1 **A. Loop Module**

2 **1. Definition Of A Loop**

3 **Q. What outside plant items comprise the loop?**

4 **A.** The outside plant ("OSP") items that comprise the loop and its components
5 include the local loop, subloop, line conditioning[15] and network interface device
6 ("NID"). The Modified Synthesis Model's loop module definition of these
7 components, with a few significant exceptions, reflects the definition established
8 by the Commission in the First Report and Order.
9

10 **Q. How was the local loop element defined in the Commission's First Report**
11 **and Order?**

12 **A.** The local loop element was defined in the Commission's First Report and Order
13 as:

14 . . . as a transmission facility between a distribution frame or its
15 equivalent, in an incumbent LEC central office, and the network interface
16 device at the customer premises. This definition includes, for example,
17 two-wire and four-wire loops that are conditioned to transmit the digital
18 signals needed to provide services such as ISDN, ADSL, HDSL and DS-1
19 level signals.[16]
20

[15] The Commission ordered that Line Conditioning costs be recovered as a non-recurring cost, and therefore line conditioning costs are not identified by the Modified Synthesis Model. In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98, *Third Report and Order and Fourth Further Notice of Proposed Rulemaking*, FCC-238 (rel. Nov. 5, 1999) at ¶ 194.

[16] In the Matter of the Local Competition Provisions of the Telecommunications Act of 1996, In the Matter of Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers, CC Docket Nos. 96-98 and 95-185, *First Report and Order*, FCC-325 (rel. Aug. 8, 1996) at ¶ 380 ("First Report and Order").

In defining the loop this way, the Commission not only specified the physical nature of the loop, but also defined the loop in terms of its capability to deliver specific types of services.

Q. What are the current Commission definitions of the local loop, subloop, line conditioning, and network interface device elements?

A. The Commission's unbundling rules further defined the loop, and other elements that comprise it, including the subloop, line conditioning, and network interface device as:

> The local loop network element is defined as a transmission facility between a distribution frame (or its equivalent) in an incumbent LEC central office and the loop demarcation point at an end-user customer premises, including inside wire owned by the incumbent LEC. The local loop network element includes all features, functions, and capabilities of such transmission facility. Those features, functions, and capabilities include, but are not limited to, dark fiber, attached electronics (except those electronics used for the provision of advanced services, such as Digital Subscriber Line Access Multiplexers), and line conditioning. The local loop includes, but is not limited to, DS-1, DS-3, fiber and other high capacity loops.[17]

> The subloop network element is defined as any portion of the loop that is technically feasible to access at terminals in the incumbent LEC's outside plant, including inside wire. An accessible terminal is any point on the loop where technicians can access the wire or fiber within the cable without removing a splice case to reach the wire or fiber within. Such points may include, but are not limited to, the pole or pedestal, the network interface device, the minimum point of entry, the single point of interconnection, the main distribution frame, the remote terminal, and the feeder/distribution interface.[18]

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[17] 47 C.F.R. § 51.319(a)(1).

[18] 47 C.F.R. § 51.319(a)(2).

> Inside wire is defined as all loop plant owned by the incumbent LEC on end-user customer premises as far as the point of demarcation....[19]

> Line conditioning is defined as the removal from the loop of any devices that may diminish the capability of the loop to deliver high-speed switched wireline telecommunications capability, including xDSL service.[20]

> The network interface device network element is defined as any means of interconnection of end-user customer premises wiring to the incumbent LEC's distribution plant, such as a cross-connect device used for that purpose.[21]

In these rulings, the Commission moved away from narrowly defining loops to provision a limited range of services for federal USF purposes, and instead adopted an expanded definition that requires UNE loops to support a much broader range of services.

Q. Please explain why the USF requirements reflected in the Modified Synthesis Model's loop module cannot produce TELRIC-compliant UNE costs.

A. The Modified Synthesis Model is incapable of accurately determining the costs for all components of the loop as defined by the Commission (such as fiber loops, subloop-distribution and subloop-feeder). For those elements of the loop that the Modified Synthesis Model is capable of developing cost estimates, the cost

[19] 47 C.F.R. § 51.319(a)(2)(i).

