REDACTED – FOR PUBLIC INSPECTION

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

D.T.E. 01-20 (Part A)

SURREBUTTAL TESTIMONY OF DAVID GARFIELD ON BEHALF OF VERIZON NEW ENGLAND INC. d/b/a VERIZON MASSACHUSETTS

December 17, 2001

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1. 1 I. **INTRODUCTION**

1. 2 Q. What is your name and address?

1. 3 A. My name is David Garfield. My business address is 3 Corporate Place,
1. 4 Piscataway, New Jersey.

1. 5 Q. Please describe your educational background and academic and professional
1. 6 experience.

1. 7 A. I attended the University of Delaware, graduating with a Bachelor's of Science
1. 8 Degree in Mathematics in 1976 and Rutgers University, graduating with a Master
1. 9 of Science Degree in Applied Mathematics in 1978. I have attended numerous
1. 10 Telcordia and switch vendor courses relating to switching system provisioning
1. 11 and engineering. I have also attended courses related to service cost studies
1. 12 and economic principles.

1. 13 I was initially employed with Bell Laboratories in 1978 in Holmdel, New
1. 14 Jersey, in the Local Switching Systems Engineering Center. My initial
1. 15 responsibilities included area planning for remote switching and methodology
1. 16 development for switch replacement studies. I came to Bellcore (currently known
1. 17 as Telcordia Technologies) upon divestiture in 1984, continuing work on switch
1. 18 replacement studies with digital switching systems until 1986, where I briefly
1. 19 worked on DMS-100F cost model development for the Switching Cost
1. 20 Information System (SCIS). Upon conclusion of this work effort, I supported
1. 21 development of custom local area signaling services (CLASS) requirements
1. 22 through 1989, when I transferred to the Business Decision Support organization
1. 23 to work on SCIS.

1. 1 Q. Please describe your experience regarding SCIS.

1. 2 A. I have over twelve years experience on SCIS. During this time, I have worked on
1. 3 model development for Nortel's DMS100-F switching system, Stromberg-
1. 4 Carlson's DCO switching system, Lucent's 5ESS switching system, and Fujitsu's
1. 5 FETEX-150 switching system. This work included development of the model
1. 6 itself, development of requirements for the programming staff, testing, and
1. 7 documentation review. I have been responsible for the ongoing evolution of the
1. 8 model office portion of SCIS for the past seven years. My current responsibilities
1. 9 include serving as SCIS model office development team leader, model office
1. 10 development for the 5ESS switching system, and training.

1. 11 Q. Have you testified in other UNE price setting proceedings?

1. 12 A. Yes. I have testified as an SCIS subject matter expert in Unbundled Network
1. 13 Element (UNE) hearings in the states of Georgia, Alabama, Louisiana,
1. 14 Tennessee, North Carolina, South Carolina, Florida, Maryland, and Virginia.

1. 15 Q. What is the purpose of your surrebuttal testimony?

1. 16 A. The purpose of my testimony is to respond to three issues raised in the rebuttal
1. 17 testimony of the AT&T/WorldCom Recurring Cost Panel regarding Verizon MA's
1. 18 use of SCIS Version 2.8. I am filing this testimony at the request of Verizon MA.
1. 19 My testimony is closely related to the surrebuttal testimony of the Verizon MA
1. 20 Recurring Cost Panel, consisting of Ms. Nancy Matt, Mr. Michael Anglin, Mr.
1. 21 John Livecchi, Mr . Joseph Gansert and Mr. Louis Minion. In fact, although my
1. 22 testimony is being filed separately due to administrative considerations, my

1. 1 testimony is so interrelated to Recurring Cost Panel surrebuttal that I consider my
1. 2 testimony to be part of the Panel's testimony.
1. 3 Q. Please summarize your surrebuttal testimony.
1. 4 A. My surrebuttal testimony addresses three issues raised by AT&T/WorldCom
1. 5 witness Catherine Pitts. First, AT&T/WorldCom incorrectly asserts that SCIS is
1. 6 designed to model only new switch installations. My surrebuttal testimony
1. 7 demonstrates that SCIS, by design, models installation of new switching
1. 8 systems, growth of existing switching systems, or a mix, as long as the
1. 9 appropriate discount input is entered into SCIS. It is not limited solely to
1. 10 installation of new switching systems as AT&T/WorldCom imply. Second,
1. 11 AT&T/WorldCom claim that SCIS is a "static" model and its results provide just a
1. 12 "snapshot" of the network. My surrebuttal testimony demonstrates that SCIS
1. 13 provides more that just a "snapshot" of the network and its results are not purely
1. 14 "static". Third, AT&T/WorldCom claim that the port is the appropriate cost driver
1. 15 for "getting started" investment and Equivalent POTS Half Call (EPHC)
1. 16 investment (a 5ESS switching system specific result). My surrebuttal testimony
1. 17 demonstrates that there is a much stronger link to usage than to ports for both
1. 18 types of investments, making usage the more appropriate cost driver.[1/]
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[1/] More detail on this point for EPHC related investment is provided in the EPHC discussion on pages 10 through 14.

