value. Exhibit WCC-4 is a copy of this comparison.

Q. HOW DID THE PETITIONERS USE THIS COMPARISON TO DEFEND THE $520.14 INPUT VALUE?

A. The Petitioners providing the following explanation in response to data request No. 21:

> The "constant IO (EO) switching investment term, small ICO" for the Petitioners was developed based on a comparison of the central office switching investment of the small Missouri companies as shown on their annual reports to the Commission with the HAI model results using the default input. (Certain companies were removed from the analysis either because they leased their COE switch, or because the annual report results reported COE switching investment for multiple states in which certain companies operate.) This comparison showed that the model developed COE switching investment was only XX% [55%] of the actual investment for COE switching for these companies, which was deemed to be inappropriately low. The input was then modified to the current higher level which resulted in the model developing COE switching investment equal to XX% [72%] of the actual COE switching investment for the companies. This level was deemed reasonable as an estimate of forward-looking costs in view of the general belief that the current cost of digital switching may be somewhat less than it was in earlier years. (emphasis added)

Simply stated, the Petitioners increased HAI 5.0a's default value of $416.11 because, in comparing this estimate with their embedded switch investment, they deemed the default value to be "inappropriately low."

Q. DOES THE COMPARISON SUPPORT THE $520.14 INPUT VALUE?

A. It does not. First of all, the analysis, or comparison, is incorrect. The embedded investments in switching and the HAI model results reflect significantly different

switch sizes, so any comparison of the embedded investment with HAI results is meaningless.

Second, even if the embedded investments and HAI model results were comparable, the comparison provides no basis for increasing the *constant EO switching investment term* from $416.11 to $520.14 per line – particularly when the Petitioners' own cost expert recognizes that switch prices continue to decline. There is nothing in the comparison affirming that $520.14 per line produces accurate estimates of the cost to purchase and install new switches.

Q. HOW, THEN, DID THE PETITIONERS CONCLUDE THAT A 55% RATIO OF CURRENT SWITCH INVESTMENT TO EMBEDDED INVESTMENT, IF PROPERLY DONE, WOULD BE TOO LOW AND THAT A 78% RATIO WOULD BE REASONABLE?

A. The Petitioners have provided no basis for this conclusion. They were asked to provide workpapers, analyses or other substantive evidence, and they provided none. The Petitioners' cost expert conceded that the increased switching investment per line was based solely on a "judgment estimate" and that this "judgment estimate" is not based on any facts. He did not consult switch vendors to obtain current switch costs. Schoonmaker Dep. at 43. He did not consult the Turner Price Index or any other publicly available data. *Id.* at 19–20. Instead, the switching investment per line was developed solely on an incorrect comparison of HAI model results to embedded investment. The Petitioners have provided no basis for the $520.14 *constant EO switching investment term.*

Q. HAS THE FCC REQUIRED THAT COST STUDY DATA BE VERIFIABLE?

A. Absolutely. In the *Virginia Arbitration Cost Order,* 18 FCC Rcd 17722 at ¶¶ 38 and 48 (2003), the FCC held that "[a]ll data, formulas and other aspects of the models must be made available to other parties for their evaluation":

> [A]ny assumptions contained in the model should be verifiable. Any data used to estimate costs should either be derived from public sources, or capable of verification and audit without undue cost or delay.

For example, in that proceeding, the FCC refused to accept the statements of the incumbent LEC's "experts" when not supported by any "objective data." *See id.* at ¶ 515 ("Verizon's unsupported statements fail to demonstrate that the number of nodes per ring would increase in a forward-looking network.").

The Petitioners have failed to meet their burden of proof with respect to the current cost they would incur to purchase and install new switches.

Comparison Used to Support the Increase is Incorrect

Q. HOW IS THE COMPARISON OF THE PETITIONERS' EMBEDDED SWITCH INVESTMENTS TO THE HAI MODEL RESULTS INCORRECT?

A. The embedded switch investments and the HAI model results in the Petitioners' comparison are based on significantly different switch sizes, in terms of line capacity. The Petitioners' existing switches have more line capacity than the line capacity assumed in the HAI model. This causes the HAI results to appear even lower than the Petitioners' embedded investments and makes the comparison of

current-to-embedded investment meaningless. In his deposition, Mr. Schoonmaker, agreed that if the line quantities in the HAI model were changed to be consistent with current line capacities, the HAI results would be higher. *See* Schoonmaker Dep. at 37. It is thus not surprising the embedded investments are much greater than the HAI model results.

Q. HOW SIGNIFICANT IS THIS ERROR?

A. It is very significant. Page one of Exhibit WCC-5 is the original comparison for 21 Petitioners in arbitration with T-Mobile.[9] It shows that using the HAI model default value of $416.11 for the *constant EO switching investment term* results in current switch investments that are 47% lower than the Petitioners' embedded investment. When the Petitioners' input value of $520.14 is used, the difference is 30% – or the roughly the same difference they considered to be "reasonable."

Page two of Exhibit WCC-5 puts the embedded investments and HAI results on an equal basis in terms of switch capacity. Now, the HAI result is only 8% lower than the embedded investment, whereas the HAI result using the Petitioners' input value actually results in a current investment greater than the embedded investment, an outcome that the Petitioners' cost expert would even agree is unreasonable. The Petitioners' comparison of embedded investment and HAI results shows nothing other than the fact that $520.14 is much too high and that the HAI default value also is too high.

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[9] The Petitioners excluded three ILECs in arbitration with T-Mobile, because their embedded investments include plant for operations in Missouri and other states, or because of a difference in the accounting for switch investment.

Q. IF THE $520.14 INPUT VALUE PRODUCES UNREASONABLE RESULTS, DOES THIS MEAN THE PETITIONER COST STUDIES SHOULD USE THE HAI 5.0A DEFAULT VALUE?

A. No, the default value is based on switch prices from 1995, and switch prices have declined in the past decade, as evidenced by the Turner Price Index (TPI) and as agreed to by the Petitioners' cost expert. That means that instead of increasing the default value, it should be reduced. The TPI for digital electronic switching has declined approximately 30% in the past decade. This would indicate that the HAI 5.0a default value of $416.11 per line would be approximately $291 today.

Q. ARE YOU RECOMMENDING $291 BE USED IN THE HAI MODEL FOR SWITCHING INVESTMENT?

A. No. The Petitioners' switching investments must be reduced from the levels in their cost studies, but instead of reducing the HAI model input, I recommend that publicly available switch cost data produced by the FCC be used. As I discussed above, the FCC has ruled that all assumptions in an ILEC cost study must be "verifiable" and based on "objective data" – that is, "[a]ny data used to estimate costs should either be derived from public sources, or capable of verification and audit without undue cost or delay." *Virginia Arbitration Cost Order*, 18 FCC Rcd 1772 at ¶¶ 37, 48 and 515 (2003).

HAI 5.0a Switching Investment Per Line Should be Reduced based on Publicly Available Cost Data

Q. PLEASE DESCRIBE THE FCC SWITCH COST DATA.

A. Following its *Universal Service Order* adopted in May, 1997, the FCC issued a series of reports and orders, which dealt with the cost methodology, cost models and input values to be used in estimating forward-looking costs of services to be supported by federal universal service funds. In the "Tenth Report and Order," CC Docket Nos. 96-45 and 97-160, 14 FCC Rcd 20156 (1999), the Commission selected input values to be used in computing forward-looking costs for supported services. The following costs were selected for switching:

> 296. Switch Cost Estimates. We adopt the fixed cost (in 1999 dollars) of a remote switch as $161,800 and the fixed cost (in 1999 dollars) of both host and stand-alone switches as $486,700. We adopt the additional cost per line (in 1999 dollars) for remote, host, and stand-alone switches as $87. *Id.* at 20281 ¶ 296.

In selecting these values, the FCC considered actual switch costs for both rural and non-rural telephone companies. While the costs are in 1999 dollars, they are more recent than the HAI 5.0a switch cost data and based on publicly available data. The FCC decided to not use the default input values of HAI 5.0a:

> For reasons set forth below, we affirm our tentative conclusion to use the publicly available data from LEC depreciation filings, and to supplement the depreciation data with data from LEC reports to the RUS [Rural Utility Service]. We also affirm our tentative conclusion that we should not rely on the BCPM and HAI default values, because these values are largely based on non-public information or opinions of their experts, without data that enable us adequately to substantiate those opinions. *Id.* at ¶ 297.

Q. HAVE YOU ATTEMPTED TO VERIFY THE REASONABLENESS OF THE FCC COST DATA FOR USE IN ESTIMATING RURAL ILEC SWITCH COSTS?

A. Yes, I compared publicly available data on actual rural telephone company switch costs with estimates based on the FCC cost data. The estimates were reasonably

close to the actual switch costs. The Rural Utility Service (RUS) filed comments in August, 1997 with the FCC during the proceedings in CC Docket No. 97-160 on the issue of estimating rural telephone company switch costs.[10] The RUS provided actual costs for 21 host switches and 17 remote switches in the early 1990's. These switch costs are quite outdated; however, I was interested in whether the FCC cost data (in 1999 dollars) would understate rural ILEC switch costs.

Exhibit WCC-6 compares the actual rural ILEC switch costs with estimated switch costs based on the FCC cost data. Page 1 compares host costs with estimated switch costs. The estimated switch costs are greater than the actual switch costs in 15 of 21 cases. Three of the six switches with actual costs greater than the estimates involved switches with very large numbers of remotes, causing unusually high costs. Page two provides a similar comparison for remote switches. In this case only two of 17 remote switches had actual cost significantly greater than the estimated costs (greater than 12%). Based on this comparison, the switch costs selected by the FCC (in 1999 dollars) do not appear to understate rural ILEC switch costs.

Q. FOR CERTAIN PETITIONERS, WOULD YOU QUESTION WHETHER THE FCC COST DATA IS APPROPRIATE FOR ESTIMATING SWITCH COSTS?

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[10] "Comments of the Rural Utilities Service," In the Matter of Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket No. 97-160, August 7, 1997.

A. Yes, some of the Petitioners have single switches with a small number of lines. These are standalone switches. At $486,700 for a standalone switch, the FCC cost data overstates their fixed cost of placing a new switch. I would prefer for the Petitioners with small standalone switches to produce valid estimates of the current costs to purchase and install switches suitable for their operations.[11]

Q. SINCE THE FCC SWITCH COSTS ARE IN 1999 DOLLARS, SHOULD THEY BE ADJUSTED TO ESTIMATE THE COST OF PURCHASING AND INSTALLING SWITCHES TODAY?

A. Yes, the FCC adjusted for switch price changes from the installation dates of the switches it studied to 1999. Switch costs have continued to decline in subsequent years by approximately 12% based on the Turner Price Index. To express the host and remote switch costs on a current cost basis, they should be reduced by 12%. Current estimates of the cost to purchase and install switches are as follows:

Standalone / host switch fixed cost = $428,296 = (1 – 12%) X $486,700.

Remote switch fixed cost = $142,384 = (1- 12%) X $161,800.

Per-line cost = $76.56 = (1- 12%) X $87.

In other words, taking the FCC's estimates (in 1999 dollars) for the fixed costs of switches and lowering them by 12% for continued price decreases in subsequent

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[11] ** _____ **

years results in fixed costs per switch of $428,296 and $142,384 for standalone / host and remote switches, respectively. Again, these fixed costs should not be used for Petitioners with very small operations; company-specific estimates of current switch replacement costs should be made. When the variable or per-line cost in 1999 is similarly adjusted, the current cost is $76.56 per line.

Q. WHAT IS THE EFFECT ON CASS COUNTY'S END OFFICE SWITCHING COSTS OF USING THE FCC COST DATA (IN CURRENT DOLLARS)?

A. The end office switching cost for Cass County is reduced by 46%, from $0.0091 to $0.0048 per minute of use. The corrected HAI 5.0a calculations are shown in Exhibit WCC-7. I substituted the FCC cost data (in current dollars) for the end office switching data in the HAI 5.0a methodology. I also made the following changes:

- Updated the lines in service to 2004 quantities based on Cass County's response to T-Mobile data requests.
- Lowered the switched port administrative fill factor from 98% to a more conservative 94% to be consistent with the FCC's choice for this value in the Tenth Report and Order. *See Tenth Report and Order* at ¶¶ 330-32.
- Removed the HAI 5.0a power plant investments, because the FCC cost data already include these costs. *See id.* at ¶¶ 291-92.

Q. PLEASE SUMMARIZE YOUR TESTIMONY ON THE QUESTION OF THE APPROPRIATE PER-LINE INVESTMENT FOR END OFFICE SWITCHING.

A. The Petitioners have utterly failed to meet their burden of proof that current switching investments per line should be $520.14 – or 25 percent higher than the HAI 5.0a estimate for small telephone companies based on equipment costs in 1995. Given the reduction in switch costs over the past decade, it would also be inappropriate to use the HAI estimate of $416.11 (as it is based on 1995 equipment costs). Instead, the Petitioner cost studies should be corrected using the FCC switch cost data (in current dollars). In the case of the very small ILECs, care must be taken not to overstate their costs to purchase and install new switches using the FCC data.

Switching Issue No. 2: Overstatement of Usage-Sensitive Portion of Switching

Q. IS THE COMMISSION'S JOB COMPLETED ONCE IT DETERMINES THE FORWARD LOOKING SWITCH INVESTMENT PER LINE?

A. No. As noted above, the FCC has held that under the "additional cost" standard of the Act, ILECs may recover in reciprocal compensation only the usage, or traffic sensitive, portion of their end office switch costs (and not the non-traffic sensitive portion of such costs). Accordingly, the Petitioners have the burden of demonstrating what portion of new switch costs would be allocated to usage – what the HAI model refers to as the *end office non-port fraction.*

Q. WHAT IS THE DEFAULT VALUE FOR THIS INPUT VARIABLE?

A. HAI 5.0a uses a 70% factor – that is, the model assumes that 70 percent of a switch's costs are usage sensitive and 30 percent are non-usage sensitive (and therefore not included in computing reciprocal compensation rates).

Q. WHAT FRACTION DID THE PETITIONERS USE IN THEIR COST STUDIES?

A. They used the 70% default value contained in the HAI model. *See* Schoonmaker Dep. at 39.

Q. DO YOU AGREE THAT 70% OF SWITCHING COSTS TODAY ARE USAGE-SENSITIVE?

A. I do not. A 70% *end office non-port fraction* may have been appropriate based on switches sold in 1995 (the period in which HAI model developers developed the default value). However, the evidence is clear that with advances in technology and changes in the way vendors price switches, usage-sensitive costs for switches have fallen dramatically.

Q. WHAT LEADS YOU TO CONCLUDE THAT USAGE-SENSITIVE COSTS HAVE FALLEN DRAMATICALLY?

A. One indication is the change in the HAI model itself. Current versions of the model have a default value for the *end office non-port fraction* of zero percent (0%). The developers of the model no longer support 70% as the usage-sensitive portion of switch costs. The Petitioners' cost expert also acknowledges that both HAI model versions 5.2 and 5.3 use a zero percent (0%) *end office non-port fraction*. *See* Schoonmaker Dep. at 48.

Q. ARE THERE OTHER REASONS THAT LEAD YOU TO CONCLUDE THAT USAGE-SENSITIVE SWITCHING COSTS HAVE DRAMATICALLY DECREASED OVER TIME?

A. Yes. The FCC determined in its 2003 *Virginia Arbitration Cost Order* that none of the getting started costs of a switch are usage-sensitive. Getting started costs represented a large portion of usage-sensitive costs years ago.

> We conclude above, for purposes of determining the appropriate switch discount, 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 subscriber 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. Virginia Arbitration Cost Order at ¶ 463.

Several State commissions have independently reached the same conclusion.[12] For example, the Illinois Commerce Commission has stated:

> Our extensive investigation of Ameritech's ULS cost structure conclusively demonstrated that Ameritech's switch costs are not usage sensitive, and Ameritech's attempt to unilaterally reclassify the local switch as usage sensitive is a blatant violation of our TELRIC Order. *Investigation into the Compliance of Illinois Bell*

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[12] See, e.g., The Costs of Telecommunications Services Provided by SBC Michigan, Case No. U-13531, 2004 Mich PUC LEXIS 315 (Sept. 21, 2004); Investigation into the Compliance of Illinois Bell Telephone Company with the Order in Docket 96-0486/0569, No. 98-0396, 2001 Ill. PUC LEXIS 1249 (Oct. 16, 2001); Commission Investigation and Generic proceeding on Ameritech Indiana's Rates for Interconnection, Service, Unbundled Elements, and Transport and Termination, Cause No. 406-11-S1, Phase I, 2002 Ind. PUC LEXIS 219 (March 28, 2002).