[20] 47 C.F.R. § 51.319(a)(3)(i).

estimates are incorrect because the Model fails to use forward-looking engineering standards and fails to apply proper costing criteria. In addition, the Model is incapable of modeling a loop that is able to support the wide-range of services required, including dark fiber, ISDN, DDS, DS-1, and DS-3.

2. Loop Design, Engineering And Quality Of Service Issues

Q. Does the Modified Synthesis Model adhere to Carrier Serving Area loop design standards?

A. No. The Modified Synthesis Model does not adhere to Carrier Serving Area ("CSA") loop design standards, which limit the use of copper loops to 12,000 feet beyond the feeder/distribution interface and enable Verizon VA to support a wide range of digital services. In developing the Synthesis Model for its national USF program, the Commission abandoned the CSA standard, thereby causing the Synthesis Model to design plant that may be incapable of supporting many services currently offered over basic loops (i.e., a modem speed greater than 28.8 kbs, ISDN, DDS) and will introduce inefficiencies in incumbent local exchange carrier ("ILEC") provisioning processes. This standard is not forward-looking since it is not capable of efficiently provisioning the services that the Commission uses to define a loop. Analog modems, BRISDN, and DDS were designed to work within the CSA loop standards. Any deviation from these standards could prevent the delivery of these services and would introduce inefficiencies in the incumbent carrier's operations. Attachment 2 describes how the CSA loop design standards evolved over time.

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[21] 47 C.F.R. § 51.319(b).

1

2 **Q. Does the failure to adhere to appropriate industry engineering guidelines for**
3 **designing the OSP network have a significant impact on the loop cost**
4 **estimates of the Modified Synthesis Model?**

5 **A.** Absolutely. Verizon VA has over 11,500 distribution areas in its network, but
6 the Modified Synthesis Model develops only 5,575 serving areas.[22] Although the
7 estimate of 5,575 distribution areas is severely understated, it would have been
8 even lower were it not for the use of the inflated line count. The Modified
9 Synthesis Model's understatement of distribution areas by approximately 51
10 percent is the result of its failure to support the industry distribution CSA loop
11 design standard, and as I will discuss, failure to account for vacant residential and
12 business units, to adhere to accepted industry engineering practices when building
13 OSP, and to exercise sound economic judgment when designing the feeder and
14 distribution networks. These infirmities highlight the fundamentally flawed,
15 theoretical nature of the Modified Synthesis Model. The significant
16 understatement of the distribution plant investment per-unit, due to overstated
17 demand, unattainably high utilization, low structure costs, fewer distribution areas
18 and too little length of cable, causes the Modified Synthesis Model to produce an
19 unreasonably low estimate of the cost of provisioning adequate loop plant.

20

[22] For purposes of this analysis, I will refer to Model serving areas, or clusters, rather than distribution areas because the Model does not provide detailed outputs for distribution areas. This approach is used because the difference between the number of distribution areas (equivalent to the Serving Area Interfaces (SAIs)) and clusters is minimal. While the Modified Synthesis Model can establish as many as two distribution serving areas per cluster, it generates 5,575 clusters and 5,652 SAIs (distribution areas) (about 1 percent more distribution areas than the number of clusters).

1 **Q. Why did the Commission adopt a cost model that does not adhere to**
2 **forward-looking loop design standards?**
3 **A.** The Commission adopted the Synthesis Model for the national USF mechanism
4 and found "that the public interest would not be served by burdening the federal
5 universal support mechanism with the additional cost necessary to support a
6 network that is capable of delivering very advanced services."[23] Thus, in the USF
7 context, the Commission was content to model a network that ignored the need to
8 provide all services that Verizon VA's network is designed to provide, including,
9 ISDN, DDS, DS-1, DS-3 and dark fiber. As a result, AT&T/WorldCom's
10 Modified Synthesis Model is not capable of modeling the type of network needed
11 to provide all of these services.
12
13 **Q. Does the Modified Synthesis Model adhere to accepted loop planning**
14 **standards and guidelines?**
15 **A.** No. The Modified Synthesis Model fails to adhere to industry standard loop
16 planning and sizing guidelines that recommend building sufficient distribution
17 plant to accommodate subscribers' needs for multiple lines, demand fluctuations
18 (also called "churn") and growth. For example, Lucent Technologies' "Outside
19 Plant Engineering Handbook" recommends, as the standard for allocating
20 distribution cable pairs, 2 pairs per potential residential living unit and 5 pairs per

[23] Fifth Report and Order at ¶ 70.

potential business for small business areas.[24] Verizon VA's distribution facilities have been built according to industry guidelines and Verizon VA's cost study includes sufficient distribution facilities to meet the needs of customers. The Modified Synthesis Model ignores accepted industry practices and, as a result, models loop plant with insufficient capacity to meet current and future demand needs.

