CONFIDENTIAL

STATE OF SOUTH DAKOTA

PUBLIC UTILITIES COMMISSION

IN THE MATTER OF THE PETITION OF SANTEL COMMUNICATIONS COOPERATIVE, INC. FOR ARBITRATION PURSUANT TO THE TELECOMMUNICATIONS ACT OF 1996 TO RESOLVE ISSUES RELATED TO THE INTERCONNECTION AGREEMENT WITH ALLTEL, INC.	Docket No. TC07-115 **DIRECT TESTIMONY** **OF** **NATHAN A. WEBER**

DIRECT TESTIMONY OF NATHAN WEBER ON BEHALF OF SANTEL COMMUNICATIONS COOPERATIVE, INC.

Q1. Please state your name, employer, business address and telephone number.

A1. My name is Nathan Weber. I am the Director of Engineering of Vantage Point Solutions, Inc. ("Vantage Point"). My business address is 2211 North Minnesota Street, Mitchell, South Dakota, 57301.

Q2. On whose behalf are you testifying?

A2. I am testifying on behalf of Santel Communications Cooperative, Inc. ("Santel"). Based on my experience working with Santel for over 5 years, I know that Santel provides local telephone exchange service and exchange access services in South Dakota and is engaged in the provision of general telecommunications services in the State of South Dakota subject to the jurisdiction of the South Dakota Public Utilities Commission ("Commission").

Q3. Generally, what types of services does Vantage Point perform?

A3. Vantage Point is a telecommunications engineering and consulting company whose services include long range communication plans and feasibility studies, emerging technology analysis and migration studies, telecommunications electronic equipment engineering, outside plant engineering, field services engineering and regulatory consulting.

Q4. What are your duties and responsibilities at Vantage Point?

A4. I am responsible for providing consulting and engineering services to clients in a wide array of technical and regulatory areas associated with telecommunications. Our client base consists of small Independent Telephone Companies such as Santel. Vantage Point has more than 80 fulltime employees on staff. I am also responsible for the normal duties you would expect from the director of engineering for a company of our size.

Q5. What is your educational background?

A5. I have a Bachelor of Science in Electrical Engineering from South Dakota State University in Brookings, South Dakota.

Q6. Do you hold any professional engineering licenses?

A6. Yes. I am a licensed professional engineer in North Dakota and South Dakota. I am also a member of the National Council of Examiners for Engineering and Surveying (NCEES).

Q7. Do you have a resume of your experience?

A7. Yes, it is attached to my testimony as Exhibit NW-D-1.

Q8. What is the purpose of your direct testimony?

A8. The purpose of my direct testimony is to provide technical facts relating to the Arbitration[1] between Santel and Alltel Communications, Inc. (Alltel). I will provide information relating to Issue 1 identified in the Petition for Arbitration for Santel (referred to herein as the "Petition"). This issue was presented in the Petitions as follows: "Is the reciprocal compensation rate for IntraMTA Traffic proposed by Telco appropriate pursuant to 47 U.S.C. § 252(d)(2)?" Specifically, I will explain the engineering inputs and how they comply with FCC rule 51.505(b)(1).

Q9. Can you provide a general overview of the engineering inputs provided for the Forward-Looking Economic Cost (FLEC) model?

A9. The engineering inputs associated with the Santel FLEC model consist of several components. First, the "Switching" network includes items associated with the deployment of a typical Class 4/5 voice switch. The individual components that were included in the FLEC engineering design for the switching network are separated into four main categories including Common, Line Cards, Line Interface Cards, and Trunk Cards. The "Inter-Exchange Transport" cost estimates associated with the Santel FLEC study included Inter-Exchange Transport electronics and Outside Plant (OSP) cable to interconnect the respective exchanges. The Inter-Exchange Transport cost estimates were divided into three main categories including Base Costs, Line Costs, and Tributary Costs. Similarly,

[1] In The Matter of the Petition Of Santel Communications Cooperative, Inc. for Arbitration Pursuant to the Telecommunications Act Of 1996 To Resolve Issues Related to The Interconnection Agreement With Alltel, Inc. (referred to herein as the "Petition").

the OSP cable construction cost estimates were separated into "Town" and "Rural" categories.

Q10. What voice switching technology and architecture was assumed in the development of the FLEC capital investment estimates?