Telephone Company with the Order in Docket 96-0486/0569, No. 98-0396, 2001 Ill. PUC LEXIS 1249 at *172 (Oct. 16, 2001).

Indeed, just last week the Eighth Circuit Court of Appeals affirmed the decision of the Minnesota Public Utilities Commission that a reciprocal compensation rate of zero was appropriate because incumbent LECs incurred no "additional costs" in terminating calls originating on other carriers' networks. *See Ace Telephone* v. *Koppendrayer*, Nos. 05-1170/1171, 2005 U.S. App. LEXIS 28885 (8th Cir., Dec. 29, 2005) ("But if no additional costs are incurred, there is nothing to pay.").

Q. THESE FCC, STATE COMMISSION AND COURT DECISIONS INVOLVED RBOCS. DOES THE SAME ANALYSIS APPLY TO SMALL ILECS?

A. I believe it does. Switch vendors have not limited the dramatic increase in switch processor and memory for switches to just large telephone companies. Switches for small ILECs have also seen large increases in processor capacity and memory (as have personal and other computers). It is just as unlikely that switch usage will exhaust small switches for small companies. Accordingly, there are no "additional costs" resulting from usage of the switch, with the exception of the interoffice trunk equipment.

Q. WHY DO YOU MAKE AN EXCEPTION FOR INTEROFFICE TRUNK EQUIPMENT?

A. The quantity of equipment used to interface the switch with incoming and outgoing trunks carrying traffic between switches is affected by the volume of traffic among offices. So, I believe it is appropriate to treat this relatively small portion of end office switching costs as usage-sensitive.

Q. WHAT WOULD BE THE SWITCHING INVESTMENT PER LINE FOR THIS USAGE-SENSITIVE TRUNK EQUIPMENT?

A. The trunk investment based on HAI 5.0a data is $18.33 per line, which is relatively small portion of the total switch investment per line (less than 10%).[13]

Q. WHAT PROOF DO THE PETITIONERS CITE FOR CONTINUING TO USE A 70 PERCENT AS THE USAGE-SENSITIVE PORTION OF END OFFICE SWITCHING?

A. The Petitioners have made no effort to consult with switch vendors on current switching technology or pricing. *See* Schoonmaker Dep. at 43. They have not produced any documentation concerning their proposal. *See id.* at 44.

Their cost expert did state that he relied on "work we've done for other clients, not in Missouri" (*id.* at 44). The CMRS Providers requested copies of this information with the confidential portions of the document protected.

Q. WHAT DID THIS INFORMATION SHOW?

A. The information contained a series of estimates of new switch costs and the associated lines of capacity. There was very little detail to indicate whether the estimates were limited to switching equipment and what hardware and software was included in the estimates. Switch costs per line were calculated, and it is my understanding from the *Alma* case that Mr. Schoonmaker has inferred that the variance in costs per line across the switches means usage is driving switch costs.

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[13] $18.33 / line = ($100 switch investment / trunk X 1.1 installation factor) / 6 lines per trunk. (Per HAI 5.0a.)

However, this is not a valid conclusion from the data. The reason is that total switch costs include substantial fixed or getting started costs. As the size of switches vary in terms of lines, so does the average fixed cost per line. (Larger switches with more lines have lower fixed costs per line, and vice versa.) This does not mean that usage is causing differences in switch costs.

Q. PLEASE SUMMARIZE YOUR TESTIMONY CONCERNING THE PROPORTION OF SWITCHING THAT IS USAGE-SENSITIVE?

A. The Petitioners have not begun to meet their burden of proof. The situation facing the Commission is similar to that faced by the Indiana Commission, which held:

> [T]he level of detail in Ameritech's evidence is not remotely sufficient to allow us to resolve those issues. Ameritech has assumed numerous facts not in evidence; we need not, and we will not, base our decision on the rate structure or rate levels for the ULS-ST offering on Ameritech's highly speculative arguments about the relative usage of Ameritech's switches, cost causation and allocation, and subsidization. * * * The burden is on Ameritech in this proceeding to support the inclusion of a usage-sensitive rate element in the rate structure for ULS-ST. For the reasons discussed in the previous paragraphs, Ameritech has not met that burden. Accordingly, we find that Ameritech's request to assess a usage-sensitive switching charge for ULS-ST should be denied and that the switching costs (including usage costs, if any) for the ULS-ST offering should be recovered from CLECs on a flat-rate basis. *Commission Investigation and Generic proceeding on Ameritech Indiana's Rates for Interconnection, Service, Unbundled Elements, and Transport and Termination*, Cause No. 406-11-S1, Phase I, 2002 Ind. PUC LEXIS 219 at *110-11 (March 28, 2002).

Given the Petitioners' failure to meet their burden of proof, I believe the Commission is required to assume no more than $18.33 per line as the usage-sensitive portion of end office switching investment.

Switching Issue No. 3: Excessive Land and Building Space Requirements

Q. WHY ARE LAND AND BUILDING SPACE REQUIREMENTS IN THE PETITIONER COST STUDIES EXCESSIVE?

A. The land and building investment necessary for switching in HAI 5.0a is quite high. The model assumes 500 square feet of floor space for switches with up to 1,000 lines, and 1,000 square feet of space for switches up to 5,000 lines. These equate to areas of approximately 22' X 22' (or 484 square feet) and 32' X 32' (or 1,024 square feet), respectively, **_____

_____

_____

_____

_____.**

Q. WHAT IS THE EFFECT ON CASS COUNTY'S SWITCHING COSTS OF CORRECTING ITS LAND AND BUILDING SPACE REQUIREMENTS?

A. I rounded Cass County's floor space to the next 50 square foot increment, which is the space provided by Southwestern Bell in Missouri for a single bay of equipment in its Caged Collocation tariff.[14] I also allowed for a minimum of 100 square feet of area, resulting in switch equipment floor spaces of 100 square feet for the remotes and 200 square feet for the Peculiar switch. Substituting these floor spaces in Exhibit WCC-7 reduces the end-office switching cost from $0.0048 to $0.0040 per minute.

[14] Local Access Tariff, P.S.C. Mo. – No. 42, Section 2, para. 20.3, original sheet 51, effective 10/21/01.

Correction of Petitioner Cost Studies

Q. YOU HAVE IDENTIFIED THREE FUNDAMENTAL ISSUES IN THE PETITIONERS COST STUDIES FOR END OFFICE SWITCHING. HAVE YOU CORRECTED THE CASS COUNTY COST FOR THESE ISSUES?

A. Yes, when Cass County's costs are corrected using the FCC switch cost data (in current dollars) and its land and building space requirements are properly sized, its end office switching or termination cost is reduced from $0.0091 to $0.0040 per minute of use. These calculations are shown in Exhibit WCC-8. This corrects for the first and third issue. To correct for the second issue relating to the usage-sensitive portion of switching, I use only the switch trunk investment of $18.33 per line (rather than the FCC cost data). This results in a termination cost of $0.0012 per minute of use.[15]

Q. WHAT WOULD BE THE CORRECTED END OFFICE SWITCHING COSTS FOR OTHER PETITIONERS?

A. While there presumably would be slight differences in the Petitioner costs due to differences in annual cost factors and minutes of use per line, the corrected end office switching costs for all companies would be approximately $0.0012 per minute, after correcting for all three issues. This is a fraction of the average end office switching costs of $0.0092 per minute for the T-Mobile Petitioners and $0.0010 for Cingular Petitioners.

ANALYSIS OF TRANSPORT COSTS

[15] $0.0012 = $18.33 / line X (1 + 2.9% land and building loading) X 28.7% annual cost factor / (11,542 MOU / line X 40% interoffice traffic fraction).

Description of Costs

Q. WHAT TRANSPORT COSTS MAY THE PETITIONERS RECOVER IN RECIPROCAL COMPENSATION?

A. The FCC defines transport 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 switch that directly serves the called party, or equivalent facility provided by a carrier other than an incumbent LEC." 47 C.F.R. § 51.701(c).

In this case, transport begins at the meet point with the intermediate carrier (typically, Southwestern Bell), which delivers the mobile-to-land traffic to the Petitioner's network. A Petitioner then assumes responsibility for transporting mobile-to-land calls from the meet point to its end office serving the called party. This may involve the call being transported over one or more interoffice links.[16] The telephone plant used in providing transport includes transmission equipment and cables. Tandem switching is not used by the Petitioners in transporting wireless originated traffic. Reciprocal compensation recovers the forward-looking economic costs of the transmission equipment and interoffice cables used for transport.

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[16] An interoffice link refers to the cables and associated transmission equipment connecting two nodes in an ILEC network. Although network nodes may not involve switching at each end of the interoffice link, as in the case of private lines or special access circuits, the network nodes for the transport of CMRS Provider traffic refers to either switches or the meet point with the intermediate carrier.

Q. CAN YOU GIVE AN EXAMPLE OF TRANSPORT?

A. Yes, Exhibit WCC-9 illustrates the interoffice network of Cass County, based on a network diagram provided by the Company. Suppose a wireless customer calls a Cass County customer located in the Peculiar exchange. The call is delivered by Southwestern Bell to a meet point with Cass County's network. From this point, the call is transported over fiber cable for a short distance to the Peculiar switch (PCLRMOXA). The switch then connects the call to the called party's access line or local loop. Transport costs include the costs of the fiber cable between the meet point and the Peculiar switch and the transmission equipment at the end of the cable. Transport does not include the Peculiar switch, which is part of termination, or the called party's local loop.[17]

Another call might be to a customer served by the East Lynn switch (ELYNMOXA), which is a remote switch subtending to the Peculiar host switch. The call is transported from the meet point to the Peculiar switch. There, the call is transported from the Peculiar host to the East Lynn remote. This transport is provided using transmission equipment and several miles of fiber cable between the two switches. Again, the cost of switching at Peculiar and East Lynn are part of termination rather than transport.

[17] As I discuss above, the costs of the local loop are not usage or traffic-sensitive. In other words, there are no additional costs for loop plant caused when the ILEC transports and terminates wireless traffic. Loop costs are attributable to ILEC end-users and are recovered through local service rates and other mechanisms.

Each Petitioner's network is different. Some companies employ one or more fiber rings to connect their switches, **_____ _____.** Others have only one switch, in which case transport involves a relatively simple fiber connection from the switch to the meet point with the intermediate carrier. **_____ _____.**

Q. HOW IS TRANSPORT DEFINED IN THE HAI 5.0a MODEL?

A. The HAI model defines three types of transport – common transport, direct transport and dedicated transport – as follows:

> g) Common Transport -- A switched trunk between two switching systems on which traffic is commingled to include LEC traffic as well as traffic to and from multiple IXCs. These trunks connect end offices to tandem switches. Results are provided on a per-minute basis for the central office terminating equipment associated with the UNE, and for the transmission medium.
>
> h) Dedicated Transport -- The full-period, bandwidth-specific interoffice transmission path between LEC wire centers and an IXC POP (or other off-network location). It provides the ability to send individual and/or multiplexed switched and special services circuits between switches. Results are provided on a per-minute basis and per-channel basis for the central office terminating equipment and entrance facilities associated with the UNE, and on a per-minute and per-channel basis for the transmission medium.
>
> i) Direct Transport -- A switched trunk between two LEC end offices. Results are provided on a per-minute basis for the central office terminating equipment associated with the UNE, and on a per-minute basis for the transmission medium.[18]

The definitions are unclear in terms of which type of transport applies to land-to-mobile traffic. It is not even clear that any one accurately represents transport in

[18] "HAI Model Release 5.0a – Model Description," HAI Consulting, Inc., Revised 02/16/98, pp. 71-72.

this case. In fact, the Petitioners have attempted to estimate their transport costs by summing the HAI model costs for both common and dedicated transport.

Q. HOW DID YOU DEAL WITH THIS AMBIGUITY?

A. I analyzed the HAI model cost calculations for common and dedicated transport to understand what they actually represent. I did this by reproducing the HAI model results for the two types of transport using the model algorithms and cost data. This allowed me to understand the model's assumptions regarding a Petitioner's network configuration and its calculations of interoffice distances, cable costs and ultimately the transport cost per minute of use. I could then ask, "Does this make sense? Does it reflect the Petitioner's network? Does it comply with the FCC rules for TELRIC and forward-looking costs?" I was able to get around terms used by the HAI model and focus on the real meaning of the model results.

Q. WHAT DO FCC RULES FOR TELRIC AND FORWARD-LOOKING ECONOMIC COSTS REQUIRE IN COMPUTING TRANSPORT COSTS?

A. There are several important aspects of FCC Rules 51.505 and 51.511 that affect properly computed transport costs. These include the following:

- The network architecture, or the arrangement of switches, interoffice cabling and the types of transport systems used, is supposed to reflect each Petitioner's existing switch locations. Then, a forward-looking interoffice network is supposed to be designed to carry the total demand for voice, data and other traffic in the most efficient, least-cost means possible. For purposes of its cost model, an ILEC's transport network should reflect

what "would exist in a competitive market (i.e., the most efficient network using currently available technology)." *Virginia Arbitration Cost Order* at ¶ 505. In fact, FCC Rule 51.505(b)(1) specifies that ILEC cost studies should use "the lowest cost network configuration, given the existing location of the incumbent LEC's wire centers."

- Transport network elements – transmission equipment and cabling – are supposed to be sized to efficiently serve total demand over a reasonable planning period. While network elements have spare capacity, the amount of spare capacity and the associated cost should not be excessive.
- The cost of transport elements should be attributed to all the users of the network elements. Thus, transport costs are recovered from all the services and customers using them. FCC Rule 51.511 requires that the total cost of a network element be divided by its total demand, so that each user bears a share of the network element cost in proportion to capacity consumption.

As I describe the HAI 5.0a model and the Petitioners' cost studies, I will point out how they fail to adhere to these requirements and how the dramatic overstatement in transport costs caused by their failure to follow FCC Rules.

Q. IN WHAT ORDER WILL YOU DESCRIBE THE TWO TYPES OF TRANSPORT INCLUDED IN THE PETITIONER'S COST STUDIES?

A. I will start with common transport costs and describe these in detail. After this, I will describe dedicated transport costs and the reason including these, as the

Petitioners have done, is duplicative and overstates their costs and reciprocal compensation requirements.

Q. WHAT HAVE THE PETITIONERS DETERMINED THEIR COMMON TRANSPORT COSTS TO BE?

A. Exhibit WCC-10 shows the common transport costs per minute for each Petitioner. The costs were determined by HAI 5.0a. The ILEC costs range from a low of $0.0099 per minute for Fidelity Telephone and Granby Telephone to a high of $0.2716 per minute for Peace Valley Telephone, which is an incredibly high figure.

Exhibit WCC-11 shows the same common transport costs split between the costs of fiber and transmission equipment. Fiber costs are the predominant portion of common transport costs representing on average 88% of the total. For this reason, my analysis primarily focuses on interoffice cable.

Cass County's costs are shaded, because I used this company as the example in the following discussion of transport cost issues. HAI 5.0a estimates Cass County's forward-looking cost to transport a minute of wireless traffic is $0.0163, of which $0.0138 is for cable and the remainder is for transmission equipment. I will now describe the first issue related to transport costs – the overstatement of interoffice cable lengths.

Transport Issue No. 1: Overstatement of Interoffice Cable Length

Q. HOW DOES HAI 5.0A OVERSTATE INTEROFFICE CABLE LENGTH?

A. HAI 5.0a, as used by the Petitioners, reflects a network architecture that is completely unrealistic. The model assumes that if a small ILEC in Missouri were to rebuild its local network, it would place fiber cables from each of its switches to the nearest Bell Operating Company switch (or Southwestern Bell, in this case). There would be no direct connections between the ILEC's own switches (*e.g.*, between a host and one of its subtending remotes). This would mean that every time a subscriber makes a local call to another subscriber served by a different switch within a Petitioner's network, the call would be transported to Southwestern Bell's network and then back to the called party's switch. This modeling assumption overstates interoffice cable lengths.