II. SCIS, BY DESIGN, ESTIMATES THE INVESTMENTS OF GROWTH EQUIPMENT, SUCH AS LINE AND TRUNK ADDITIONS, IN ADDITION TO THE INVESTMENTS OF NEW SWITCHES.

Q. AT&T/WorldCom have stated that SCIS is designed to estimate the investment of a new switch. [Pitts at 23.] Can SCIS be used to estimate the investment of growth equipment or a mix of new and growth equipment as well?

A. Yes, SCIS is designed to estimate the investment of switch growth, new switches, and a mix of new and growth switches.

Q. Please briefly describe how SCIS models switching investments.

A. SCIS is designed to model forward-looking incremental switching investments in terms of the "cost drivers,"[2/] as defined in the switch vendor's engineering rules. To accomplish this objective, a bottom-up modeling analysis is performed utilizing the latest hardware vintages, vendor engineering rules, equipment capacities, and vendor list prices. The switch engineering rules provided by the vendors that are used in Telcordia's bottom-up modeling analysis, are applicable to both installation of new switching systems and growth of existing switching systems. That is, one set of engineering rules applies to both applications. As one can observe, regardless whether installation of a new switching system or growth of an existing switching system is being modeled, the SCIS methodology addresses the latest vendor provided technical/engineering parameters, and the user, such as Verizon, inputs its latest contract specifics.

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[2/] Line terminations by type, line CCS by type including ISDN lines, trunk terminations by type, trunk CCS by type, central processor real time, ISDN PPS, SS7 octets, remote umbilical CCS, and peripheral processor real time are some of the typical cost drivers inherent in modern day digital switching systems.

1. 1 Q. Please explain how the price lists obtained by Telcordia were used in the
1. 2 development of Verizon MA's discount input for SCIS.
1. 3 A. Discounts entered into SCIS by its users are applied uniformly to all individual
1. 4 equipment items of the switching system. Verizon's testimony in this proceeding
1. 5 bears this out. Verizon MA has testified in this proceeding that it developed a
1. 6 single discount value reflecting their current vendor contracts by analyzing actual
1. 7 switch equipment purchases (***both installation of new switching systems and***
1. 8 ***growth of existing switching systems***) in the year 2000. Verizon determined
1. 9 total investment for this switching equipment based on list prices (the same price
1. 10 lists used for SCIS model development) and based on their vendor contracts.
1. 11 The resulting total investments were compared to obtain a net discount reflecting
1. 12 Verizon's mix of new switch and growth purchases, not just growth purchases.
1. 13 In general, the price list from any switch vendor used for SCIS
1. 14 development is the starting point from which users such as Verizon enter their
1. 15 discount input data. ***This allows SCIS to model new switch equipment,***
1. 16 ***growth equipment, or a mix of new and growth equipment, as long as the***
1. 17 ***appropriate discount input is used.***[3/]
1. 18 Q. If Verizon's switch purchases were primarily due to new switch installations,
1. 19 would Verizon's new switch discount be appropriate for use in SCIS?
1. 20 A. No. Even if Verizon purchased primarily new switch installations, use of
1. 21 Verizon's new switch discount in SCIS would yield a short-run result. New switch

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[3/] Appropriate line, trunk, and traffic data are required as well.