A10. For the purposes of the FLEC engineering model for Santel, it was assumed that they would deploy "Softswitching" technology within their network. The Softswitching technology is a packet, voice switching technology. This type of switch will allow for either Time Division Multiplexing (TDM) interfaces or packet interfaces to be deployed. The Softswitch uses packet technology for switching voice traffic, but this technology allows for either packet or TDM circuit connections to be used for line or trunk interfaces.

The Softswitch architecture, as commonly implemented in the industry and in the Santel FLEC engineering model, consists of four components including the Call Agent, Signaling Gateway, Media Gateway, and Outboard Line Bays (OLB's). The function of a Call Agent is to provide services such as media and signaling gateway control and billing, call routing logic, Communications Assistance for Law Enforcement Act (CALEA) support, and miscellaneous subscriber services such as call waiting, distinctive ringing, and off-premise extensions. The Signaling Gateway's function is to provide the Signaling System 7 (SS7) signaling interface for the Softswitch. In addition, the Media Gateway provides media (voice) switching and processing capabilities. A diagram depicting this architecture is attached to my testimony as Exhibit NW-D-2.

The OLB equipment is used to provide analog plain old telephone service (POTS) line interfaces to the end subscribers. In a legacy digital switching architecture, the analog POTS lines were typically equipped in separate equipment bays, and the switch processors communicated with the analog POTS line cards via inter-bay interfaces and cables. One attribute of Softswitching platforms that is unique when compared to legacy digital switching architectures is the absence of on-board analog POTS line cards within the Media Gateway chassis. For Softswitch deployments, it is typically necessary to use devices such as OLB terminals, which are sometimes referred to as Digital Loop Carriers (DLC's), to provide analog POTS line card interfaces to serve the subscribers. For the Santel FLEC engineering design, OLB's were assumed to provide this functionality. Like other Softswitching networks, the OLB's assumed in the Santel FLEC engineering design function as virtual extensions of the Class 5 switch.

For Santel, the FLEC engineering design assumed the use of a distributed Softswitching network. As part of this architecture, centralized Call Agents are assumed to be deployed at each "host" switching location. The locations that are designed to include the Call Agents for Santel include Parkston and Woonsocket.

A single Media Gateway with a Signaling Gateway is included for each exchange. For new switching network deployments, this architecture is commonly deployed by telecommunications service providers whose number of subscribers and scope of services offered are comparable to Santel.

The FLEC engineering design for Santel also includes the deployment of "Intermediate Tandem" functionality at the Woonsocket exchange. In this architecture, the trunks from the various Santel exchanges are aggregated in the

Woonsocket switch. The purpose of this function is to provide improved efficiencies by maximizing the "fill" of the outgoing trunks to the Access Tandem provider. The assumed efficiency of the Intermediate Tandem function reduces the quantity of trunks to the Access Tandem provider by approximately 20 percent.

Q11. Can you explain the design parameters were considered when developing the switching network architecture for the FLEC model?

A11. The FLEC engineering design for Santel was developed to provide an efficient voice switching network that offers the appropriate grade of service for the subscribers of Santel. The ability to provide voice services with 99.999% availability is paramount to telecommunications service providers such as Santel. One key attribute that is included in the design is emergency stand-alone capabilities for all exchanges. This emergency stand-alone functionality offers the ability for subscribers to make local calls in the event that the communication path to the Call Agent is severed.

In addition, the switching network is designed to adhere to the South Dakota service standards for telecommunications companies set forth in the Administrative Rules for South Dakota. Specifically, the switching system was assumed to include custom calling feature such as call waiting, call forwarding, abbreviated dialing, caller identification, and three-way calling as set forth in A.R.S.D. Section 20:10:33:04. Similarly, the switching network is designed to adhere to A.R.S.D. Section 20:10:33:05 which states that during any busy hour, the telecommunications service provider network must allow for a minimum of 98 percent of call attempts to receive dial tone within three (3) seconds, a minimum of 98 percent of properly dialed calls for extended service area to be properly terminated, and a minimum of 98 percent of properly dialed calls routed entirely over the network of the local exchange carrier to be properly terminated.

Other required functions included in the FLEC engineering design for the switching network include E-911 service support, as well as CALEA support. In addition, the switching network architecture for the Santel FLEC engineering design included SS7 signaling capabilities.

Q12. In your expert opinion, is the technology and architecture used for the FLEC model considered to be an economical, long-term solution?

A12. Yes. As stated previously, the distributed Softswitching architecture assumed for the Santel FLEC model is a commonly deployed model for new switching network implementations. One primary reason that this architecture is commonly deployed in this market space is due to the fact that it is a robust and cost-effective solution for telecommunications service providers.