The Petitioners would have the Commission believe that they would build new interoffice networks that would require use of a third-party network (Southwestern Bell) to complete local calls between their subscribers. This would dramatically increase the their own costs of providing local service, because not only would they have to transport local calls over greater distances, but they would also have to pay Southwestern Bell to transport every local call. This network architecture is completely inconsistent with TELRIC principles, where the FCC has said that cost models should use the "most efficient" network architecture. *Virginia Arbitration Cost Order* at ¶ 505. *See also id.* at ¶ 496 (architecture should be "the least-cost, most-efficient and reasonable"); 47 C.F.R. § 51.505(b)(1)(ILEC cost studies must use "the lowest cost network configuration").

Q. WHAT DID HAI 5.0a COMPUTE AS THE INTEROFFICE CABLE LENGTH FOR CASS COUNTY?

A. The HAI model estimated 169.5 miles of fiber cable would be required to connect Cass County's six end office switches to the nearest Southwestern Bell switches. This is shown in Exhibit WCC-12. For example, the Creighton central office (CGTNMOXA) is 20.2 miles from Southwestern Bell's Archie office (ARCHMOAX). This is the length of a single cable between the two offices. HAI 5.0a assumes two separate cables are required to provide a diverse route in the event one of the cables is cut or otherwise taken out of service. The resulting total cable length for CGTNMOXA is 40.5 miles (cell E9). The same assumptions and method are used by HAI 5.0a for the other switches, yielding a total cable length of 169.5 miles.

Q. CAN YOU GIVE A PRACTICAL EXAMPLE OF HOW THIS OVERSTATES THE CABLE LENGTH?

A. Suppose a customer served by the East Lynn office called another served by the Peculiar office. The HAI model estimates that the call would travel 14.9 miles from ELYNMOXA to Southwestern Bell switch, ARCHMOAX (cell B12). The call apparently would then travel over Southwestern Bell's network from ARCHMOAX to KSCYMO40 for an unknown distance. Finally, the call would return to Cass County's network over a 10.4 mile cable from KSCYMO40 to PCLRMOXA. Excluding the Southwestern Bell network, HAI 5.0a estimates a transport distance over Cass County's network of 25.3 miles.

Q. WHAT IS THE ACTUAL CABLE DISTANCE BETWEEN EAST LYNN AND PECULIAR?

A. **_____.**[19] This compares with 50.6 miles assumed by HAI 5.0a (cells E12 and cell E14).

Q. DO YOU KNOW THE ACTUAL TOTAL INTEROFFICE CABLE LENGTH FOR CASS COUNTY?

A. **_____** versus 169.5 miles in the HAI model.[20]

Q. DO YOU BELIEVE THE HAI MODEL HAS REFLECTED THE "LOWEST COST NETWORK CONFIGURATION" AS REQUIRED BY FCC RULE 51.505 (b) (1)?

A. Certainly not. It is unbelievable that Cass County would consider a forward-looking network design like the one assumed by HAI 5.0a. It would increase the Company's investment in interoffice cable by **___**, not to mention having it rely entirely on Southwestern Bell's network for completion of its own local calls (which, in turn, would needlessly increase its cost of providing local services). This is a fundamental flaw in HAI 5.0a model as used by the Petitioners.

---

[19] **_____ **

[20] **_____ **

Q. IS THE SAME APPROACH USED FOR THE OTHER PETITIONERS?

A. Yes. In his December 12 deposition, Mr. Schoonmaker was asked whether the same approach is used for all companies, and he responded as follows:

> Q. Okay. Does HAI 5.0a use the same model as we've discussed here for determining transport distances for all the petitioners; in other words, all of the other companies [besides Cass County]?
>
> A. Yes.
>
> Q. So in effect it measures the distance to the nearest BOC wire center for each office and then it doubles the distance; is that correct?
>
> A. Yes. *See* Schoonmaker Dep. at 67-68.

Q. GIVEN THIS, DOES HAI 5.0A AS USED BY THE PETITIONERS OVERSTATE CABLE LENGTHS FOR OTHER PETITIONERS?

A. Yes. The responses to T-Mobile's data request No. 32 for twelve Petitioners were sufficient to estimate actual cable lengths. In every case, HAI 5.0a overstated the lengths by amounts ranging from **_____ _____ _____**.

This is a good example of the issue. Peace Valley's cost study indicates the cable portion of its common transport cost is $0.2610 per minute, a very high cost by any benchmark. As it turns out, HAI 5.0a estimated that Peace Valley is 86 miles from the nearest BOC office and would require 172 miles of interoffice cable (2 cables X 86 miles). Peace Valley does not require nearly this amount of cable. Here is Peace Valley's response to data request No. 32:

**_____
_____
_____
_____
_____.**

Even if Peace Valley placed a second cable to the meet point for diversity for a total of six miles of cable, the HAI model has overstated the cable length by a factor of **__** (186 miles proposed vs. **___** miles actual). The 26.1 cent per minute transport cost for Peace Valley is clearly wrong. The Petitioner is attempting to recover from wireless carriers costs it does not incur. Transport costs for the other Petitioners also are wrong in varying degrees due to this error.

In summary, HAI 5.0a assumes network architectures for all Petitioners that are unrealistic and in doing so substantially overstates interoffice cable distances and transport costs. This error is common to all Petitioners. Thus, combining study results to produce an average transport cost for the Petitioners, as they may suggest, cannot alleviate the problem. Interoffice cable distances must be based on realistic, forward-looking network designs to determine reasonable costs consistent with TELRIC principles.

Transport Issue No. 2: Oversized Interoffice Cable

Q. WHAT IS THE ISSUE WITH RESPECT TO THE SIZE OF INTEROFFICE CABLES?

A. HAI 5.0a always assumes that 24 fiber cables are used for interoffice transport. The cable size is "hardwired" in the model, so the Petitioners cannot change this assumption by modifying input values, even though on a forward-looking basis

they might employ smaller (or even larger) cable sizes to serve their anticipated demand for cable fibers. For the small rural ILECs in Missouri this often results in larger cables being assumed by the model than are necessary, resulting in overstated transport costs.

Q. HOW WOULD AN ILEC DETERMINE THE NECESSARY CABLE SIZE?

A. For each cable route between two network nodes, the ILEC would forecast the needed cable fibers based on total anticipated demand for transport over the cable route.[21] The total demand for fibers would include those needed for transport systems, digital loop carrier systems, leased fibers and others.[22] Based on the total anticipated demand, the ILEC would purchase and install the next larger cable size. There may be practical, lower limits on available cable sizes, so in some cases the ILEC might expect to only use a fraction of the total fibers. There would be no economic reason, though, to place a fiber cable several sizes greater than the ultimate demand expected for the cable route.

Q. DOES CABLE SIZING AFFECT TRANSPORT COSTS?

---

[21] A cable route is a run of cable of a particular fiber size. There may be one cable route or run of cable of a particular size running the full distance between two network nodes (or switches), or there may be several routes of varying cable sizes, which together provide a fiber connection between the nodes.

[22] A digital loop carrier (DLC) system is used to provide "loops" to ILEC customers located far from their serving end office. A remote terminal is placed near the remote customer locations, and voice grade circuits are provided from the remote terminal to the serving end office switch over cable fibers. The cable fibers may be in the same cable route containing fibers used for interoffice transport.

A. Yes. Based on HAI 5.0a fiber cost data, eight fiber and twelve fiber cables cost 16% and 12% less, respectively, than 24 fiber cable.[23] Anytime a Petitioner's forward-looking network calls for a smaller cable size than 24 fibers, there is a significant reduction in costs.

Q. IN YOUR ANALYSIS OF CASS COUNTY'S TRANSPORT COSTS DID YOU FIND ANY CABLE ROUTES REQUIRING MORE THAN 24 FIBER CABLE?

A. **_____.**

Q. WHAT ARE CASS COUNTY'S CURRENT INTEROFFICE CABLE SIZES?

A. Cass County currently has interoffice cable sizes ranging from **_____.**[24] Exhibit WCC-13 shows the interoffice links in the Company's network and the cable routes making-up each link. It also shows the current fiber cable size, the number of fibers in service and the cable length or route distance. **_____.**

[23] 16% = ((24 fibers – 8 fibers) X $0.05 / fiber-foot) / ($3.50 / foot for 24 fiber cable + 95% X $1.68 / foot for buried fiber trenching + 5% X $0.07 / foot for poles for aerial fiber). 12% = ((24 fibers – 12 fibers) X $0.05 / fiber-foot) / $5.10 / foot for 24 fiber cable, including structures.

[24] **_____**

For each cable route, I have estimated an adequate cable size to serve existing demand and allow for future growth.[25] This is labeled, "Forward-Looking Cable Size." **_____**, the minimum cable size assumed on a forward-looking basis is eight fibers. The other possible cable sizes are 12 and 24-fiber. The minimum number of fibers allowed for future growth is two fibers, with some routes having as many as 12 fibers for growth.

Q. WHAT IS THE IMPACT OF THE HAI MODEL ASSUMING 24 FIBER CABLE THROUGHOUT CASS COUNTY'S INTEROFFICE NETWORK?

A. Keep in mind that HAI 5.0a estimated Cass County needs 169.5 miles of cable for its interoffice network, when the company actually has only **_____** of cable. The model incorrectly calculated interoffice cable investment of $4.57 million, assuming 100% 24 fiber cable. Had the model accurately reflected Cass County's interoffice distances, the cable investment would have been **_____ _____** less (again assuming 24 fiber cable) than what Cass County is proposing. Using the forward-looking cable sizes of eight, twelve and 24 fiber cable, the forward-looking investment would be **_____** than the model result.[26]

Q. DID MR. SCHOONMAKER CONFIRM IN HIS DEPOSITION THAT 24 FIBER CABLE IS USED FOR ALL PETITIONERS?

---

[25] **_____ _____ _____ _____.**

[26] Exhibit WCC-14 shows the calculation of the **_____** investment.

A. Yes, he was asked about this issue on page 76 of his deposition. The questions and his answers are as follows:

> Q. I think you verified earlier that HAI 5.0a assumes a 24-fiber cable and its basic workings; is that correct?
>
> A. For interoffice facilities, yes.
>
> Q. Is that a user input that can be modified in the system?
>
> A. That number of fibers, no, but the cost per foot can be modified.
>
> Q. But the number of fibers cannot be modified?
>
> A. Well, the input is in a cost per foot number.
>
> Q. So if you wanted --- if you wanted to adjust downward from the 24-fiber cable, could you do that by varying the costs per foot?
>
> A. Sure.
>
> Q. Did --- in your runs for Cass County or the other petitioners, did you change the default cost per foot number?
>
> A. I did not.

Interoffice cable size is an important factor in determining transport costs. The Petitioners are likely to argue that the additional costs of larger fiber sizes is not significant, due to the fact that a significant portion of fiber cable costs are for trenching, engineering and installation. However, anytime a small ILEC can satisfy its total demand with an eight fiber cable versus twenty-four fiber cable, there is a 16% savings in costs. When twelve fiber cable can be used, the savings is 12%. These are not insignificant amounts. The CMRS Providers should not have to pay inflated transport rates because of inaccurate cable sizing in HAI 5.0a.

Transport Issue No. 3: Failure to Reflect Sharing of Interoffice Cable

Q. WHAT DO YOU MEAN BY SHARING INTEROFFICE CABLE?

A. Fibers in a Petitioner's interoffice cable network are used for many purposes, including transport systems, digital loop carrier systems and others. These uses "share" the cable, and each should bear a proportionate share of the cable cost.

Q. PLEASE GIVE AN EXAMPLE USING CASS COUNTY?

A. Take for example cable route 1c shown in Exhibit WCC-13. **_____

_____

_____

_____

_____

_____.**

Another example is cable route 2b. **_____

_____

_____.**

Q. WHAT ARE FCC RULES FOR COMPUTING COSTS OF SHARED NETWORK ELEMENTS, SUCH AS INTEROFFICE CABLES?

A. FCC Rule 51.511(a) specifically addresses the calculation of costs for shared network elements. It 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 Sec. 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.

In this case, the cost of the interoffice cable would be divided by the total number of fibers in service. The resulting unit cost would be attributed to each user based on the number of fibers required.

Q. HOW DOES HAI 5.0a FAIL TO REFLECT THE SHARING OF INTEROFFICE CABLE?

A. The model assigns the entire cost of interoffice fiber cable to transport. None of the cost is assigned to digital loop carriers, leased fibers or other uses of the fiber. HAI 5.0s does assign a portion of the cost of structures – trenching and poles – to feeder cable used for digital loop carrier systems, recognizing that interoffice cables and feeder cables share trenches and poles for a portion of their routes.

Q. PLEASE ILLUSTRATE THIS WITH AN EXAMPLE FOR CASS COUNTY?

A. I will use cable route 2a shown in Exhibit WCC-13, **_____

_____

_____

_____

_____

_____

_____.** This amount would be entirely allocated to interoffice transport.

HAI 5.0a fails to realistically model Cass County's network, and in doing so, fails to comply with the FCC rule. **_____

_____

_____.** The FCC Rule requires that the cost per fiber be calculated by dividing the total cable cost of **_____

_____

_____

_____**[27] The Petitioners fail to recognize the efficiencies gained by sharing fiber cable. Wherever small ILECs in Missouri have cable routes shared by interoffice transport systems, digital loop carrier systems, leased fibers and other users, the HAI model dramatically overstates their costs.

Q. WHAT PERCENTAGE OF CASS COUNTY'S INTEROFFICE FIBER CABLE IS SHARED AMONG THE INTEROFFICE TRANSPORT SYSTEM AND OTHER USERS?

A. **_____

_____

_____

_____**, whereas the HAI model assumes 100% of the interoffice cable is used by the interoffice transport system. HAI 5.0a is clearly wrong as applied to the Petitioners' transport networks.

Q. HOW DOES HAI 5.0a COMPUTE COMMON TRANSPORT CABLE COSTS, IF IT DOES NOT REFLECT INTEROFFICE CABLE SHARING?

---

[27] **_____

_____

_____.**

A. Exhibit WCC-15 shows how the $0.0138 per minute common transport cable cost for Cass County is calculated by the HAI model. These are the primary steps.

- Calculations begin with the miles of interoffice fiber cable for each wire center (col. E) based on the erroneous assumption of two fibers from each Cass County wire center to the nearest Southwestern Bell wire center.
- HAI 5.0a also determines the total number of interoffice trunks required for the traffic and special access (SA) circuits at each wire center.[28]
- The model calculates the fiber cable investment for each wire center based on the interoffice cable mileage and a 24 fiber cable cost of $3.50 per foot. Example: $748,018 in col. J for Creighton (CGTNMOXA) = 40.5 miles X (5,280' X $3.50 / foot).
- An additional, modest investment is calculated for the sheath in which buried cable is placed (col. K).
- Cass County and the other Petitioners indicated 95% of interoffice cable would be buried on a forward-looking basis, and 5% aerial. Therefore, HAI 5.0a treats 95% of the fiber cable and sheath investments (cols. J and K) as buried. The buried amounts appear in cols. L and M. The remaining fiber cable investment is considered aerial cable (col. S).

[28] In the HAI model, an interoffice trunk is a voice grade or DS0 equivalent circuit. HAI 5.0a calculates the quantity of trunks required to handle common, direct and dedicated transport, plus Operator Services and Special Access circuits. This quantity is shown in column I of Exhibit WCC-15.

- Next, the model calculates the investment for buried cable placement. This is based on the interoffice cable mileage for each wire center and a buried structures or trenching cost of $1.68 per foot. Example: $359,369 in col. N for Creighton = 40.5 miles X (5,280' X $$1.68 / foot).
- The model similarly calculates pole investment using $0.07 per foot (of cable) for pole costs.
- HAI 5.0a has a set of algorithms that determine the portion of buried cable placement and pole investments shared with feeder cable used to provide loops to Cass County customers. An adjustment is made to allocate approximately 36% of these costs to feeder cable. These adjustments appear in cols. O and Q. Note that none of the 24 fiber cable investment is allocated to feeder cable.
- The total investment in buried cable, aerial cable and poles (cells R15, S15 and T15) equals $4.2M for 169.5 miles of 24 fiber cable.