1. 1 discounts provided by the switch vendors are only applicable to equipment
1. 2 provided upon initial switch installation. Subsequent growth additions needed in
1. 3 future years would be purchased using Verizon's growth discount. Over time, the
1. 4 weighting of switch equipment purchased using new switch discounts versus
1. 5 growth switch discounts would gradually shift from the new switch discount
1. 6 towards the growth discount. Therefore, a longer term weighting of both
1. 7 discounts as the discount input in SCIS would yield a better long-run result.
1. 8 Q. AT&T/WorldCom assert that SCIS is a "static" model. [Pitts at 23.] Does this
1. 9 issue have any impact on whether or not SCIS can model growth equipment or a
1. 10 mix of new and growth equipment?
1. 11 A. Absolutely not. The primary issue here is the discount value to use in SCIS. As I
1. 12 previously stated, SCIS can model new switch equipment, growth equipment, or
1. 13 a mix of new and growth equipment, as long as the appropriate discount input is
1. 14 used. The precise value to use for SCIS's discount input is an interpretation
1. 15 argument of TELRIC principles. However, once that argument is settled, the
1. 16 resulting discount value can easily be included in Verizon's SCIS input data. The
1. 17 "static" model issue has no bearing on the discount issue. Even
1. 18 AT&T/WorldCom admit in their rebuttal testimony[4] that "Performing a dynamic
1. 19 cost study is extremely difficult, requires extensive demand analysis, and has not
1. 20 been used, to my knowledge, in the telephone industry for determining the costs
1. 21 of retail services or wholesale elements." Based on these statements,

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[4] Pitts at 23, footnote 19.

1. 1 AT&T/WorldCom offer no practical alternative to using a "static" model in any
1. 2 type of service cost study. However, it is my belief that SCIS is more that just a
1. 3 "static" model which I address in Section III.

1. 4 **III. SCIS PROVIDES MORE THAN JUST A "SNAPSHOT" OF THE NETWORK**
1. 5 **AND ITS RESULTS ARE NOT PURELY "STATIC"**

1. 6 Q. Why is SCIS more than just a "static" model?

1. 7 A. SCIS is more than just a "static" model due to its use of capacity costs to model
1. 8 switching equipment that replicates frequently and its capability to model future
1. 9 upgrades and/or additions for switching equipment that replicates infrequently.

1. 10 Q. Please explain what frequent replication and infrequent replication mean.

1. 11 A. Switching equipment whose capacity (expressed in terms of one or more
1. 12 resources which are listed in footnote 2, excluding central processor or SS7
1. 13 capacities) is used up in a relatively short time frame and is purchased in multiple
1. 14 quantities throughout the life of a switching system is said to replicate frequently.
1. 15 This type of equipment includes line cards, line peripherals, trunk peripherals,
1. 16 shelves, frames, cabinets, etc. In general, the capacity of these equipment items
1. 17 is fully utilized throughout most of the switching system's life.

1. 18 Conversely, equipment whose capacity is not fully utilized throughout the
1. 19 life of the switching system or takes many years to be fully utilized is said to
1. 20 replicate infrequently. This type of equipment includes processor related
1. 21 equipment and SS7 link termination related equipment.

1. 22 Q. How does SCIS model switching equipment that replicates frequently?

1. 23 A. SCIS models switching equipment that replicates frequently using capacity costs.
1. 24 The capacity cost for an equipment item is defined as the cost of the equipment

item divided by its capacity. For example, the capacity cost of a pizza that costs $8 and provides 8 slices is $1 per slice ($8 for the pizza pie divided by 8 slices).

Q. Why are SCIS results for switching equipment that replicates frequently not purely "static"?

A. As stated in the previous answer, SCIS results for frequently replicating equipment are based on capacity costs. It has been shown that a simple capacity cost is a good approximation to marginal cost, even when future additions are considered.[5] This "permits the use of an easy and verifiable formula to determine what otherwise would be a complex, data intensive exercise. It is not even necessary to know the specific service demand forecasts, equipment and its utilization at various points in time, or other data that is difficult to obtain."[6] These results show that unit investment results of SCIS reflect more than just a "snapshot" of the network, contrary to AT&T/WorldCom's assertion in their rebuttal testimony.

Q. You stated that a simple capacity cost is a good approximation to marginal cost. SCIS also provides average costs. Is capacity cost a good approximation to average cost as well?

A. Yes. SCIS uses capacity costs in average cost calculations for switching equipment that replicates frequently, since average cost quickly converges to capacity cost as more units are purchased over time.

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[5] Lee, J. J. and Schmid-Bielenberg, V. (1990). "*Capacity Cost: A Practical Substitute for Marginal Cost*", Bellcore, TM-BDS-017476.

1. 1 Q. How does SCIS model switching equipment that replicates infrequently?