Q13. With regards to the engineering design for the "Switching" network for Santel, what components comprise the various categories (*e.g.* Common, Line Cards, Line Interface Cards, and Trunk Cards) for the FLEC capital investment estimates?

A13. The Switching network investments for Santel are separated into four (4) primary categories including "Common", "Line Cards", "Line Interface Cards", and "Trunk Cards." First, the category of Common items includes components that are common to the system. This category of network investment does not include any voice circuit interface cards that are active in the proposed system. The items included in the "Common" investment category include, but are not limited to, the following: Call Agent hardware, Call Agent software, Media Gateway chassis (including redundant central processing units, power supplies, and cooling fans), Media Gateway software, Signaling Gateway hardware, EMS and Web Provisioning systems, feature right-to-use fees (e.g. CALEA, Centrex, Web Provisioning, Emergency Stand-Alone, and concurrent call license), Ethernet interface, OLB chassis, OLB processors, OLB administration interface, and spare circuit cards. A diagram depicting the allocation of the switching network components to the respective categories is attached to my testimony as Exhibit NW-D-3. In addition, a component level pricing breakdown for each category of investment at each respective exchange is attached to my testimony as Exhibit NW-D-4.

The "Line Cards" category includes only the analog POTS line cards that are equipped in the OLB chassis. No other equipment is included in this group.

Next, the "Line Interface Card" category includes equipment in the Media Gateway and OLB terminals. The items included are the circuit interface cards that provide DS-1 GR-303 connectivity between the Media Gateway and the OLB terminal.

Finally, the "Trunk Card" category includes circuit interface cards in the Media Gateway that are used for trunk interfaces. In other words, these circuit cards provide communication from the Media Gateway to the Public Switched Telephone Network (PSTN).

A loading factor is included to each investment category for the respective locations to account for miscellaneous items. Specifically, a 10 percent factor is incorporated in each category to account for installation materials and labor. In addition, a 15 percent factor is included for miscellaneous costs such as taxes and engineering.

Q14. What technology and configuration options were assumed for the Inter-Exchange Transport cost estimates?

A14. With regards to the FLEC engineering model designed for the Santel Inter-Exchange Transport network, it is assumed that the network would be implemented as an OC-192 Synchronous Optical NETworking (SONET) transport network. In accordance with South Dakota Codified Law, Chapter 49-31-60, the transport network architecture was selected to provide highly available, switched, survivable optical transport rings between the respective exchanges. In order to accomplish this, the proposed network is designed in a ring architecture in which diverse fiber paths are utilized. This is a common network design architecture that limits the potential for an individual exchange from being isolated from the rest of the network due to a single fiber optic cable cut. SONET architectures typically offer rapid traffic recovery in the event of a fiber optic cable cut or optical transceiver failure. The target failure recovery time for SONET networks is approximately 50 milliseconds.

The proposed SONET infrastructure for Santel is assumed to be a carrier-grade solution that includes redundant power supplies, processor units, switch fabric, timing units, and cooling fans. In addition, the system is designed to offer both Synchronous Transport Signal (STS) and Virtual Tributary (VT) switching capabilities to allow for granular traffic management capabilities. The solution included in the FLEC engineering design is required to support a variety of circuit interfaces such as OC-192, OC-48, OC-12, OC-3, DS-3, DS-1, Gigabit Ethernet, and 10/100 BaseT. With the exception of the Ethernet interface cards, the tributary interfaces are configured to provide hardware redundancy to ensure an appropriate level of availability. Traditional hardware redundancy is typically not available for Ethernet interfaces today.

Q15. How were the quantities of circuit interface cards assumed for the FLEC capital investment estimates derived?

A15. The quantities of circuit interface cards assumed in the FLEC engineering design are based upon the circuit requirements for the transport of the Switching network circuits, as well as miscellaneous special access circuits. The SONET solution assumed for this FLEC engineering design has circuit interface cards that have standard densities for interface port quantities. For example, the quantity of DS-1 ports provided on a single DS-1 interface card is 28. Similarly, the DS-3 circuit interface cards include eight DS-3 interfaces and the 10/100 BaseT Ethernet circuit interface cards include four 10/100 BaseT interfaces.

With regards to the SDN Terminal at the Mt. Vernon exchange, it is assumed that the quantity of interfaces equipped at this location will match the equipment configuration that is presently deployed at this location.