This is a good point to pause and put in perspective the three transport issues that I have described.

Q. PLEASE DO.

A. HAI 5.0a estimated that Cass County would spend today $4.2 million, after adjusting for structure sharing, to build 169.5 miles of 24 fiber buried and aerial cable. As described earlier, had the model not overstated the interoffice cable mileage and assumed all 24 fiber cable, the cable investment would be **_____ _____**.

Now the question is, "How much of this inflated cable investment is borne by Cass County's interoffice transport system versus other users of interoffice cable?" The answer is 100%. Cass County's cost study fails **_____

_____

_____

_____**.

Instead, the full burden is placed on 871 interoffice trunks (cell I15), resulting in grossly overstated costs per trunk and per minute of use. If a reciprocal compensation rate is set based on HAI 5.0a costs, the CMRS Providers would be subsidizing Cass County local services, which use the **_____

_____**.

Q. AFTER COMPUTING THE TOTAL INVESTMENT IN BURIED CABLE, AERIAL CABLE AND POLES, WHAT DOES HAI 5.0A DO?

A. The model allocates the investments to common, direct and dedicated transport in proportion to the quantity of trunks for each. In Exhibit WCC-15, I do this by dividing the total cable plant investments (cols. R - T) by total trunks (col. I) to calculate unit investments per trunk (cols. U - W). I then multiply the unit investments times the HAI model quantity of common transport trunks (col. X) to compute common transport investments in buried cable, aerial cable and poles.

In the next step, HAI 5.0a calculates the annual costs associated with the plant allocated to common transport. These include capital costs (depreciation, cost of capital and income taxes) and operating expenses (cable network expenses, support expenses, common overheads and others). The annual costs represent

HAI 5.0a's estimate of *forward-looking economic costs* for common transport cable.

In the final step, annual costs are divided by annual minutes of use to calculate the common transport cost per minute. The result is $0.0138, the same figure appearing in the summary of costs in Exhibit WCC-11 and the same figure derived by the Petitioner from HAI model output.

Correcting for Transport Issues No. 1, 2 and 3.

Q. IS IT POSSIBLE TO MODIFY THE INPUT VALUES TO HAI 5.0a TO CORRECT FOR TRANSPORT ISSUES NOS. 1, 2 AND 3?

A. It may be possible, but I think it is very difficult to make HAI 5.0a work for small ILECs. Keep in mind that reciprocal compensation rates are to be based on company-specific costs. With respect to Transport Issues Nos. 1 – 3, this means the following:

- Interoffice mileages must reflect cable route distances among each company's network nodes based on a forward-looking design of fiber rings and point-to-point interoffice links. Some Petitioners have single fiber rings and others have multiple rings. The smallest companies with single switches only have a point-to-point connection to the meet point with the intermediate carrier.
- Cable sizes must be based on total anticipated fiber demand for interoffice transport systems, digital loop carrier systems, leased fibers and others. Forward-looking cable sizes will vary by Petitioner and cable route within its network.

- Unit investments must reflect total demand and the sharing of cable investment among multiple users. Each Petitioner's situation is different.

To develop company-specific costs using HAI 5.0a would require manipulating the input data in some fashion to account for these key factors affecting transport cable costs.

Q. IS IT PRACTICAL FOR A SMALL ILEC TO COMPUTE COMMON TRANSPORT CABLE COSTS THAT ARE CORRECT AND COMPLY WITH THE FCC RULES?

A. Yes, I believe so. I have computed corrected common transport cable costs for Cass County in Exhibit WCC-16. Cass County falls in the middle of the Petitioners in terms of network complexity. Grand River Mutual Telephone has a more complicated interoffice network, while Farber Telephone, Peace Valley Telephone and others have relatively simple networks.

Q. ARE THE CORRECTIONS TO CASS COUNTY'S COMMON TRANSPORT CABLE COSTS IN EXHIBIT WCC-16 BASED ON HAI 5.0a COST DATA AND INFORMATION PROVIDED BY THE COMPANY?

A. Yes, the corrections reflect company-specific information obtained in responses to T-Mobile data requests on cable route distances, cable sizes, cable sharing and interoffice trunks in service. HAI 5.0a cost data are used for fiber cable costs, capital cost factors, operating expense factors and the common transport minutes of use per trunk. Exhibit WCC-16 corrects only for the methodological flaws in HAI 5.0a related to the three issues.

Q. DID ALL PETITIONERS PROVIDE THE SAME INFORMATION AS CASS COUNTY?

A. T-Mobile's data requests sought the same information from all the Petitioners; however, the complete set of information was not produced by any of the companies. In the case of Cass County, it took several exchanges between the attorneys for T-Mobile and the Petitioners to obtain sufficient information to produce Exhibit WCC-16. I believe each Petitioner, though, should be able to provide this information.

Q. DESCRIBE THE CORRECTIONS TO CASS COUNTY'S COMMON TRANSPORT CABLE COSTS?

A. Exhibit WCC-16 corrects Cass County's costs using the following steps:

- First, the forward-looking cable size is determined for each cable route (col. F). The current quantity of fibers in service is "bumped-up" to the next cable size, where eight, twelve and 24 fiber cables were selected as possible choices. This complies with FCC Rule 51.505 and its requirement for an efficient network configuration. It avoids cable sizes with fiber capacity that likely will never be employed.
- The HAI 5.0a cable cost data are used to develop an installed cable cost per foot (col. G). These data are shown in cells B37 – B40.
- For simplicity, I assumed 100% buried cable versus 95% assumed in the Petitioner cost studies. The difference between assuming 100% versus 95% buried cable has little impact on the result.

- Total buried cable investment is computed for each cable route based on the cable length (col. E) and the cable cost per foot (col. G).
- Per FCC Rule 51.511, the total buried cable investment is divided by total fibers in service to compute the unit investments shown in col. I.
- **_____
_____
_____
_____
_____
_____
_____**
- Cass County provided the number of voice grade trunks or DS0s added to the transport system at each switch. Based on the location of each switch along the Company's interoffice ring, I estimated the cumulative DS0s on the OC48 system along each cable route. I adjusted the total DS0s circuits using HAI 5.0a's assumption of 90% transmission terminal fill. Example: **_____
_____**.[29]

[29] **_____
_____
_____
_____
_____.**

- The cable investment per DS0 is computed by dividing the cable investment for the OC48 transport system by the DS0s in service along each cable route. This also complies with FCC Rule 51.511.
- Annual costs per DS0 or trunk are calculated using the same annual cost factors in HAI 5.0a (col. N), and the costs are divided by 100,539 annual minutes of use per trunk, which is the traffic volume estimated by Cass County. These calculations determine the cost for a minute of traffic to travel along each cable route.
- The last step is to weight the per-minute cable costs by the percentage of wireless traffic expected over each interoffice link. **_____

_____

_____

_____

_____

_____**

And, so on.

The corrected common transport cable cost is $0.0021 per minute versus $0.0138 in the HAI model.

Q. PLEASE SUMMARIZE FOR THE COMMISSION THE MAIN POINTS RELATED TO COMMON TRANSPORT CABLE COSTS.

A. I would like for the Commission to be aware of and address the following:

- HAI 5.0a as used by the Petitioners does not accurately model small ILEC networks. It overstates interoffice cable lengths, overstates cable sizes,

fails to recognize cable sharing, and ultimately overstates common transport cable costs. In the case of Cass County, HAI 5.0a's common transport cable cost estimate is 6.6 times the Company's true forward-looking economic cost.

- Correcting for HAI 5.0a's flaws is not a matter of combining the erroneous results of all the Petitioners to produce an average cost in hopes that "errors cancel out." When the results of most, if not all, Petitioners are overstated, the average can only be overstated. Each Petitioner's cost study must be corrected.
- Transport cable costs can be properly and practically calculated per the FCC Rules using the approach I have shown for Cass County in Exhibit WCC-16. The method is straightforward and requires network information that should be available to all Petitioners. Based on information provided by some Petitioners, I have been able to correct the common transport cable costs of 20 Petitioners. These costs are used in the corrected transport and termination costs shown in Exhibit WCC-1. T-Mobile and Cingular are attempting to obtain cost information for the other seven Petitioners so that similar corrections can be made for these companies.

Transport Issue No. 4: Oversized Transmission Equipment and Costs

Q. WHY DO YOU CONSIDER THE PETITIONER TRANSMISSION EQUIPMENT AND COSTS TO BE OVERSIZED?

A. There are two main reasons. First, the HAI 5.0a model assumes the same combination of transmission equipment is used at every central office for all Petitioners, regardless of their network architecture (fiber ring or point-to-point) and interoffice transport bandwidth requirements. This combination of equipment includes an OC48 add / drop multiplexer, an OC3 terminal multiplexer and a digital cross connect system (per DS3). **_____

_____

_____

_____

_____.** HAI 5.0a cannot model a least cost, most efficient network using the same equipment combination for all companies.

Secondly, HAI 5.0a assumes that optical regenerators are required every 40 miles along interoffice cable routes. Normally, this would not add much to transmission equipment costs, because cable route distances between network nodes generally are less than 40 miles. **_____

_____.** However, because HAI 5.0a inflates cable distances by assuming two cables connect every Petitioner switch to the nearest BOC switch, regenerator quantities and costs become substantially overstated.

Q. CAN YOU ILLUSTRATE HOW HAI 5.0a COMPUTES TRANSPORT TRANSMISSION EQUIPMENT COSTS?

A. Yes, Exhibit WCC-17 shows the cost calculations for Cass County and Peace Valley Telephone. The HAI model estimates that $104,400 of transmission

equipment is required at each switch to multiplex and add / drop trunks, special access and other circuits to the interoffice ring for transport to another network location. In the case of Peace Valley this would be $104,400 of transmission equipment **_____ _____**.

For one of Cass County's central offices, HAI 5.0a adds an additional $15,000 for an optical regenerator, because it calculated 40 miles of fiber cable from the Creighton office (CGTNMOXA) to the nearest Southwestern Bell office. **_____ _____ _____** In the case of Peace Valley, the HAI model adds $60,000 of regenerator costs (4 regenerators X $15,000 each), because it assumes Peace Valley has 172 miles of cable to the nearest BOC wire center – when, in fact, **_____ _____**.

Q. IS IT POSSIBLE TO CORRECT THE TRANSPORT TRANSMISSION EQUIPMENT COSTS?

A. Yes, but it requires information that is not available in the HAI model. In its data request No. 34, T-Mobile requested information on the total demand for transport for each interoffice link in a Petitioner's network, the transport system size (say, OC-3 vs. DS3 point-to-point) and the system capacity. Data request No. 33 asked for total demand – actual and modeled by HAI 5.0a – for each interoffice link. The assumption was that HAI 5.0a might be modeling each Petitioner's network in a way that bears some resemblance to reality; this, of course, turns out to not be

the case. Therefore, to correct the Petitioners' transmission equipment costs, this type of information is needed either for the Petitioners' existing networks, if they consider them to be representative of their forward-looking design, or for a forward-looking design. In addition, current transmission equipment costs based on currently available technology and vendor pricing are needed to estimate plant investment.

Q. CAN YOU SHOW HOW THE TRANSPORT TRANSMISSION EQUIPMENT COSTS WOULD BE CORRECTED?

A. Yes, Exhibit WCC-18 shows Cass County's cost calculations with several obvious corrections based on the issues that I have described for transmission equipment. I have removed the OC-48 add / drop multiplexer and used only the OC-3 ADM / terminal multiplexer. **_____ _____** I also removed the regenerator investment, since it does not apply. The interoffice trunk quantities from the cost corrections for common transport cable are used (Exhibit WCC-16). And I reflected the number of nodes that mobile-to-land traffic would pass through depending on the destination switch. The resulting transmission equipment cost is $0.0017 or about 70% of the value in Cass County's cost study. The cost correction, though, would be much greater for smaller ILECs, where the oversized transmission equipment causes their costs to be substantially overstated.

Q. HAVE YOU MADE SIMILAR CORRECTIONS TO THE TRANSMISSION EQUIPMENT COSTS OF OTHER PETITIONERS?

A. As in the case of common transport cable, I corrected the costs of twenty of the Petitioners, where I had enough information about their networks and demand to do so. Corrected transmission equipment costs for these companies were combined with the corrected cable costs to produce the common transport costs per minute for these twenty companies shown in Exhibit WCC-1.

Transport Issue No. 5: Unnecessary Inclusion of Dedicated Transport Costs

Q. WHY HAVE THE PETITIONERS INCLUDED DEDICATED TRANSPORT IN ADDITION TO COMMON TRANSPORT IN THEIR COST STUDIES?

A. They have not explained the reason for doing this. It makes no sense whatsoever. HAI 5.0a defines dedicated transport a "full-period, bandwidth-specific interoffice transmission path between LEC wire centers and an IXC POP (or other off-network location)." And, it defines common transport as a "switched trunk between two switching systems on which traffic is commingled to include LEC traffic as well as traffic to and from multiple IXCs." A mobile-to-land call cannot simultaneously pass over these two types of transport – it is one or the other. Likewise, a call would not go over one and then the other, because the HAI model assumes that the two types of transport are over the same cables and transmission equipment between the Petitioners' switches and the nearest Bell Operating Company switch. A call would have to pass through a fiber cable over common transport, and then turn around a pass through the same cable over dedicated transport. It is pure fiction and an intentional duplication of costs.

Q. DOES THE METHOD YOU HAVE USED TO CORRECT CASS COUNTY'S COMMON TRANSPORT COSTS MAKE THIS ISSUE IRRELEVANT?

A. Yes, Exhibits WCC-17 and WCC-18 model the actual interoffice network of Cass County and determine the cost per minute of transport to each of the Company's switches over common transport trunks. It is not necessary to add any additional costs for dedicated transport.

Q. WHAT IS YOUR RECOMMENDATION WITH RESPECT TO THIS ISSUE?

A. Dedicated transport costs should be excluded entirely from all Petitioner transport and termination costs.

Correction of the Petitioner Cost Studies

Q. PLEASE SUMMARIZE THE CORRECTIONS THAT ARE NECESSARY TO PROPERLY COMPUTE THE PETITIONERS' FORWARD-LOOKING ECONOMIC COSTS FOR COMMON TRANSPORT?

A. First, common transport cable costs must be corrected for proper cable length and cable sizes. Cable sharing should be recognized through the proper calculation of forward-looking unit costs. Transmission equipment then should be sized according to each Petitioner's network requirements. Finally, dedicated transport costs should be excluded entirely. I have made these corrections for twenty companies, and I will attempt to correct the common transport costs of the remaining Petitioners as the necessary information is made available.

ANALYSIS OF ISUP SIGNALING COSTS

Description of Costs

Q. WHAT ARE ISUP SIGNALING COSTS?

A. Carriers use signaling to set-up and take-down interoffice calls, whether the call remains on their network or is destined to the network of another carrier. Most carriers use a Signaling System 7 (SS7) network that is separate from the network used in transporting voice or data communications. An SS7 network may be used, for example, to retrieve information from a database (and these are known as TCAP messages). Of relevance to this proceeding are ISUP messages over an SS7 network. ISUP is an acronym meaning ISDN User Part. ISUP signaling refers to the exchange of short data messages between Petitioner end offices and computers used to set-up interoffice telephone calls. The computer is referred to as a Signal Transfer Point (STP) and is part of the SS7 network. ISUP signaling costs are the capital costs and operating expenses associated with plant used to handle these messages.

Q. EARLIER YOU SAID THAT ISUP SIGNALING COSTS ARE SMALL. IF SO, WHY ARE YOU COMMENTING ON THE SIGNALING COSTS OF THE PETITIONERS?

A. Some of the Petitioners have estimated very high signaling costs. As I discuss below, HAI 5.0a's cost methodology for small ILECs is wrong, and the costs should be corrected.

Q. WHAT ARE THE PETITIONER'S ISUP SIGNALING COSTS?

A. Exhibit WCC-19 shows the signaling cost per minute of use for each Petitioner. The ILEC costs range from $0.0007 per minute for Fidelity Telephone Company to $0.0193 per minute for Iamo Telephone Company.