1. 2 A. Central processor related equipment and SS7 link termination equipment are the
1. 3 two types of switching equipment modeled in SCIS that is said to replicate
1. 4 infrequently. In both cases, input fields are available for users such as Verizon to
1. 5 indicate when upgrades and/or additions occur in the future. In the case of
1. 6 central processor related equipment, these upgrades and/or additions represent
1. 7 additional processor related investments that occur in future years. In the case
1. 8 of SS7 link termination equipment, these upgrades and/or additions represent the
1. 9 additional SS7 link termination investments that occur in future years. Once the
1. 10 timing of these future upgrades and/or additions is indicated in input data, SCIS
1. 11 computes the resulting cash flow and, using standard present value techniques,
1. 12 makes these future investments comparable to the investments associated with
1. 13 the other output result categories of SCIS. As one can observe, SCIS reflects
1. 14 more than just a "snapshot" for processor and SS7 termination related
1. 15 equipment, contrary to AT&T/WorldCom's claim.

1. 16 Q. There are no indications that central processor related equipment or SS7
1. 17 termination related equipment upgrades occur in Verizon's SCIS input data.
1. 18 Does this make SCIS a "static" model?

1. 19 A. No. Verizon's decision not to model any upgrades or additions does not make
1. 20 SCIS a "static" model. SCIS provides the capability to model such upgrades.
1. 21 However, users such as Verizon have the ultimate responsibility of deciding

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[6] Lee, J. J. and Schmid-Bielenberg, V. (1990). "*Capacity Cost: A Practical Substitute for Marginal Cost*", Bellcore, TM-BDS-017476, page 20.

1. 1 whether or not to reflect any upgrades in their input data. The need for and
1. 2 timing of future upgrades are sometimes difficult to forecast. If Verizon had
1. 3 modeled any upgrades, their UNE costs would have increased based on
1. 4 forecasts that might be difficult to defend. It is Telcordia's understanding that
1. 5 Verizon chose a more conservative approach by deciding not to model any
1. 6 central processor equipment related or SS7 termination equipment related
1. 7 upgrades.

1. 8 **IV. VERIZON MA'S COST CAUSATIVE IDENTIFICATION OF SWITCHING**
1. 9 **EQUIPMENT BETWEEN TRAFFIC SENSITIVE AND NON-TRAFFIC**
1. 10 **SENSITIVE CATEGORIES IS CONSISTENT WITH THAT OF SCIS.**

1. 11 Q. Do you agree with AT&T/WorldCom that Verizon misidentified cost causation and
1. 12 therefore has misassigned costs to its various switch rate elements? [Pitts at 31-
1. 13 35]

1. 14 A. No. Verizon's identification of cost causation is consistent with cost causative
1. 15 determinations used in SCIS's methodology. In particular, Verizon has done so
1. 16 for the two major areas addressed by AT&T/WorldCom; assignment of "getting
1. 17 started" investment and assignment of the Equivalent POTS Half Call (EPHC)
1. 18 investment categories. AT&T/WorldCom suggest that these two areas be
1. 19 associated with the non-traffic sensitive category while SCIS ultimately treats
1. 20 them as traffic sensitive based on an engineering-based cost causative analysis.

1. 21 Q. How do "getting started" investments relate to switch processor equipment?

1. 22 A. SCIS determines a "getting started" investment for each switching system. This
1. 23 investment models the investment for processor-related equipment and other
1. 24 equipment independent of switch size (*i.e.*, lines and trunks) and traffic.

However, the ultimate limiting resource of the processor complex has historically been and still is realtime for today's modern digital switches (*i.e.*, milliseconds, not terminations). Therefore, the processor is inherently traffic sensitive, since usage determines ultimate exhaust.

Q. You just stated that the getting started investment in SCIS models the investment for processor-related equipment and other equipment independent of switch size and traffic. Doesn't this contradict your assertion that the getting started investment in SCIS is traffic sensitive?

A. No. SCIS is a bottom up, engineering oriented model. However, there is a point where the engineering stops. SCIS is designed to model individual switching systems throughout a network. As such, engineering of individual equipment components within a switching system is modeled by SCIS. Engineering beyond this level (i. e., number of switching systems required in a wire center) is not modeled by SCIS. Users such as Verizon must define each individual switching system in their input data. If two switching systems are needed in a single wire center, it is the users responsibility to define two switching systems in their input data. SCIS was never designed to determine that two switching systems are needed instead of one. Instead, network-planning tools were developed to specifically address this issue. As a result, the statement that the getting started investment is independent of switch size and traffic is consistent with engineering limits provided by SCIS. If SCIS had the capability to engineer the number of switching systems needed in a wire center, then the getting started investment