Q. Does the Synthesis Model follow a stringent loop plant sizing standard for USF purposes?

A. No. The Commission, in the Tenth Report and Order, recognized that companies build distribution plant to "ultimate demand," but rejected this practice, in part, because of the burden that it placed on the USF mechanism.[25] However, by ignoring industry-accepted OSP planning guidelines when costing UNEs, the Synthesis Model, and by default the Modified Synthesis Model, effectively allow competitors to utilize services for which they have inadequately compensated Verizon VA.

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[24] Lucent Technologies, "Outside Plant Engineering Handbook" (Oct. 1996) Interfaced Cable Sizing Guidelines at pgs. 3-11. This Handbook was originally prepared and published by AT&T and is now published by Lucent as a result of the corporate separation.

[25] Tenth Report and Order at ¶ 199.

1 **Q. Does the Modified Synthesis Model further understate OSP investment by**
2 **ignoring vacant residential and business units?**
3 **A.** Yes. Year 2000 Census Bureau statistics for Virginia show that approximately
4 205,000 housing units (or approximately 7.1 percent of all housing units) were
5 vacant at the time of the census. Of these, 150,300 (or 73.3 percent) are
6 classified as year-round use.[26] A significant number of housing units are vacant
7 pending rental turnover or real estate transfer. Tenants and buyers generally
8 expect to have telephone service at their new location at or near the time of
9 occupancy, particularly when the space was previously occupied.
10
11 Furthermore, in designing and placing OSP facilities, engineers must also
12 consider existing vacant lots that are potential building sites as well as zoning
13 laws that regulate building occupancy. In a neighborhood of multi-family homes,
14 it is appropriate to engineer the OSP to the expected level of occupancy, even
15 though the living units might be occupied by fewer families than zoning
16 regulations permit.[27] By ignoring these real-world costs associated with vacant
17 residential and business units, the Modified Synthesis Model is able to artificially
18 decrease UNE cost estimates.
19

[26] United States Census Bureau 2000 General Demographic Characteristics (Table DP-1) for Virginia.

[27] AT&T/WorldCom stated in response to Verizon VA's Third Set of Data Requests to AT&T and Fourth Set of Data Requests to WorldCom, Request No. VZ-VA 53, that the Model includes some unoccupied housing units since the customer locations data is based, in part, on an address database for mass mailings. As with AT&T/WorldCom's other assertions, there is no quantitative or documented support for this claim or the amount of vacant housing allegedly covered by the mailing list. It is also improbable that the database referred to by AT&T/WorldCom sent mailings to vacant lots.

Q. Does the Modified Synthesis Model adhere to widely-accepted engineering standards in sizing the feeder and distribution networks?

A. No. Widely-accepted engineering standards call for maximizing the length of the feeder segment of a local loop to take advantage of the inherent efficiencies in feeder plant. The Modified Synthesis Model fails to adhere to these standards by using a smaller number of clusters (i.e., surrogate distribution areas) than would be used in an optimally-designed network. This smaller number of clusters produces shorter feeder segments between the distribution areas and the central office.

Q. Why is it efficient to maximize the feeder segment of the loop?

A. Feeder facilities can be operated at higher utilization levels than distribution facilities because feeder facilities serve larger groups of subscribers and experience less variability in demand. Widely-accepted engineering standards and sound economic reasoning account for this by maximizing the length of the feeder portion of loops and minimizing the length of the distribution portion.

Q. How does the Modified Synthesis Model's failure to maximize the feeder segment of the loop impact the Model's loop cost estimates?