Q. WHAT ARE THE MAIN COMPONENTS OF THESE COSTS?

A. ISUP signaling costs consist of two parts - the cost of the data link or transport between the Petitioner's end office and the STP, and the cost of the STP. Exhibit WCC–20 gives the breakdown of each ILEC's signaling cost between these two components. The link cost is the larger part of the total, representing on average 90% of ISUP signaling costs. I focused on link costs for my analysis.

Signaling Issue No. 1: Overstatement of Signaling Link Costs

Q. WHY ARE THE SIGNALING LINK COSTS COMPUTED BY HAI 5.0a WRONG?

A. The HAI model generally overstates signaling link costs. It does this in two ways.

First, the model assumes there is a pair of signaling links for every Petitioner switch, whether it is a standalone, host or remote switch. The Petitioners do not have signaling link pairs for all their switches. For example, the HAI model assumes Fidelity Telephone has a pair of signaling links for each of eight switches, or a total of 16 links.[30] In reality, based on its response to T-Mobile's

[30] The HAI model indicates Fidelity Telephone has eight end office switches. **___ ** SS7 links would not be required for DLC systems or the remotes.

data request, **_____

_____**.

Secondly, the HAI model assumes that the signaling links run over the same, fictitious interoffice cable routes as common transport; i.e., a cable route from each Petitioner switch to the nearest BOC switch. Consequently, the Petitioner signaling link costs suffer from the effects of Transport Issue No. 1. They also suffer from Transport Issues No. 2 and 3.

Correction of Petitioner Cost Studies

Q. HOW DID YOU CORRECT THE PETITIONER ISUP SIGNALING COSTS FOR THESE ERRORS?

A. I used the actual, current costs the Petitioners are paying for SS7 interconnection links, which were provided in response to T-Mobile data request No. 41. **_____

_____

_____

_____

_____** This is the amount paid by ILECs using the Missouri Network Alliance as their service provider.

Then, I simply divided the monthly SS7 interconnection service charge by the HAI model estimate of ISUP and TCAP messages (on a monthly basis).[31] The resulting cost per message was adjusted to compute the corrected link cost per

[31] TCAP stands for "Transaction Capabilities Application Par." TCAP messages are requests for and responses to requests for database lookups made by ILEC switches.

minute, using the same values as in HAI 5.0a for messages per call attempt, call completion ratio and minutes per call. I did not modify the STP costs per minute of the Petitioners. The graph in Exhibit WCC-21 shows the corrected ISUP signaling costs per minute. The corrected ILEC signaling costs range from **_____ _____**. The larger companies (with more than 20 million signaling messages per year) have signaling costs of $0.001 per minute or less.

Q. DO YOU RECOMMEND FURTHER ADJUSTMENTS IN THE ISUP SIGNALING COSTS?

A. No, I will accept that the "least cost, most efficient" means for Peace Valley Telephone to reach STPs is to **_____ _____**.[32] However, if there is a lower cost alternative, the TELRIC methodology requires that its forward-looking economic costs reflect this alternative. At this point, I have no way of knowing what other alternatives the Company might have. The same comments apply to the other Petitioners with relatively high signaling link costs per minute.

CONCLUSIONS AND RECOMMENDATIONS

Q. HAVING ANALYZED THE PETITIONER COST STUDIES PRODUCED USING THE HAI 5.0a MODEL WHAT IS YOUR OVERALL IMPRESSION?

[32] **_____ _____ _____ _____.**

A. HAI 5.0a as used by the Petitioners utterly fails to accurately model the transport and termination costs of small ILECs in Missouri. Its results bear no relationship to the real world network architectures of the Petitioners; its cost data, particularly for switching, are outdated; and, it makes key assumptions, such the percentage of end office switching that is usage sensitive, that are no longer valid. Even the developers of the HAI model have recognized the need to change the model with respect to the usage-sensitive portion of switching. The current HAI model assumes that no portion of switching cost is usage-sensitive.

Q. HAS THE COST EXPERT FOR THE PETITIONERS RECOGNIZED THESE ISSUES IN HAI 5.0a?

A. Yes, in his direct testimony in the *Alma* arbitration, Mr. Schoonmaker expressed "concerns about the validity of the results of the HAI Model I am presenting." Schoonmaker Direct Testimony, IO-2005-0468, at 7 (July 21, 2005). He went on to describe his "concerns" about "a lack of sufficient time and resources to fully explore all the proposed default inputs" and that the model's default values "may not reflect the economic costs of the companies in all respects." *Id.* at 7-8. He noted the "broad inputs and generalized formulas for all companies, rather than specific inputs for individual companies, [which] tend to mask unique circumstances of individual companies, which cause substantial differences in costs in the real world." *Id.* at 8. Perhaps the most prescient of his observations was the following:

> [The] results from the model are likely to be less accurate for smaller geographic areas, such as individual exchanges or small companies with a few exchanges, than they are for large

companies, such as SWBT and Verizon who have hundreds of exchanges. *Id.* at 8.

The Commission must understand that HAI 5.0a is inaccurate for all the Petitioners in this arbitration and therefore cannot be used to determine forward-looking economic costs as the basis of reciprocal compensation rates for small ILECs in Missouri.

Q. YET, MR. SCHOONMAKER SUPPORTED THE COSTS DEVELOPED BY HAI 5.0a, DID HE NOT?

A. Mr. Schoonmaker gave the following rationale for supporting the HAI model results:

> Given the requirements in the FCC rules to develop forward-looking costs and the current state of tools that are available to develop such cost results at a reasonable cost to the companies, I believe the costs developed are the best available forward-looking costs of these companies for meeting the requirements of the FCC rules. However, I specifically have concerns about giving too much reliance to individual company results when those results reflect a single exchange or only a few exchanges. While individual company results have been developed for each of the Petitioners, I believe it is more appropriate to use an average of the companies as a proxy for each of the individual companies rather than using the individual company rates themselves. Schoonmaker Direct, IO-2005-0468, at 9.

Q. DO YOU AGREE WITH HIS RATIONALE?

A. Absolutely not. I have shown in my testimony for Cass County Telephone that it is not difficult or necessarily costly to compute transport and termination costs that comply with the FCC rules. Much of the complexity of the HAI model is in developing loop costs where customer locations and feeder and distribution cable design and costing are very involved. Reciprocal compensation (or recovery of transport and termination costs) does not involve loop costs, so a tool as complex

as HAI 5.0a, even if it was not as flawed as it is, is not necessary. The HAI model also is complex, because it models Bell Operating Company and large Independent company networks involving hundreds of switches and complex interoffice networks. The networks of the Petitioners are much simpler. Again, there is no need for the complexity of the HAI model.

I believe it is very practical for the Petitioners to determine forward-looking economic costs using simple methods, such as those I employed for Cass County. I already have computed corrected ISUP Signaling costs using the actual rates the Petitioners are paying for SS7 network connection. If the Commission adopts the position taken by the FCC and other state commissions regarding usage-sensitive switching costs, I have computed a cost of $0.0012 per minute for end office switching. And, I have estimated common transport for twenty of twenty-seven petitioners. The results of these corrections are shown in Exhibit WCC-1 and the graph I presented early in my testimony.

In short, we are very close to having reasonable forward-looking economic costs for the Petitioners. There is no need to try to "fix" the HAI model.

Q. IS MR. SCHOONMAKER CORRECT THAT AVERAGING THE PETITIONER COST RESULTS REDUCES THE CHANCES FOR ERROR?

A. With all due respect, he is wrong about this. As I have shown, HAI 5.0a systematically overstates interoffice cable lengths and cable sizes. It does not recognize the sharing of interoffice cables. Each Petitioner's end office switching

cost is based on an inflated switching investment per line that Petitioners attempt to justify by an erroneous comparison of embedded investment to HAI model results. ISUP signaling costs suffer from the same interoffice cable costing errors. And dedicated transport costs should not be included for any of the companies. All of these errors result in overstating transport and termination costs and no amount of averaging will eliminate the errors.

Q. What is your overall conclusion concerning Petitioners' transport and termination costs?

A. When properly corrected through application of appropriate TELRIC principles, the costs incurred by the Petitioners are less than the 3.5 cent per minute rate which they propose. Under governing FCC rules the Petitioners have failed to prove that their rate proposal is cost-justified. In my testimony I provide corrections to the Petitioners' costs, using appropriate governing TELRIC principles, and provide a chart containing those costs for each Petitioner. See Exhibit 1. T-Mobile and Cingular propose that the Arbitrator and the Commission approve interMTA rates for each Petitioner on an individual basis (not a single collective rate, as the Petitioners propose), and that those rates be set at levels no higher than the costs set forth in Exhibit 1. For the seven Petitioners for which I cannot provide accurately redetermined costs, due to their failure to provide necessary information, their proposed rate of 3.5 cents is not supported by their costs, and for those companies the Arbitrator and the Commission should determine that traffic will be exchanged on a bill-and-keep basis unless and until

they respond fully to the T-Mobile data requests. If they respond promptly, I may be able to propose rates for those companies in my rebuttal testimony.

Q. WILL YOU CONTINUE TO ATTEMPT TO OBTAIN PETITIONER INFORMATION NECESSARY TO CORRECT TRANSPORT COSTS FOR THE REMAINING PETITIONERS?

A. Yes, I plan to make every attempt to obtain this information and will either provide a late exhibit for addition to my direct testimony, or I will include the corrected transport costs in rebuttal testimony.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Petition for Arbitration of Unresolved Issues in a Section 251(b)(5) Agreement with T-Mobile USA, Inc.	)))))	Case No. TO-2006-0147, et al Consolidated

AFFIDAVIT OF W. CRAIG CONWELL

STATE OF SOUTH CAROLINA

COUNTY OF GREENVILLE

W. Craig Conwell, appearing before me, affirms and states:

1. My name is W. Craig Conwell. I am an independent telecommunications consultant.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of T-Mobile USA, Inc. and Cingular Wireless, having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby affirm that my answers contained in the attached testimony to the questions propounded, including any attachment thereto, are true and accurate to the best of my knowledge, information and belief.

W. Craig Conwell

W. Craig Conwell

Subscribed and sworn to before me in the 5th day of Jan, 2006.

Notary Public

My Commission Expires:

3-24-09

Exhibit WCC–1

Corrected Transport and Termination Costs

	Corrected Cost Studies				
Company	End Office Switching *	ISUP Signaling	Dedicated Transport	Common Transport	Total
BPS Tel. Co.	$ 0.00118	$ 0.00133	$ -	$ 0.00142	$ 0.0039
Cass County Tel. Co.	$ 0.00118	$ 0.00069	$ -	$ 0.00545	$ 0.0073
Citizens Tel. Co. - MO	$ 0.00117	$ 0.00100	$ -	$ 0.00244	$ 0.0046
Craw-Kan Tel. Coop. - MO	$ 0.00119	$ 0.00157	$ -	NA	NA
Ellington Tel. Co.	$ 0.00118	$ 0.00225	$ -	$ 0.00568	$ 0.0091
Farber Tel. Co.	$ 0.00118	$ 0.00209	$ -	$ 0.00413	$ 0.0074
Fidelity Tel. Co.	$ 0.00117	$ 0.00039	$ -	$ 0.00545	$ 0.0070
Granby Tel. Co. - MO	$ 0.00118	$ 0.00136	$ -	$ -	$ 0.0025
Grand River Mutual Tel. Co. - MO	$ 0.00118	$ 0.00046	$ -	$ 0.00545	$ 0.0071
Green Hills Tel. Co.	$ 0.00119	$ 0.00108	$ -	$ 0.00545	$ 0.0077
Holway Tel. Co.	$ 0.00119	$ 0.00558	$ -	NA	NA
Iamo Tel. Co. - MO	$ 0.00119	$ 0.00287	$ -	NA	NA
Kingdom Tel. Co.	$ 0.00119	$ 0.00092	$ -	$ 0.00568	$ 0.0078
KLM Tel. Co.	$ 0.00118	$ 0.00269	$ -	$ 0.00640	$ 0.0103
Lathrop Tel. Co.	$ 0.00119	$ 0.00252	$ -	$ 0.00091	$ 0.0046
Le-Ru Tel. Co.	$ 0.00120	$ 0.00608	$ -	$ 0.00740	$ 0.0147
Mark Twain Rural Tel. Co.	$ 0.00119	$ 0.00099	$ -	$ 0.00545	$ 0.0076
McDonald County Tel. Co.	$ 0.00117	$ 0.00118	$ -	$ 0.00740	$ 0.0097
Miller Tel. Co. - MO	$ 0.00119	$ 0.00307	$ -	$ 0.00413	$ 0.0084
New Florence Tel. Co.	$ 0.00116	$ 0.00680	$ -	$ 0.00413	$ 0.0121
Oregon Farmers Mutual Tel. Co.	$ 0.00117	$ 0.00279	$ -	$ 0.00413	$ 0.0081
Peace Valley Tel. Co.	$ 0.00120	$ 0.00929	$ -	$ 0.00413	$ 0.0146
Rock Port Tel. Co.	$ 0.00116	$ 0.00195	$ -	NA	NA
Steelville Tel. Exch. Inc.	$ 0.00117	$ 0.00145	$ -	$ 0.00545	$ 0.0081
Goodman Tel. Co.	$ 0.00119	$ 0.00199	$ -	NA	NA
Ozark Tel. Co.	$ 0.00118	$ 0.00199	$ -	NA	NA
Seneca Tel. Co.	$ 0.00118	$ 0.00199	$ -	NA	NA

* Note: End office switching costs reflect today's usage-sensitive portion of switching plant, which is limited to switch trunk equipment connecting interoffice trunks.

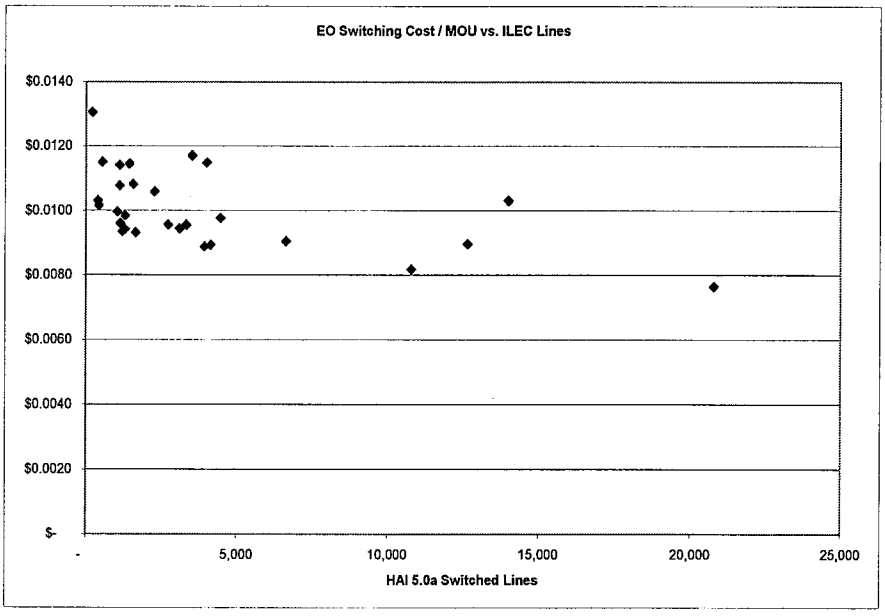
NA: Not available; insufficient Petitioner information available to produce corrected common transport costs.