1. 1 would be sensitive to switch size and traffic, since the getting started investment
1. 2 would be repeated for each switching system.
1. 3 Q. Inspection of Verizon's SCIS input data shows that none of their central switch
1. 4 processors are expected to exhaust throughout their lives. Should the processor
1. 5 related equipment still be treated as traffic sensitive?
1. 6 A. Theoretically, the answer depends on each switch's processor load forecast. If
1. 7 one applies a long run incremental cost ("LRIC") theory, then central processor
1. 8 investment, as well as the remaining getting started investment should only be
1. 9 treated as *variable* (i.e. traffic sensitive), if the central processor is expected to
1. 10 exhaust. In the more controversial case, where the central processor is not
1. 11 expected to exhaust, then LRIC theory categorizes the getting started investment
1. 12 as *shared fixed.* However, the FCC's Local Competition Order states that shared
1. 13 costs must be reflected in TELRIC studies. Since realtime is the most limiting
1. 14 resource, as I mentioned earlier, it is therefore appropriate to express the getting
1. 15 started investment in terms central processor realtime (i.e. traffic sensitive), when
1. 16 incorporating TELRIC cost study methodology.
1. 17 Q. Is the assumption of SCIS that the switch processor is usage-limited consistent
1. 18 with evolving switch technology?
1. 19 A. Yes, the linkage of processor exhaust to realtime is supported by the reality of
1. 20 constantly-evolving switch processor capacity. Switch vendors, such as Lucent,
1. 21 and Nortel have constantly evolved the processor complex of their respective

1. 1 digital switching systems in order to stay one step ahead of realtime demand.[7]
1. 2 This evolution has enabled Lucent and Nortel to achieve advertised processor
1. 3 capacities and avoid processor exhaust situations or near exhaust scenarios that
1. 4 result in service degradation. In today's environment of sophisticated
1. 5 subscribers and services, it is improper and unrealistic to assume that
1. 6 processors will not exhaust throughout their life if not upgraded or retrofitted in
1. 7 the future, even given the capabilities of current processors. In fact, Nortel has
1. 8 acknowledged this by developing a sophisticated capacity management tool
1. 9 called **[BEGIN NORTEL PROPRIETARY] [END NORTEL**
1. 10 **PROPRIETARY]** for use by local exchange companies such as Verizon. Local
1. 11 exchange companies use **[BEGIN NORTEL PROPRIETARY] [END**
1. 12 **NORTEL PROPRIETARY]** to identify possible processor exhaust situations
1. 13 based on a series of demand inputs such as lines, trunks, calls and feature
1. 14 activations at both present and future timeframes. Assignment of getting
1. 15 started investment to traffic sensitive switching elements properly accommodates
1. 16 such processor growth and evolution, in a manner that tracks its cause: usage.

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[7] Consider Nortel's DMS-100F switching system as an illustration of such switch processor evolution. If a new DMS-100 was purchased in the early 1980's, Nortel supplied their current state of the art processor called NT40. If a new DMS-100 is purchased today, Nortel supplies, at a minimum, their SuperNode 70 (SN70) processor. The original NT40 processor, as well as the interim SuperNode vintages (SN10 through SN60) are no longer available for purchase and can not handle today's realtime *demand from subscribers. The SuperNode 70 processor is approximately* **[BEGIN NORTEL PROPRIETARY] [END NORTEL PROPRIETARY]** times faster than the original NT40 processor. More recently, Nortel is offering their latest processor complex beyond SuperNode 70, XA-CORE, providing further evidence that even today's processors are not expected to handle the realtime load throughout the life of the switching system.

1. 1 Q. How does SCIS apportion the "getting started" investment?

1. 2 SCIS apportions the getting started investment based on realtime. Telcordia
1. 3 obtains precise realtime consumption data from the switch vendors for different
1. 4 types of calls and features and incorporates this information into SCIS. As a
1. 5 result, SCIS provides a mechanism to apportion the getting started investment to
1. 6 individual calls and features based on the realtime actually consumed by such
1. 7 calls and features. The resulting investment is characterized as call setup
1. 8 related investment. This investment is eventually combined with other usage
1. 9 related investment (*i.e.*, investment per minute-of-use) in the cost study process.
1. 10 Based on their testimony, Verizon used a more direct approach to apportion
1. 11 getting started investment to minute-of-use costs. In their approach, Verizon
1. 12 apportioned the getting started investment from SCIS's total investment report
1. 13 directly to total minutes-of-use from their traffic data. Using their approach,
1. 14 Verizon apportioned the getting started investment to the correct destination,
1. 15 namely usage costs.