Q16. With regards to the engineering design for the "Inter-Exchange Transport" network for Santel, what components comprise the various categories (*e.g.* Base Cost, Line Interface, Tributary Interface, etc.) for the FLEC capital investment estimates?

A16. The "Inter-Exchange Transport" electronics assumed for the FLEC engineering design included items that are divided into three (3) primary categories including "Base Cost", "Line Interface", and "Tributary Interface." For example, the items included in the "Base Cost" category are essentially the common hardware and software elements that are required for the system. Specifically, these items include the equipment chassis, cooling fan modules, CPU, Digital Communications Channel (DCC) units, alarm interface units, timing and synchronization modules, STS switch fabric, VT1.5 switch fabric, system software, Element Management System software, and miscellaneous cabling. A diagram depicting this categorization of components is attached to my testimony as Exhibit NW-D-5. In addition, a component level pricing breakdown for each category of investment at each respective exchange is attached to my testimony as Exhibit NW-D-6. The "Line Interface" cost category includes the OC-192 circuit interfaces cards that are necessary to provide the optical line interfaces between adjacent SONET network elements.

Finally, the "Tributary Interface" costs include a variety of circuit interface cards that are required to add and drop traffic at each respective location. These "Tributary Interface" cards assumed for Santel include OC-48, DS-3, DS-1, Gigabit Ethernet, and 10/100 BaseT Ethernet circuit interface cards.

A loading factor is included to each investment category for the respective locations to account for miscellaneous items. Specifically, a 10 percent factor is incorporated in each category to account for installation materials and labor. In addition, a 15 percent factor is included for miscellaneous costs such as taxes and engineering.

Q17. What methodology was utilized to determine the total route mile distance for Outside Plant (OSP) fiber optic cable construction between the adjacent locations?

A17. In the development of the FLEC engineering design, it was assumed that the fiber optic transport infrastructure would be implemented to allow for diverse fiber routes to and from each respective exchange. This design methodology complies with South Dakota Codified Law, Chapter 49-31-60, by enabling switched survivable rings. In addition, diverse fiber optic cable routing is commonly implemented by companies such as Santel to prevent a single fiber optic cable cut from isolating an exchange from the rest of the network. The design of the fiber optic cable route assumed cable placement that provides for the most probable and efficient route between adjacent exchanges. It is assumed that public right-of-way will be used for this fiber optic cable construction. Therefore, the assumed cable route was designed to follow existing roads. The approximate distance for the "Town" and "Rural" construction were summed to provide the total route mile distance between the respective exchanges. A diagram depicting the general fiber optic cable route is attached to my testimony as Exhibit NW-D-7.

Q18. What is considered "Town" construction versus "Rural" construction?

A18. For the purposes of this design, it was assumed that the fiber optic cable would be constructed to the existing central office building in each exchange. Any cable routes that fall within the city limits of a community, or within an area that has a population density consistent with a town environment, were designated as "Town" construction. The routes that fall outside the city limits (or comparable cost per foot estimate of $11.93. A loading factor of 15% for engineering and taxes was added to determine the final result of $13.72 per foot for OSP town construction. A detailed pricing breakdown showing the unit quantities and unit costs used to derive the per-foot pricing estimate for town construction is attached to my testimony as Exhibit NW-D-9.

Q20. How was the per-mile rate for the OSP "Rural" construction estimates determined?

A20. The OSP Rural construction estimates for Santel were based upon actual rural fiber optic cable construction costs within their service territories. The pricing of $592,666.64 is the construction cost for a 74.22 mile OSP project that was bid for Santel in March 2003. An annual "normalization" factor of 5% was added to the OSP bid price to determine the estimated current pricing for rural construction. The result of this normalization is an estimated cost for construction of $720,390.01 for an equivalent project being bid in December 2007. Dividing this normalized total by 74.22 routes miles provides an average cost per mile of approximately $9,705 in the Santel service territories. This result was subsequently multiplied by a 15% loading factor to account for items such as engineering and taxes. The final, loaded cost per mile for rural OSP construction is estimated at approximately $11,161. A detailed pricing breakdown showing the unit quantities and unit costs used to derive the per-foot pricing estimate for town construction is attached to my testimony as Exhibit NW-D-10.

Q21. Does that conclude your testimony?

A21. Yes. However, I wish to reserve the opportunity to supplement this testimony in the future, if necessary.