Exhibit WCC-2

End Office Switching Costs

HAI 5.0a Output - MO ILECs

Company	EO Switching Cost / Minute	Minutes of Use	Switched Lines	Percent of Total MOU
BPS Tel. Co.	$ 0.0096	38,491,741	3,335	3%
Cass County Tel. Co.	$ 0.0091	76,557,012	6,633	6%
Citizens Tel. Co. - MO	$ 0.0089	45,762,507	3,943	4%
Craw-Kan Tel. Coop. - MO	$ 0.0106	26,055,608	2,284	2%
Ellington Tel. Co.	$ 0.0108	18,223,586	1,579	1%
Farber Tel. Co.	$ 0.0131	2,427,510	211	0%
Fidelity Com. Svc. I	$ 0.0077	261,807,131	20,794	20%
Fidelity Com. Svc. II	$ 0.0082	128,570,072	10,792	10%
Fidelity Tel. Co.	$ 0.0090	146,978,886	12,667	11%
Granby Tel. Co. - MO	$ 0.0096	31,461,510	2,743	2%
Grand River Mutual Tel. Co. - MO	$ 0.0103	161,848,746	14,008	12%
Green Hills Telecom. Svc.	$ 0.0094	14,325,195	1,222	1%
Green Hills Tel. Co.	$ 0.0117	40,241,177	3,529	3%
Holway Tel. Co.	$ 0.0115	6,305,165	552	0%
Iamo Tel. Co. - MO	$ 0.0114	12,802,483	1,118	1%
Kingdom Tel. Co.	$ 0.0098	51,088,930	4,461	4%
KLM Tel. Co.	$ 0.0115	16,619,991	1,448	1%
Lathrop Tel. Co.	$ 0.0099	14,893,363	1,303	1%
Le-Ru Tel. Co.	$ 0.0094	14,824,245	1,306	1%
Mark Twain Com. Co.	$ 0.0108	12,602,724	1,124	1%
Mark Twain Rural Tel. Co.	$ 0.0115	45,634,646	4,013	3%
McDonald County Tel. Co.	$ 0.0094	36,227,359	3,115	3%
Miller Tel. Co. - MO	$ 0.0100	11,937,083	1,048	1%
New Florence Tel. Co.	$ 0.0102	5,135,648	439	0%
Oregon Farmers Mutual Tel. Co.	$ 0.0096	13,263,512	1,143	1%
Peace Valley Tel. Co.	$ 0.0103	4,548,122	402	0%
Rock Port Tel. Co.	$ 0.0093	19,545,162	1,667	1%
Steelville Tel. Exch. Inc.	$ 0.0089	47,865,151	4,139	4%
Total	$ 0.0092	1,306,044,265	111,018	100%
Goodman Tel. Co.	$ 0.0099	19,402,087	1,706	
Ozark Tel. Co.	$ 0.0094	22,736,454	1,970	
Seneca Tel. Co.	$ 0.0089	32,872,951	2,857	



	A	B	C	D	E	F	G	H	I
1	**Transport and Termination TELRIC**								
2									
3	**End Office Switching**								
4									
5	**Company:**	**Cass County Tel Co**							
6									
7		Switch - CLLI Code							
8		CGTNMOXA	CLEVMOXA	DRXLMOXA	ELYNMOXA	GRCYMOXA	PCLRMOXA	Total - Original	
9	**Plant investment**								
10	*End office switching*								
11	Constant EO switching investment term, small ICO	$ 520.14	$ 520.14	$ 520.14	$ 520.14	$ 520.14	$ 520.14	$ 520.14	
12									
13	Multiplicative EO switching investment term	-14.922	-14.922	-14.922	-14.922	-14.922	-14.922	-14.922	
14	Switched lines	437	619	864	517	1,396	2,800	6,633	
15	Switch port administrative fill	98%	98%	98%	98%	98%	98%	98%	
16	Equipped line capacity	446	631	882	528	1,424	2,857	6,768	
17	Switch size adjustment	$ (91.02)	$ (96.22)	$ (101.20)	$ (93.55)	$ (108.35)	$ (118.74)		
18									
19	Trunk port investment / end	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
20	Lines / trunk port	6	6	6	6	6	6	6	
21	Trunk port investment adjustment	$ (16.67)	$ (16.67)	$ (16.67)	$ (16.67)	$ (16.67)	$ (16.67)	$ (16.67)	
22									
23	Analog line circuit offset for DLC lines, per line	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	
24	Total DLC lines	442	642	873	522	1,443	2,913	6,835	
25	Total lines	442	642	873	522	1,443	2,913	6,835	
26	Percent DLC lines	100%	100%	100%	100%	100%	100%	100%	
27	DLC line adjustment	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	
28									
29	SS7 link termination investment, both ends	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	
30	Link termination investment at switch	$ 450	$ 450	$ 450	$ 450	$ 450	$ 450	$ 450	
31	SS7 links / line	0.0045	0.0031	0.0023	0.0038	0.0014	0.0007		
32	SS7 link investment / line	$ 2.04	$ 1.40	$ 1.03	$ 1.72	$ 0.62	$ 0.31		
33									
34	Trunk ports / line								
35	Local direct trunks (X 2)	0.0272	0.0249	0.0206	0.0268	0.0166	0.0137		
36	Local tandem trunks	0.0045	0.0031	0.0023	0.0038	0.0021	0.0014		
37	Operator services trunks	0.0091	0.0078	0.0069	0.0096	0.0055	0.0045		
38	Direct routed access trunks	0.0430	0.0389	0.0344	0.0402	0.0319	0.0306		
39	Tandem routed access trunks	0.0408	0.0374	0.0332	0.0383	0.0312	0.0302		
40	IntraLATA direct trunks (X 2)	0.0045	0.0031	0.0023	0.0038	0.0014	0.0007		
41	IntraLATA tandem trunks	0.0181	0.0171	0.0149	0.0172	0.0125	0.0110		
42	Total ports / line	0.1472	0.1323	0.1145	0.1398	0.1012	0.0920		
43									
44	Total lines / wirecenter	442	642	873	522	1,443	2,913	6,835	
45	Total switched lines	437	619	864	517	1,396	2,800	6,633	
46	Trunk port investment / end	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
47	Trunk port investment / line	$ 14.88	$ 13.74	$ 11.57	$ 14.11	$ 10.46	$ 9.57		
48									
49	Subtotal - investment / line	$ 424.38	$ 417.39	$ 409.88	$ 420.76	$ 401.21	$ 389.61		
50									

	A	B	C	D	E	F	G	H	I
1	**Transport and Termination TELRIC**								
2									
3	**End Office Switching**								
4									
5	**Company:**	**Cass County Tel Co**							
6									
7		Switch - CLLI Code							
8		CGTNMOXA	CLEVMOXA	DRXLMOXA	ELYNMOXA	GRCYMOXA	PCLRMOXA	Total - Original	
49	Subtotal - investment / line	$ 424.38	$ 417.39	$ 409.88	$ 420.76	$ 401.21	$ 389.61		
50									
51	Switch port administrative fill	98%	98%	98%	98%	98%	98%	98%	
52	Switch installation multiplier	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
53	End office switching investment / line	$ 476.34	$ 468.50	$ 460.06	$ 472.28	$ 450.33	$ 437.32	$ 451.22	
54									
55	End office switching investment	$ 208,024	$ 289,922	$ 397,566	$ 244,364	$ 628,485	$ 1,224,612	$ 2,992,974	
56									
57	*MDF / protector*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
58									
59	*Wirecenter*								
60	Square feet of floor space / switch	500	500	500	500	1,000	1,000		
61	Building construction cost / sq. ft.	$ 75	$ 75	$ 75	$ 75	$ 85	$ 85		
62	Building investment	$ 37,500	$ 37,500	$ 37,500	$ 37,500	$ 85,000	$ 85,000		
63									
64	Power plant	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 10,000	$ 10,000		
65	Wirecenter investment	$ 42,500	$ 42,500	$ 42,500	$ 42,500	$ 95,000	$ 95,000	$ 360,000	
66									
67	*Land*								
68	Square feet of land / switch	1,000	1,000	1,000	1,000	2,000	2,000		
69	Land cost / sq. ft.	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 7.50	$ 7.50		
70	Land investment	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 15,000	$ 15,000	$ 50,000	
71									
72	Total plant investment	$ 255,524	$ 337,422	$ 445,066	$ 291,864	$ 738,485	$ 1,334,612	$ 3,402,974	
73									
74	**Annual costs**								
75	*Capital costs*								
76	Capital cost factors								
77	Digital switching	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	
78	Buildings	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	
79	Land	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	
80	Annual capital costs								
81	End office switching	$ 33,662	$ 46,914	$ 64,333	$ 39,542	$ 101,700	$ 198,163	$ 484,314	
82	MDF / protector	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
83	Wirecenter	$ 6,420	$ 6,420	$ 6,420	$ 6,420	$ 14,350	$ 14,350	$ 54,379	
84	Land	$ 841	$ 841	$ 841	$ 841	$ 2,524	$ 2,524	$ 8,413	
85	Total	$ 40,923	$ 54,175	$ 71,594	$ 46,803	$ 118,574	$ 215,037	$ 547,106	
120									

Transport and Termination TELRIC

End Office Switching

Company: **Cass County Tel Co**

		Switch - CLLI Code						
		CGTNMOXA	CLEVMOXA	DRXLMOXA	ELYNMOXA	GRCYMOXA	PCLRMOXA	Total - Original
87	*Network expenses*							
88	Network expense factors							
89	Digital switching	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%
90	Land & buildings	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%
91	Annual network expenses							
92	End office switching	$ 9,881	$ 13,771	$ 18,884	$ 11,607	$ 29,853	$ 58,169	$ 142,166
93	MDF / protector	$ -	$ -	$ -	$ -	$ -	$ -	$ -
94	Wirecenter	$ 4,687	$ 4,687	$ 4,687	$ 4,687	$ 10,476	$ 10,476	$ 39,698
95	Land	$ -	$ -	$ -	$ -	$ -	$ -	$ -
96	Total	$ 14,568	$ 18,458	$ 23,571	$ 16,294	$ 40,329	$ 68,645	$ 181,864
97								
98	*Support expenses*							
99	Ratio of support expenses to direct expenses	22.3%	22.3%	22.3%	22.3%	22.3%	22.3%	22.3%
100	Direct expenses	$ 55,491	$ 72,633	$ 95,165	$ 63,097	$ 158,902	$ 283,682	$ 728,970
101	Total	$ 12,377	$ 16,201	$ 21,226	$ 14,074	$ 35,443	$ 63,275	$ 162,596
102								
103	Annual costs							$ 891,566
104								
105	Corporate overhead factor							10.4%
106	Annual costs w/ corporate overhead							$ 984,289
107								
108	Carrier-to-carrier customer service percentage							0.2%
109	Annual costs before uncollectibles							$ 986,061
110								
111	Uncollectibles percentage							0.4%
112	Total annual costs							$ 990,354
113								
114	End office non-port fraction							70%
115	Non-line port annual costs							$ 693,248
116								
117	Annual switched minutes							76,557,012
118	Cost / minute							$ 0.00906
119								
120								

Exhibit WCC-4

Missouri Small Companies
Comparison of Central Office Switching Investment
Actual Data to USF Models

		Actual 2003 COE Investment	HAI - Missouri Cost Runs	HAI - Default	% Diff HAI - Missouri Runs to Actual	% Diff HAI - Default to Actual
AllTel Missouri, Inc.	1	29,416,818	25,441,000	19,458,000	-13.52%	-33.85%
Alma Telephone Company	2	244,127	173,000	134,000	-29.14%	-45.11%
BPS Telephone Company	3	1,430,445	1,536,000	1,159,000	7.38%	-18.98%
Cass County Telephone Company	4	6,106,918	3,047,000	2,298,000	-50.11%	-62.37%
Chariton Valley Telephone Co	5	0	3,663,000	2,800,000	#DIV/0!	#DIV/0!
Choctaw Telephone Company	6	320,447	253,000	194,000	-21.05%	-39.46%
Citizens Telephone Company of MO	7	3,066,150	1,805,000	1,359,000	-41.13%	-55.68%
Craw Kan Telephone Coop., Inc.	8	12,178,306	1,114,000	857,000	-90.85%	-92.96%
Ellington Telephone Company	9	773,305	768,000	591,000	-0.69%	-23.57%
Farber Telephone Company	10	212,755	111,000	87,000	-47.83%	-59.11%
Fidelity Telephone Company	11	5,534,617	6,598,000	4,942,000	19.21%	-10.71%
Goodman Telephone Company, Inc.	12	589,186	795,000	603,000	34.93%	2.34%
Granby Telephone Company	13	2,598,904	1,258,000	947,000	-51.59%	-63.56%
Grand River Mutual Telephone Corporation	14	13,573,848	6,712,000	5,136,000	-50.55%	-62.16%
Green Hills Telephone Corporation	15	1,030,977	1,754,000	1,358,000	70.13%	31.72%
Holway Telephone Company	16	440,153	275,000	213,000	-37.52%	-51.61%
Iamo Telephone Company	17	2,567,649	554,000	429,000	-78.42%	-83.29%
Kingdom Telephone Company	18	3,842,062	2,111,000	1,608,000	-45.06%	-58.15%
KLM Telephone Company	19	810,051	698,000	535,000	-13.83%	-33.95%
Lathrop Telephone Company	20	959,356	617,000	470,000	-35.69%	-51.01%
Le-Rue Telephone Company	21	1,612,377	621,000	474,000	-61.49%	-70.60%
Mark Twain Rural Telephone Company	22	3,747,821	2,428,000	1,979,000	-35.22%	-47.20%
McDonald County Telephone Company	23	1,763,550	1,440,000	1,088,000	-18.35%	-38.31%
Mid-Missouri Telephone Co	24	1,413,149	1,771,000	1,368,000	25.32%	-3.19%
Millers Telephone Company	25	705,216	487,000	368,000	-30.94%	-47.82%
Mokan Dial Inc- Mo	26	2,319,485	344,000	262,000	-85.17%	-88.70%
New Florence Telephone Company	27	110,589	213,000	164,000	92.61%	48.30%
New London Telephone Company	28	702,420	439,000	333,000	-37.50%	-52.59%
Northeast Missouri Rural Tel Co	29	6,919,581	3,647,000	2,775,000	-47.29%	-59.90%
Orchard Farm Telephone Company	30	537,456	354,000	269,000	-34.13%	-49.95%
Oregon Farmers Mutual Tel. Co.	31	808,549	529,000	400,000	-34.57%	-50.53%
Ozark Telephone Company	32	719,687	918,000	695,000	27.56%	-3.43%
Peace Valley Telephone Company	33	765,229	196,000	151,000	-74.39%	-80.27%
Rock Port Telephone Company	34	1,206,103	768,000	580,000	-36.32%	-51.91%
Seneca Telephone Company	35	1,640,929	1,295,000	972,000	-21.08%	-40.77%
Steelville Telephone Exchange, Inc.	36	1,727,346	2,333,000	1,865,000	35.06%	7.97%
Stoutland Telephone Company	37	1,020,298	607,000	463,000	-40.51%	-54.62%
Total		113,415,859	74,010,000	56,584,000	-34.74%	-50.11%
Total Less CV, GH, Ckan, GRM, MoKan		84,313,243	60,423,000	46,171,000	-28.34%	-45.24%

The total used for comparison purposes exludes the following companies:
Chariton Valley - No actual investment because switch is leased
Green Hills - Remote switching unit investment is recorded as circuit equipment investment rather than COE switching
Craw-Kan - Actual data includes both Missouri and Kansas exchanges, HAI only includes Missouri exchanges.
Grand River Mutual - Actual data includes both Missouri and Iowa exchanges, HAI only includes Missouri exchanges.
MoKan - Actual data includes both Missouri and Kansas exchanges, HAI only includes Missouri exchanges.