1. 16 Q. Please respond to AT&T/WorldCom's claim that "getting started" costs should be
1. 17 categorized as non-traffic sensitive. [Pitts at 33.]

1. 18 A. As I stated earlier, there is no controversy when the central processor is
1. 19 expected to exhaust. In that case, the getting started investment is clearly traffic
1. 20 sensitive in the long run. However, in the non-exhaust case I referenced the
1. 21 FCC's *Local Competition Order*[8/] that states shared costs must be reflected in

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[8/] First Report and Order, In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, 11 FCC Rcd 15499, ¶ 682 (1996).

1. 1 TELRIC studies. While the FCC does not state how this should take place in the
1. 2 TELRIC context, FCC policies reflect a general view that apportionment based
1. 3 on cost causation is desirable. AT&T/WorldCom are advocating an arbitrary
1. 4 allocation of getting started investment over ports. In contrast, Verizon MA
1. 5 proposes in this proceeding apportioning the getting started investment on a
1. 6 basis that more closely tracks cost causation, namely, usage. As I stated earlier,
1. 7 the ultimate limiting resource for the central processor is realtime. Call volumes
1. 8 (i.e. realtime) on a processor are related to usage. In fact, call volumes are
1. 9 commonly estimated by dividing total minutes-of-use by an average holding time
1. 10 per call when a call load measurement is not available. The link between usage
1. 11 (*i.e.*, minutes-of-use) as a cost assignment mechanism and the shared "getting
1. 12 started" investment is stronger than that of ports. AT&T/WorldCom have offered
1. 13 no basis for linking ports as a good cost assignment mechanism for getting
1. 14 started investment other than their belief that port elements and getting started
1. 15 investment are both non-traffic sensitive.
1. 16 Indeed, AT&T/WorldCom acknowledge in their rebuttal testimony that cost
1. 17 causation is the appropriate principle for apportioning switch investments.
1. 18 However, AT&T/WorldCom's linkage of ports as a cost assignment mechanism
1. 19 for getting started investment does not yield as cost causative a result as those
1. 20 obtained under Verizon's methodology.
1. 21 Q. AT&T/WorldCom claim that EPHC categories should be considered non-traffic
1. 22 sensitive. [Pitts at 35.] Please explain what the term "EPHC" means.

1. 1 A. The term "EPHC" stands for Equivalent POTS Half Calls. Assignment of the
1. 2 EPHC categories is an issue specific to Lucent's 5ESS switching system. The
1. 3 5ESS switching system is based on a distributed processor architecture using a
1. 4 primary building block called a switching module (SM). The common equipment
1. 5 of a switching module consists of a processor complex and network equipment
1. 6 designed to connect lines and trunks to each other. The EPHC categories of
1. 7 SCIS refer to investment results based on the "half" call capacity of the processor
1. 8 complex provided with SM common equipment. In general, any call processed
1. 9 by 5ESS switching module processors can be broken up into two "half" calls.
1. 10 The first half of the call is associated with functions needed to process the call
1. 11 from the originating line or trunk. These functions include tasks such as
1. 12 providing dial tone and collecting digits. The second half of the call is associated
1. 13 with functions needed to process the call going to the terminating line or trunk.
1. 14 These functions include tasks such as providing power ringing to the terminating
1. 15 line and audible ringing to the originating line. All calls are processed in one of
1. 16 two ways. In the first case, both halves of the call stay within the same SM. That
1. 17 is, the originating line or trunk and the terminating line or trunk are physically
1. 18 served by the same SM. In this case, a single SM processor processes both
1. 19 "halves" of the call. In the second case, each half of the call is processed in
1. 20 separate SMs. That is, the originating line or trunk is served by one SM and the
1. 21 terminating line or trunk is served by another SM. In this case, two SM
1. 22 processors process their respective half of the call. As one can observe, the true
1. 23 load on a single SM is easily expressed in terms of "half" calls. That way, there