A. The Model's failure to maximize the length of feeder facilities produces lower total costs of feeder plant in the Model's hypothetical network. Rather than reflect all of the added costs of distribution facilities associated with the Model's inefficient design, the Model instead greatly understates the amount of

distribution facilities necessary to serve existing customers. This combination of an inefficiently small amount of feeder facilities and an impossibly small amount of distribution facilities substantially understate the loop investments necessary to serve Verizon's VA's customers.

Q. Does the Modified Synthesis Model adhere to service quality standards imposed by the Virginia Commission?

A. No. The Virginia Commission's service quality standards require Verizon VA to complete orders for new service within certain specified time frames.[28] Operational efficiency dictates that facilities remain in place when housing and business units are temporarily unoccupied. However, because lines to vacant housing and business units are not reported in ARMIS, the Modified Synthesis Model fails to account for them when developing the OSP network UNE cost estimates. As a result, the Model could not possibly meet the service quality standards expected by the Virginia Commission. Furthermore, the Synthesis Model fails to conform to basic engineering practices or reflect sound economic judgment in designing the network, and thereby drives up the cost of provisioning new services to Virginia consumers because of the inefficiencies resident in the Synthesis Model's network.

[28] 20 VAC 5-400-800.

3. Unbundling Digital Loop Carrier

Q. What assumptions does the Modified Synthesis Model make about fiber-fed digital loop carrier ("DLC") loops?

A. The Modified Synthesis Model assumes that all fiber fed DLC loops will be provisioned utilizing the GR-303 integrated digital loop carrier ("IDLC") switch interface, and it further assumes that it is technically feasible to unbundle such loops.

Q. Is it technically feasible and cost-effective to provide access to unbundled loops served with the GR-303 IDLC interface?

A. No. As the Verizon cost panel explained, industry standards and technical interfaces need to be developed to support using GR-303 in a multi-carrier environment.[29] Remote terminal ("RT") suppliers would also have to develop additional security, error-detection, and other capabilities necessary to support the use of the same RT and central office terminal ("COT") by multiple carriers. This required technology is not presently available.

[29] Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, -251, *Verizon Virginia Inc. Panel Testimony on Unbundled Network Element and Interconnection Costs* (July 31, 2001) at pgs. 90-93 ("Verizon VA's Cost Panel Testimony").

Q. Does AT&T/WorldCom's alleged solution to unbundling GR-303 IDLC capture all applicable costs?

A. No. Apart from the technical problems associated with a multi-carrier IDLC environment, the Modified Synthesis Model does not determine all appropriate costs that would be incurred by Verizon VA to unbundle GR-303 IDLC. For example, AT&T/WorldCom propose, as shown in Attachment 3, to unbundle IDLC by diverting a dedicated DS-1 level connection, which would be required for each competitive local exchange carrier ("CLEC") in a multi-carrier IDLC environment, from the COT to CLEC facilities. The Modified Synthesis Model, however, does not account for the cost of a dedicated DS-1 connection to the CLEC even if a multi-carrier environment could be supported, which it cannot.

4. Customer Location Issues

Q. Why is it important to accurately size distribution areas and locate customers in the network modeled by the Modified Synthesis Model?

A. In order to produce accurate results, a cost model must have an accurate representation of the area that is being modeled, an accurate identification of line counts within that area, and representative customer location data. These data inputs are the foundation of the OSP, directly influencing costs; as such, they must be accurate -- a requirement that the Modified Synthesis Model cannot satisfy.

Q. Does the Modified Synthesis Model accurately size serving areas?

1 A. No. Serving areas are typically composed of 200 to 600 living units.[30] Serving
2 areas are sized in this manner because feeder should be maximized and
3 distribution minimized as previously explained. Indeed, in a recent proceeding in
4 Maryland, Mr. Riolo, AT&T's OSP expert, testified that a serving area sized as
5 such is generally consistent with a forward-looking methodology.[31] However, the
6 Modified Synthesis Model, as a result of its inefficient and inappropriate OSP
7 design, models a network in which 21 percent of the serving areas exceed 600
8 living units.[32]
9
10 The Modified Synthesis Model's oversizing of serving areas can, in part,
11 be explained by the Model's clustering algorithm. The Commission, in
12 developing the Synthesis Model, utilized an algorithmic approach that created a
13 smaller number of large clusters in order to generate cost advantages for rural
14 areas.[33] However, because the Modified Synthesis Model creates a limited
15 number of large clusters, it violates economic and widely-accepted engineering

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[30] Lucent Technologies, "Outside Plant Engineering Handbook" (Oct. 1996) Interfaced Cable Sizing Guidelines at pgs. 3-10.