Missouri Small Companies
Comparison of Central Office Switching Investment
Actual Data to USF Models

		Actual 2003 COE Investment	HAI - Missouri Cost Runs	HAI - Default	% Diff HAI - Missouri Runs to Actual	% Diff HAI - Default to Actual
BPS Telephone Company	3	$ 1,430,445	$ 1,536,000	$ 1,159,000	7%	-19%
Cass County Telephone Company	4	$ 6,106,918	$ 3,047,000	$ 2,298,000	-50%	-62%
Citizens Telephone Company of MO	7	$ 3,066,150	$ 1,805,000	$ 1,359,000	-41%	-56%
Ellington Telephone Company	9	$ 773,305	$ 768,000	$ 591,000	-1%	-24%
Farber Telephone Company	10	$ 212,755	$ 111,000	$ 87,000	-48%	-59%
Fidelity Telephone Company	11	$ 5,534,617	$ 6,598,000	$ 4,942,000	19%	-11%
Granby Telephone Company	13	$ 2,598,904	$ 1,258,000	$ 947,000	-52%	-64%
Holway Telephone Company	16	$ 440,153	$ 275,000	$ 213,000	-38%	-52%
Iamo Telephone Company	17	$ 2,567,649	$ 554,000	$ 429,000	-78%	-83%
Kingdom Telephone Company	18	$ 3,842,062	$ 2,111,000	$ 1,608,000	-45%	-58%
KLM Telephone Company	19	$ 810,051	$ 698,000	$ 535,000	-14%	-34%
Lathrop Telephone Company	20	$ 959,356	$ 617,000	$ 470,000	-36%	-51%
Le-Rue Telephone Company	21	$ 1,612,377	$ 621,000	$ 474,000	-61%	-71%
Mark Twain Rural Telephone Company	22	$ 3,747,821	$ 2,428,000	$ 1,979,000	-35%	-47%
McDonald County Telephone Company	23	$ 1,763,550	$ 1,440,000	$ 1,088,000	-18%	-38%
Millers Telephone Company	25	$ 705,216	$ 487,000	$ 368,000	-31%	-48%
New Florence Telephone Company	27	$ 110,589	$ 213,000	$ 164,000	93%	48%
Oregon Farmers Mutual Tel. Co.	31	$ 808,549	$ 529,000	$ 400,000	-35%	-51%
Peace Valley Telephone Company	33	$ 765,229	$ 196,000	$ 151,000	-74%	-80%
Rock Port Telephone Company	34	$ 1,206,103	$ 768,000	$ 580,000	-36%	-52%
Steelville Telephone Exchange, Inc.	36	$ 1,727,346	$ 2,333,000	$ 1,865,000	35%	8%
Total less Green Hills, Craw-Kan & Grand River		$ 40,789,145	$ 28,393,000	$ 21,707,000	-30%	-47%

EXHIBIT WCC-5 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

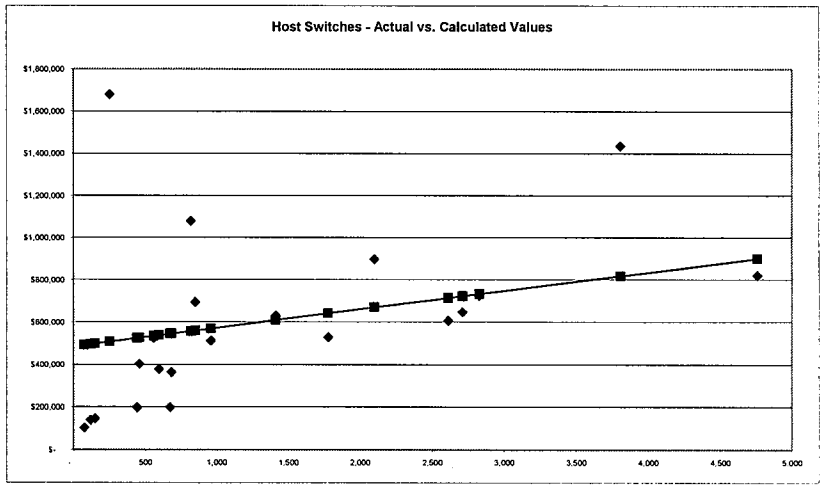
RUS Calculated vs. Actual Costs

Host Offices

Fixed cost (1999)	$	486,700
Cost / line (1999)	$	87

Number of Lines	Actual Cost per RUS Data	Additional Cost Items: MDF @ $12 / Line	Power	Engineering @ 8%	Actual, Plus Additions	Calculated Cost	Cost Differential	
75	$ 81,000	$ 900	$ 12,000	$ 7,512	$ 101,412	$ 493,225	79%	
120	$ 115,589	$ 1,440	$ 12,000	$ 10,322	$ 139,351	$ 497,140	72%	
150	$ 121,319	$ 1,800	$ 12,000	$ 10,810	$ 145,929	$ 499,750	71%	
253	$ 1,540,904	$ 3,036	$ 12,000	$ 124,475	$ 1,680,415	$ 508,711	-230%	*
443	$ 164,290	$ 5,316	$ 12,000	$ 14,528	$ 196,134	$ 525,241	63%	
460	$ 354,675	$ 5,520	$ 12,000	$ 29,776	$ 401,971	$ 526,720	24%	
560	$ 467,603	$ 6,720	$ 12,000	$ 38,906	$ 525,229	$ 535,420	2%	
598	$ 329,951	$ 7,176	$ 12,000	$ 27,930	$ 377,057	$ 538,726	30%	
674	$ 163,218	$ 8,088	$ 12,000	$ 14,664	$ 197,970	$ 545,338	64%	
684	$ 315,709	$ 8,208	$ 12,000	$ 26,873	$ 362,790	$ 546,208	34%	
820	$ 977,080	$ 9,840	$ 12,000	$ 79,914	$ 1,078,834	$ 558,040	-93%	*
850	$ 620,200	$ 10,200	$ 12,000	$ 51,392	$ 693,792	$ 560,650	-24%	**
960	$ 451,225	$ 11,520	$ 12,000	$ 37,980	$ 512,725	$ 570,220	10%	
1,412	$ 526,088	$ 16,944	$ 40,000	$ 46,643	$ 629,675	$ 609,544	-3%	
1,779	$ 429,417	$ 21,348	$ 40,000	$ 39,261	$ 530,026	$ 641,473	17%	
2,100	$ 766,053	$ 25,200	$ 40,000	$ 66,500	$ 897,753	$ 669,400	-34%	
2,615	$ 490,666	$ 31,380	$ 40,000	$ 44,964	$ 607,010	$ 714,205	15%	
2,714	$ 526,839	$ 32,568	$ 40,000	$ 47,953	$ 647,360	$ 722,818	10%	
2,830	$ 596,830	$ 33,960	$ 40,000	$ 53,663	$ 724,453	$ 732,910	1%	
3,810	$ 1,243,673	$ 45,720	$ 40,000	$ 106,351	$ 1,435,744	$ 818,170	-75%	*
4,760	$ 663,650	$ 57,120	$ 40,000	$ 60,862	$ 821,632	$ 900,820	9%	

* Hosts with large numbers of subtending remotes (10, 13 and 10 remotes / host, respectively).
** Host with large expenditure for ISDN.



RUS Calculated vs. Actual Costs

Remote Offices

Fixed cost (1999)	$ 161,800
Cost / line (1999)	$ 87

			Additional Cost Items						
Number of Lines	Actual Cost per RUS Data	MDF @ $12 / Line	Power	Remote to Host Connection	Engineering @ 8%	Actual, Plus Additions	Calculated Cost	Cost Differential
75	$ 80,762	$ 900	$ 12,000	$ 27,598	$ 9,701	$ 130,961	$ 168,325	22%
120	$ 46,328	$ 1,440	$ 12,000	$ 27,598	$ 6,989	$ 94,355	$ 172,240	45%
151	$ 72,413	$ 1,812	$ 12,000	$ 27,598	$ 9,106	$ 122,929	$ 174,937	30%
250	$ 109,381	$ 3,000	$ 12,000	$ 27,598	$ 12,158	$ 164,137	$ 183,550	11%
440	$ 60,559	$ 5,280	$ 12,000	$ 27,598	$ 8,435	$ 113,872	$ 200,080	43%
460	$ 98,249	$ 5,520	$ 12,000	$ 27,598	$ 11,469	$ 154,836	$ 201,820	23%
578	$ 88,733	$ 6,936	$ 12,000	$ 27,598	$ 10,821	$ 146,088	$ 212,086	31%
600	$ 104,276	$ 7,200	$ 12,000	$ 27,598	$ 12,086	$ 163,160	$ 214,000	24%
680	$ 181,249	$ 8,160	$ 12,000	$ 27,598	$ 18,321	$ 247,328	$ 220,960	-12%
688	$ 256,750	$ 8,256	$ 12,000	$ 27,598	$ 24,368	$ 328,972	$ 221,656	-48%
810	$ 296,970	$ 9,720	$ 12,000	$ 27,598	$ 27,703	$ 373,991	$ 232,270	-61%
865	$ 117,218	$ 10,380	$ 12,000	$ 27,598	$ 13,376	$ 180,572	$ 237,055	24%
960	$ 176,249	$ 11,520	$ 12,000	$ 27,598	$ 18,189	$ 245,556	$ 245,320	0%
1,864	$ 117,218	$ 22,368	$ 40,000	$ 27,598	$ 16,575	$ 223,759	$ 323,968	31%
1,880	$ 229,663	$ 22,560	$ 40,000	$ 27,598	$ 25,586	$ 345,407	$ 325,360	-6%
2,510	$ 273,000	$ 30,120	$ 40,000	$ 27,598	$ 29,657	$ 400,375	$ 380,170	-5%
2,740	$ 281,600	$ 32,880	$ 40,000	$ 27,598	$ 30,566	$ 412,644	$ 400,180	-3%

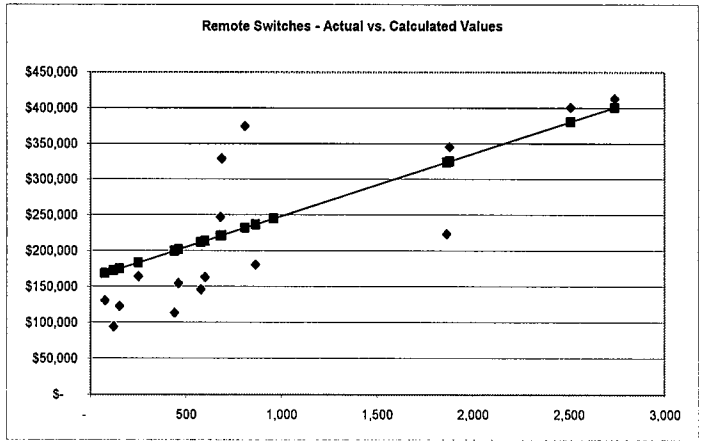


EXHIBIT WCC-7 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

EXHIBIT WCC-7 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

Exhibit WCC-8

EXHIBIT WCC-8 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

Exhibit WCC-9

EXHIBIT WCC-9 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

Exhibit WCC-10

Common Transport Costs

HAI 5.0a Output - MO ILECs

Company	Common Transport Cost / MOU	Minutes of Use	Percent of Total MOU
BPS Tel. Co.	$ 0.0106	16,681,429	3%
Cass County Tel. Co.	$ 0.0163	33,177,848	6%
Citizens Tel. Co. - MO	$ 0.0181	19,832,693	4%
Craw-Kan Tel. Coop. - MO	$ 0.0626	11,291,890	2%
Ellington Tel. Co.	$ 0.1478	7,897,294	1%
Farber Tel. Co.	$ 0.1147	1,051,771	0%
Fidelity Com. Svc. I	$ 0.0052	113,462,832	20%
Fidelity Com. Svc. II	$ 0.0086	55,719,388	10%
Fidelity Tel. Co.	$ 0.0099	63,698,099	11%
Granby Tel. Co. - MO	$ 0.0099	13,634,729	2%
Grand River Mutual Tel. Co. - MO	$ 0.0695	70,142,418	12%
Green Hills Telecom. Svc.	$ 0.0305	6,208,030	1%
Green Hills Tel. Co.	$ 0.0628	17,439,584	3%
Holway Tel. Co.	$ 0.1596	2,731,987	0%
Iamo Tel. Co. - MO	$ 0.1876	5,547,427	1%
Kingdom Tel. Co.	$ 0.0297	22,140,359	4%
KLM Tel. Co.	$ 0.0564	7,202,482	1%
Lathrop Tel. Co.	$ 0.0204	6,454,377	1%
Le-Ru Tel. Co.	$ 0.0392	6,424,217	1%
Mark Twain Com. Co.	$ 0.0795	5,460,951	1%
Mark Twain Rural Tel. Co.	$ 0.0397	19,776,407	3%
McDonald County Tel. Co.	$ 0.0290	15,700,051	3%
Miller Tel. Co. - MO	$ 0.0226	5,173,352	1%
New Florence Tel. Co.	$ 0.0212	2,225,208	0%
Oregon Farmers Mutual Tel. Co.	$ 0.0258	5,747,516	1%
Peace Valley Tel. Co.	$ 0.2716	1,970,808	0%
Rock Port Tel. Co.	$ 0.0850	8,470,425	1%
Steelville Tel. Exch. Inc.	$ 0.0117	20,743,692	4%
Total	$ 0.0309	566,007,264	100%
Goodman Tel. Co.	$ 0.0280	8,408,092	
Ozark Tel. Co.	$ 0.0327	9,853,014	
Seneca Tel. Co.	$ 0.0200	14,246,088	

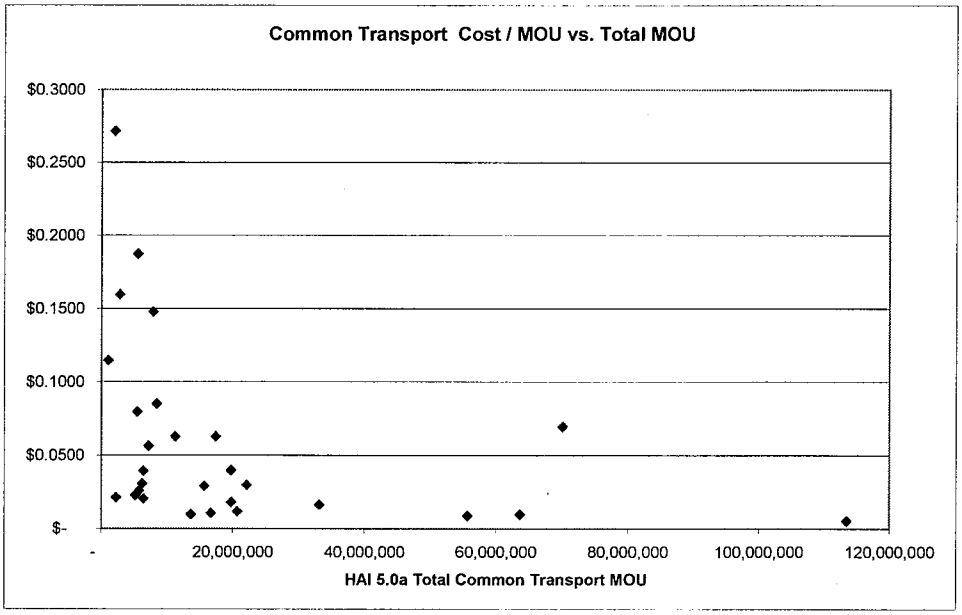


Exhibit WCC-11

Common Transport Costs

HAI 5.0a Output - MO ILECs

Company	Fiber Cost / MOU	Transmission Equipment Cost / MOU	Total Cost / MOU	Transport % of Total
BPS Tel. Co.	$ 0.0081	$ 0.0025	$ 0.0106	76%
Cass County Tel. Co.	$ 0.0138	$ 0.0025	$ 0.0163	84%
Citizens Tel. Co. - MO	$ 0.0159	$ 0.0022	$ 0.0181	88%
Craw-Kan Tel. Coop. - MO	$ 0.0550	$ 0.0076	$ 0.0626	88%
Ellington Tel. Co.	$ 0.1383	$ 0.0095	$ 0.1478	94%
Farber Tel. Co.	$ 0.1028	$ 0.0118	$ 0.1147	90%
Fidelity Com. Svc. I	$ 0.0045	$ 0.0007	$ 0.0052	86%
Fidelity Com. Svc. II	$ 0.0076	$ 0.0010	$ 0.0086	89%
Fidelity Tel. Co.	$ 0.0080	$ 0.0018	$ 0.0099	81%
Granby Tel. Co. - MO	$ 0.0078	$ 0.0021	$ 0.0099	79%
Grand River Mutual Tel. Co. - MO	$ 0.0627	$ 0.0069	$ 0.0695	90%
Green Hills Telecom. Svc.	$ 0.0265	$ 0.0040	$ 0.0305	87%
Green Hills Tel. Co.	$ 0.0523	$ 0.0105	$ 0.0628	83%
Holway Tel. Co.	$ 0.1491	$ 0.0107	$ 0.1598	93%
Iamo Tel. Co. - MO	$ 0.1762	$ 0.0114	$ 0.1876	94%
Kingdom Tel. Co.	$ 0.0251	$ 0.0046	$ 0.0297	84%
KLM Tel. Co.	$ 0.0488	$ 0.0076	$ 0.0564	86%
Lathrop Tel. Co.	$ 0.0179	$ 0.0025	$ 0.0204	88%
Le-Ru Tel. Co.	$ 0.0346	$ 0.0046	$ 0.0392	88%
Mark Twain Com. Co.	$ 0.0709	$ 0.0086	$ 0.0795	89%
Mark Twain Rural Tel. Co.	$ 0.0304	$ 0.0093	$ 0.0397	77%
McDonald County Tel. Co.	$ 0.0261	$ 0.0029	$ 0.0290	90%
Miller Tel. Co. - MO	$ 0.0198	$ 0.0027	$ 0.0226	88%
New Florence Tel. Co.	$ 0.0160	$ 0.0052	$ 0.0212	75%
Oregon Farmers Mutual Tel. Co.	$ 0.0233	$ 0.0025	$ 0.0258	90%
Peace Valley Tel. Co.	$ 0.2610	$ 0.0106	$ 0.2716	96%
Rock Port Tel. Co.	$ 0.0809	$ 0.0041	$ 0.0850	95%
Steelville Tel. Exch. Inc.	$ 0.0093	$ 0.0025	$ 0.0117	79%
Total	$ 0.0273	$ 0.0036	$ 0.0309	88%

Exhibit WCC-12

	A	B	C	D	E
1	**Common Transport Costs - Interoffice Cable**				
2					
3	**HAI 5.0a Model**				
4	Cass County Tel. Co.				
5					
6					
7					
8	Wirecenter	Wirecenter Connects to BOC CLLI	Distance to BOC CLLI	Factor for Route Diversity	Miles of Fiber Cable
9	CGTNMOXA	ARCHMOAX	20.2	2	40.5
10	CLEVMOXA	KSCYMO40	9.8	2	19.6
11	DRXLMOXA	ADRNMOAX	15.8	2	31.6
12	ELYNMOXA	ARCHMOAX	14.9	2	29.7
13	GRCYMOXA	ARCHMOAX	13.6	2	27.2
14	PCLRMOXA	KSCYMO40	10.4	2	20.9
15	Total		84.7		169.5
16					

Exhibit WCC-13

EXHIBIT WCC-13 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

Exhibit WCC-14

EXHIBIT WCC-14 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

Exhibit WCC-15

Common Transport Costs - Interoffice Cable

HAI 5.0a Model
Cass County Tel. Co.