1. 1 is no need to distinguish between calls processed entirely within a single SM
1. 2 versus calls that are processed by two SMs.
1. 3 Q. Please explain how SM common equipment is limited.
1. 4 A. Lucent's original SM platform is called "classic SM." Lucent's most recent
1. 5 switching module platform is called "SM2000." In the classic SM platform, the
1. 6 network equipment designed to connect lines and trunks to each other has a
1. 7 fixed time slot (i.e. connection path) capacity. Once this capacity is reached,
1. 8 another SM needs to be purchased. In the SM2000 switching module platform,
1. 9 the network equipment designed to connect lines and trunks to each other is
1. 10 scalable. That is, the network equipment can be purchased in discrete units of
1. 11 capacity. Up to **[BEGIN LUCENT PROPRIETARY] [END LUCENT**
1. 12 **PROPRIETARY]** such units of network can be added before another SM2000
1. 13 switching module needs to be purchased. In their testimony, AT&T/WorldCom
1. 14 correctly state that there is a port (i.e. time slot) limitation associated with the
1. 15 network equipment. When this port limitation is reached by serving a mixture of
1. 16 line interface and trunk interface equipment, another switching module must be
1. 17 purchased. This is true for the classic SM platform once the network capacity is
1. 18 reached. This is also true for the SM2000 platform once the ***maximum*** number
1. 19 of network units has been reached. ***However***, the processor complex provided
1. 20 in each SM has a call capacity limitation as well.
1. 21 Q. You've just stated that there are two capacities associated with the SM common
1. 22 equipment, ports and calls. Please explain why the EPHC categories of SCIS
1. 23 should be considered traffic sensitive.

1. 1 A. As discussed above, switch vendors have constantly evolved the processor
1. 2 complex of their respective digital switching systems in order to stay one step
1. 3 ahead of realtime demand. This statement is also true regarding Lucent's
1. 4 distributed processor architecture of the 5ESS. That is, Lucent has constantly
1. 5 evolved the SM processor complex of the 5ESS in order to stay one step ahead
1. 6 of call volume demand.[9/] This evolution has enabled Lucent to achieve
1. 7 advertised SM processor capacities and avoid processor exhaust situations or
1. 8 near exhaust scenarios that result in service degradation. Since the SM
1. 9 processors perform a significant portion of call processing functions, it is very
1. 10 important for Lucent to evolve their SM processor technology to handle
1. 11 constantly increasing call volume loads. Assignment of EPHC related investment
1. 12 to traffic sensitive switching elements properly accommodates such processor
1. 13 growth and evolution in a manner that tracks its cause: usage.
1. 14 Q. Since Lucent keeps upgrading their SM processors so that SM port capacities
1. 15 can be fully utilized, does Lucent expect every SM to fully utilize its port capacity?

1. ———————————

[9/] Lucent's classic SM processor types have evolved from SMP1 to SMP12 to SMP20 to SMP20 with data cache. SMP12 provided a **[BEGIN LUCENT PROPRIETARY] [END LUCENT PROPRIETARY]** increase in overall call capacity over SMP1. SMP20 provided a **[BEGIN LUCENT PROPRIETARY] [END LUCENT PROPRIETARY]** increase in overall call capacity over SMP12. SMP20 with data cache provided a **[BEGIN LUCENT PROPRIETARY] [END LUCENT PROPRIETARY]** increase in overall call capacity over SMP20. This information is taken from Lucent's Switching Engineering Procedures (SEP) **[BEGIN LUCENT PROPRIETARY] [END LUCENT PROPRIETARY]**. Lucent's SM2000 processor types have evolved from CORE40 to CORE60. The CORE60 processor is approximately **[BEGIN LUCENT PROPRIETARY] [END LUCENT PROPRIETARY]** times faster than the CORE40. This information is taken from Lucent's Switching Engineering Procedures (SEP) **[BEGIN LUCENT PROPRIETARY] [END LUCENT PROPRIETARY]**.

1. 1 A. No. It is Telcordia's understanding that Lucent has evolved their SM processor
1. 2 complex over time to achieve full utilization of the port capacity. However, there
1. 3 are circumstances when the realtime capacity is reached before full utilization of
1. 4 the port capacity. In fact, Lucent provides worksheets that allow local exchange
1. 5 companies to perform a detailed realtime utilization analysis of their SM
1. 6 processors so that exhaust or near exhaust situations can be identified[10/] and
1. 7 addressed by limiting the port demand on such SMs to something less than full
1. 8 capacity. In the case of the SM2000 platform, it is even more likely for the
1. 9 realtime capacity to be reached before the termination capacity associated
1. 10 because the number of network units can be grown. As the network units
1. 11 installed in a single SM2000 switching module increase, there are more lines and
1. 12 trunks competing for the fixed processor capacity provided. In fact, Lucent's
1. 13 pricing and engineering tool, **[BEGIN LUCENT PROPRIETARY] [END**
1. 14 **LUCENT PROPRIETARY]**, estimates the realtime load on individual SM2000
1. 15 switching modules and prevents its users from adding additional network units
1. 16 once the realtime capacity is reached. Based on Verizon MA's testimony, almost
1. 17 all 5ESS switching modules are modeled by the SM2000 platform in SCIS.
1. 18 Q. Please explain how SCIS handles the dual capacity (ports and call volumes)
1. 19 phenomenon of the SM common equipment.

1. _____

[10/] See Lucent's Switching Engineering Procedures (SEP) **[BEGIN LUCENT PROPRIETARY] [END LUCENT PROPRIETARY]**.

1. 1 A. SCIS recognizes that the SM common equipment has a dual capacity, ports and
1. 2 call volumes. This dual capacity phenomenon is addressed in SCIS by
1. 3 identifying investment that is related to actual usage of the SM processor
1. 4 complex (the EPHC investment categories related to usage) and investment that
1. 5 is related to unutilized capacity of the SM processor complex (the excess SM
1. 6 EPHC capacity investment categories related to ports) as separate items in its
1. 7 output reports.

1. 8 Both Verizon and AT&T/WorldCom are in agreement in their desire to
1. 9 apportion the ***unutilized*** capacity portion of SM investment results (*i.e.*, excess
1. 10 SM EPHC capacity investment) to its cost driver, ports. However, Verizon and
1. 11 AT&T/WorldCom differ regarding the appropriate cost drive for the utilized
1. 12 capacity portion of SM investment. Verizon MA testifies that it apportioned the
1. 13 ***utilized*** capacity portion of SM investment to its cost driver, usage. On the other
1. 14 hand, AT&T/WorldCom advocate apportioning this usage related investment to
1. 15 ports in their testimony.

1. 16 A similar dual capacity phenomenon exists regarding the line interface
1. 17 equipment of a switching system. Such equipment has a termination capacity
1. 18 (lines) and a usage capacity (minutes-of-use). This dual capacity phenomenon is
1. 19 addressed in SCIS in a similar manner as the SM dual capacity phenomenon
1. 20 described above. That is, SCIS identifies investment that is related to actual
1. 21 usage of the line interface equipment (line CCS investment categories related to
1. 22 usage) and investment that is related to unutilized capacity of the line interface
1. 23 equipment (the excess CCS capacity investment categories related to ports) as

separate items in its output reports. In this case, AT&T/WorldCom do not dispute the way Verizon apportions the line CCS investment categories to usage and the excess CCS capacity investment categories to ports.

Q. How did Verizon MA address the issue of dual capacity?

A. The testimony of Verizon MA addresses the dual capacity phenomenon in a consistent manner over all types of switching equipment. Specifically, investment related to actual usage of capacity is apportioned over its cost driver, usage. Investment related to unutilized capacity is apportioned over is its cost driver, ports. Verizon testifies that it did this for line termination equipment on all switching systems and for SM common equipment on 5ESS switching systems. In contrast, AT&T/WorldCom do not provide consistent treatment of the dual capacity phenomenon across line termination equipment and SM common equipment.

V. SUMMARY AND CONCLUSION

Q. Please summarize your testimony.

A. My surrebuttal testimony has addressed three primary issues. First, I have shown that SCIS is able to model installation of new switching systems, growth of existing switching systems, or a mix, as long as the appropriate discount input is entered into SCIS. It is not limited solely to installation of new switching systems as AT&T/WorldCom suggest. The pricing information requested from Telcordia by Verizon enabled Verizon to develop their discount input with respect to the same starting point as that used by Telcordia in development of the SCIS model. Second, I have shown that SCIS is more than just a "static" model due to its use

of capacity costs to model switching equipment that replicates frequently and its capability to model future upgrades and/or additions for switching equipment that replicates infrequently. Third, I have shown that there is a much stronger link to usage as a measure of cost causation than to ports for "getting started" investment and Equivalent POTS Half Call (EPHC) investment, making usage the more appropriate cost driver. However, due to the dual capacity nature of 5ESS switching module common equipment (call volumes and ports), SCIS provides a further breakdown of the EPHC investment into usage related investment associated with utilized capacity and port related investment associated with unutilized capacity.

Q. Does this conclude your testimony?

A. Yes.

Attachment A

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