Wirecenter	Miles of Fiber Cable	Total Demand: total DS-0 equivalents, with SA	Total Demand: total DS-0 equivalents, with SA (excl. SS7)	Fiber Cable Investment	Buried Cable Sheath	Buried Cable Investment: Fiber Cable	Buried Cable Investment: Cable Sheath	Buried Cable Investment: Buried Cable Placement	Buried Cable Investment: Adjustment for Sharing with Feeder	Poles: Pole Investment	Poles: Adjustment for Sharing with Feeder	Total Investment: Buried Cable	Total Investment: Aerial Cable	Total Investment: Poles
CGTNMOXA	40.5	65	63	$ 748,018	$ 3,575	$ 710,617	$ 3,396	$ 359,369	$ (114,462)	$ 14,853	$ (4,194)	$ 958,921	$ 37,401	$ 10,660
CLEVMOXA	19.6	101	99	$ 362,321	$ 21,173	$ 344,205	$ 20,115	$ 174,069	$ (60,226)	$ 7,195	$ (2,568)	$ 478,163	$ 18,116	$ 4,627
DRXLMOXA	31.6	101	99	$ 584,389	$ 1,919	$ 555,169	$ 1,823	$ 280,757	$ (98,107)	$ 11,604	$ (2,855)	$ 739,643	$ 29,219	$ 8,749
ELYNMOXA	29.7	72	70	$ 549,326	$ 14,749	$ 521,859	$ 14,012	$ 263,912	$ (103,211)	$ 10,908	$ (2,886)	$ 696,572	$ 27,466	$ 8,022
GRCYMOXA	27.2	182	180	$ 502,574	$ 1,962	$ 477,446	$ 1,863	$ 241,451	$ (78,776)	$ 9,980	$ (2,160)	$ 641,984	$ 25,129	$ 7,820
PCLRMOXA	20.9	361	359	$ 385,697	$ 54,711	$ 366,412	$ 51,976	$ 185,300	$ (99,633)	$ 7,659	$ (1,499)	$ 504,055	$ 19,285	$ 6,160
Total	169.5	883	871	$ 3,132,325	$ 98,089	$ 2,975,708	$ 93,185	$ 1,504,858	$ (554,414)	$ 62,199	$ (16,162)	$ 4,019,337	$ 156,616	$ 46,037

Common Transport Costs - Interoffice Cable

HAI 5.0a Model
Cass County Tel. Co.

Wirecenter	Investment / Trunk: Buried Cable	Investment / Trunk: Aerial Cable	Investment / Trunk: Poles	Common Transport Trunks	Common Transport Investment: Buried Cable	Common Transport Investment: Aerial Cable	Common Transport Investment: Poles	Annual Costs: Buried Cable	Annual Costs: Aerial Cable	Annual Costs: Poles	Annual Costs: Total	Minutes of Use	Common Transport - Cable Cost / MOU
CGTNMOXA	$ 15,250	$ 595	$ 170	28.0	$ 426,991	$ 16,654	$ 4,747	$ 111,406	$ 4,971	$ 1,621	$ 117,998		
CLEVMOXA	$ 4,810	$ 182	$ 47	37.0	$ 177,959	$ 6,742	$ 1,722	$ 46,431	$ 2,013	$ 588	$ 49,032		
DRXLMOXA	$ 7,469	$ 295	$ 88	44.0	$ 328,618	$ 12,982	$ 3,887	$ 85,740	$ 3,875	$ 1,327	$ 90,942		
ELYNMOXA	$ 9,968	$ 393	$ 115	31.0	$ 309,005	$ 12,184	$ 3,559	$ 80,623	$ 3,637	$ 1,215	$ 85,475		
GRCYMOXA	$ 3,568	$ 140	$ 43	66.0	$ 235,488	$ 9,218	$ 2,868	$ 61,441	$ 2,751	$ 979	$ 65,172		
PCLRMOXA	$ 1,403	$ 54	$ 17	124.0	$ 173,921	$ 6,654	$ 2,125	$ 45,378	$ 1,986	$ 726	$ 48,090		
Total				330.0	$ 1,651,982	$ 64,434	$ 18,908	$ 431,019	$ 19,234	$ 6,456	$ 456,709	33,177,848	$ 0.0138

Exhibit WCC-16

EXHIBIT WCC-16 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

Exhibit WCC-17

	A	B	C	D	E	F	G	H	I	J	K
1	**Transport Transmission Equipment Investment and Cost / Minute**										
2											
3	HAI 5.0a Results - Small MO ILECs										
4											
5		Cass County Telephone Company							Peace Valley Telephone		
6		CGTNMOXA	CLEVMOXA	DRXLMOXA	ELYNMOXA	GRCYMOXA	PCLRMOXA	Total	PCVYMOXX		
7	Transmission Equipment										
8	OC-48 (12 DS3) Add / drop multiplexer	$ 44,200	$ 44,200	$ 44,200	$ 44,200	$ 44,200	$ 44,200	$ 265,200	$ 44,200		
9	OC-3 terminal multiplexer	$ 30,200	$ 30,200	$ 30,200	$ 30,200	$ 30,200	$ 30,200	$ 181,200	$ 30,200		
10	Digital cross-connect system (per DS3)	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 180,000	$ 30,000		
11	Regenerator	$ 15,000	$ -	$ -	$ -	$ -	$ -		$ 60,000		
12	Leased facility "quasi" investment										
13	Total IO trunks	65	101	101	72	182	361	883	62		
14	Investment / trunk	$ 112	$ 112	$ 112	$ 112	$ 112	$ 112	$ 112	$ 112		
15	Leased facility total	$ 7,242	$ 11,320	$ 11,277	$ 8,023	$ 20,307	$ 40,337	$ 98,506	$ 6,931		
16											
17	Total transmission equipment investment	$ 126,642	$ 115,720	$ 115,677	$ 112,423	$ 124,707	$ 144,737	$ 739,906	$ 171,331		
18											
19	Total IO trunks (excluding SS7 links)	63	99	99	70	180	359	871	60		
20	Transmission equipment investment / trunk	$ 2,014	$ 1,164	$ 1,168	$ 1,609	$ 693	$ 403	$ 850	$ 2,851		
21											
22	Common transport trunks	28	37	44	31	66	124	330	27		
23	Common transport transmission equipment investment	$ 56,392	$ 43,068	$ 51,395	$ 49,872	$ 45,744	$ 49,940	$ 296,410	$ 76,974		
24											
25	Overall annual cost factor							28.4%	27.0%		
26	Annual costs							$ 84,327	$ 20,810		
27											
28	Annual minutes of use							33,177,848	1,970,808		
29	Transmission equipment cost / minute							$ 0.0025	$ 0.0106		

Exhibit WCC-18

EXHIBIT WCC-18 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.

Exhibit WCC-19

ISUP Signaling Costs

HAI 5.0a Output - MO ILECs

Company	ISUP Signaling Cost / MOU	Minutes of Use	Percent of Total MOU
BPS Tel. Co.	$ 0.0007	38,491,741	3%
Cass County Tel. Co.	$ 0.0011	76,557,012	6%
Citizens Tel. Co. - MO	$ 0.0014	45,762,507	4%
Craw-Kan Tel. Coop. - MO	$ 0.0053	26,055,608	2%
Ellington Tel. Co.	$ 0.0156	18,223,586	1%
Farber Tel. Co.	$ 0.0105	2,427,510	0%
Fidelity Com. Svc. I	$ 0.0004	261,807,131	20%
Fidelity Com. Svc. II	$ 0.0004	128,570,072	10%
Fidelity Tel. Co.	$ 0.0007	146,978,886	11%
Granby Tel. Co. - MO	$ 0.0006	31,461,510	2%
Grand River Mutual Tel. Co. - MO	$ 0.0068	161,848,746	12%
Green Hills Telecom. Svc.	$ 0.0019	14,325,195	1%
Green Hills Tel. Co.	$ 0.0059	40,241,177	3%
Holway Tel. Co.	$ 0.0137	6,305,165	0%
Iamo Tel. Co. - MO	$ 0.0193	12,802,483	1%
Kingdom Tel. Co.	$ 0.0021	51,088,930	4%
KLM Tel. Co.	$ 0.0056	16,619,991	1%
Lathrop Tel. Co.	$ 0.0009	14,893,363	1%
Le-Ru Tel. Co.	$ 0.0024	14,824,245	1%
Mark Twain Com. Co.	$ 0.0062	12,602,724	1%
Mark Twain Rural Tel. Co.	$ 0.0036	45,634,646	3%
McDonald County Tel. Co.	$ 0.0019	36,227,359	3%
Miller Tel. Co. - MO	$ 0.0011	11,937,083	1%
New Florence Tel. Co.	$ 0.0014	5,135,648	0%
Oregon Farmers Mutual Tel. Co.	$ 0.0012	13,263,512	1%
Peace Valley Tel. Co.	$ 0.0196	4,548,122	0%
Rock Port Tel. Co.	$ 0.0088	19,545,162	1%
Steelville Tel. Exch. Inc.	$ 0.0009	47,865,151	4%
Total	$ 0.0027	1,306,044,265	100%

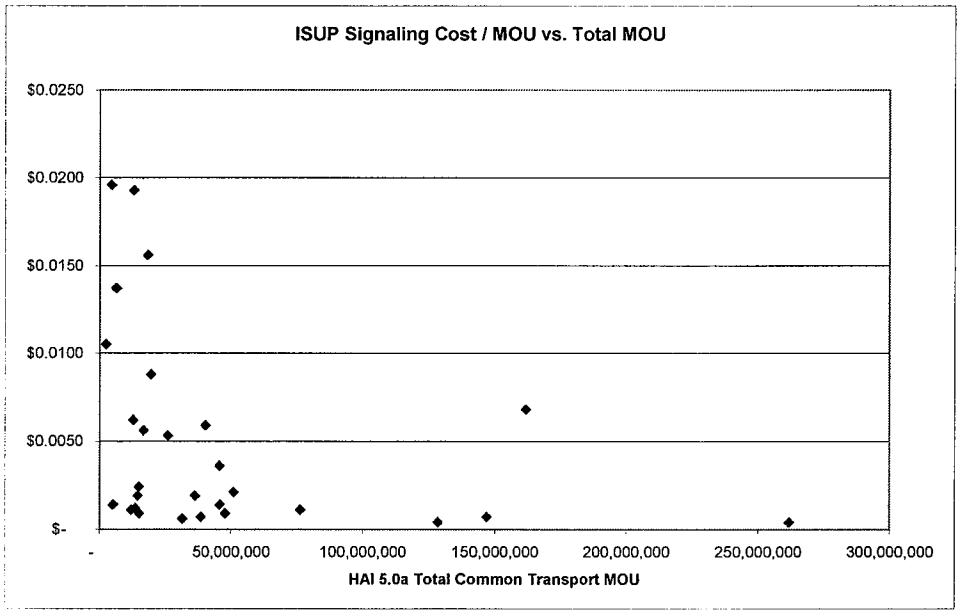


Exhibit WCC-20

ISUP Signaling Costs

HAI 5.0a Output - MO ILECs

Company	STP Cost / MOU	Link Cost / MOU	Total Cost / MOU	Link % of Total
BPS Tel. Co.	$ 0.0003	$ 0.0004	$ 0.0007	61%
Cass County Tel. Co.	$ 0.0003	$ 0.0008	$ 0.0011	76%
Citizens Tel. Co. - MO	$ 0.0003	$ 0.0011	$ 0.0014	81%
Craw-Kan Tel. Coop. - MO	$ 0.0003	$ 0.0050	$ 0.0053	95%
Ellington Tel. Co.	$ 0.0003	$ 0.0153	$ 0.0156	98%
Farber Tel. Co.	$ 0.0003	$ 0.0102	$ 0.0105	98%
Fidelity Com. Svc. I	$ 0.0003	$ 0.0001	$ 0.0004	34%
Fidelity Com. Svc. II	$ 0.0003	$ 0.0001	$ 0.0004	31%
Fidelity Tel. Co.	$ 0.0003	$ 0.0004	$ 0.0007	61%
Granby Tel. Co. - MO	$ 0.0003	$ 0.0003	$ 0.0006	54%
Grand River Mutual Tel. Co. - MO	$ 0.0003	$ 0.0065	$ 0.0068	96%
Green Hills Telecom. Svc.	$ 0.0003	$ 0.0016	$ 0.0019	87%
Green Hills Tel. Co.	$ 0.0003	$ 0.0056	$ 0.0059	96%
Holway Tel. Co.	$ 0.0003	$ 0.0134	$ 0.0137	98%
Iamo Tel. Co. - MO	$ 0.0003	$ 0.0190	$ 0.0193	99%
Kingdom Tel. Co.	$ 0.0003	$ 0.0018	$ 0.0021	87%
KLM Tel. Co.	$ 0.0003	$ 0.0053	$ 0.0056	95%
Lathrop Tel. Co.	$ 0.0003	$ 0.0006	$ 0.0009	69%
Le-Ru Tel. Co.	$ 0.0003	$ 0.0021	$ 0.0024	89%
Mark Twain Com. Co.	$ 0.0003	$ 0.0059	$ 0.0062	96%
Mark Twain Rural Tel. Co.	$ 0.0003	$ 0.0033	$ 0.0036	93%
McDonald County Tel. Co.	$ 0.0003	$ 0.0016	$ 0.0019	87%
Miller Tel. Co. - MO	$ 0.0003	$ 0.0008	$ 0.0011	76%
New Florence Tel. Co.	$ 0.0003	$ 0.0011	$ 0.0014	81%
Oregon Farmers Mutual Tel. Co.	$ 0.0003	$ 0.0009	$ 0.0012	78%
Peace Valley Tel. Co.	$ 0.0003	$ 0.0193	$ 0.0196	99%
Rock Port Tel. Co.	$ 0.0002	$ 0.0086	$ 0.0088	97%
Steelville Tel. Exch. Inc.	$ 0.0003	$ 0.0006	$ 0.0009	71%
Total	$ 0.0003	$ 0.0024	$ 0.0027	90%

Exhibit WCC-21

EXHIBIT WCC-21 CONTAINS INFORMATION DEEMED PROPRIETARY BY PETITIONERS.