[31] Before the Maryland Public Service Commission, Case No. 8745, *Hearing Transcript, Volume IV* (June 28, 2001) at p. 976, lines 11-15.

[32] AT&T/WorldCom's cost study for Virginia generates 5,575 serving areas in which 4,377 serving areas have 600 or fewer households, and 1,198 serving areas (21 percent of the total) have more than 600 households. Of the 1,198 serving areas that exceed 600 households, 584 serving areas contain 800 or more households.

[33] Before the Federal Communications Commission, CC Docket Nos. 00-251, -249, -251, Cost Studies and Supporting Documentation Setting Forth Cost Model Outputs for Unbundled Network Elements and Associated Non-Recurring Charges Submitted by AT&T Communications of Virginia, Inc. and WorldCom, Inc. Volume I (July 2, 2001) at Attachment B, p. 6 ("AT&T/WorldCom Cost Model Documentation").

practices, and produces results that bear no relationship to the Network Operations of any efficient carrier in the real world. The problematic design, as I have already mentioned, should increase costs rather than reduce costs as the Modified Synthesis Model has inappropriately done.

5. The Modified Synthesis Model's Incorrect Treatment Of Special Access Services Understates The Cost Of The 2-Wire Loop

Q. Is an accurate depiction of service demand essential to the development of TELRIC-compliant loop cost estimates?

A. Very much so. TELRIC principles determine proper economics of scale by including total demand for all services – nothing more and nothing less. The quantity of lines affects the scale of the network and therefore the efficiencies inherent in the network. It is this scale and associated efficiencies that, in part, determine UNE costs.

Q. What types of lines are included in special access lines?

A. Special access lines include traditional analog private lines and digital private services, including 64K DDS, DS-1 and DS-3 services. Digital special access lines are reported in ARMIS as equivalent DS-0 circuits. A special access DS-1 service delivers the equivalent of 24 voice grade channels (or DS-0 equivalents) over two copper cable pairs or as a channel inside a high capacity fiber system. Correspondingly, a DS-3 service delivers the equivalent of 28 DS-1 services (or 672 voice grade channels/DS-0 equivalents) over coaxial or fiber optic cable.

Both types of high-speed services also require electronic multiplexing equipment at the originating and terminating locations.

Q. Does AT&T/WorldCom use a reasonable forecast of special access lines in the Modified Synthesis Model?

A. Absolutely not. AT&T/WorldCom relies on an inflated estimate of special access line growth, as shown in Table 2 below, which more than doubles the number of special access lines between the years 2000 and 2002 and drives up the percentage of special access lines as a portion of total lines from 17.3 percent to 40.1 percent.

TABLE 2
AT&T/WorldCom's
Forecast of Special Access Lines

Year	Special Access Lines (Millions)	Total Lines* (Millions)	Percent Special Access to Total
1999	0.794	4.601	17.3
2000	1.403	5.242	26.8
2001	1.983	5.996	33.1
2002	2.803	6.999	40.1

Source: AT&T/WorldCom Cost Studies submitted on July 2, 2001.
*Total lines combines business, public, residence, and special access.

Q. Is AT&T/WorldCom's inflated forecast of special access lines justified?

A. Absolutely not. There is no justification for the projected 41 percent growth rate for the years 2001 and 2002, as shown in AT&T/WorldCom's Attachment D to its

1 cost study.[34] Mr. Pitkin failed to notice that Verizon VA's increase in special
2 access line count in the year 2000 was the result of a change in the way Verizon
3 VA defined those lines; it was not the result of a high growth rate as Mr. Pitkin
4 incorrectly assumed. Mr. Pitkin ignored the footnote in the ARMIS report for
5 special access lines that stated, "Data changed significantly over previous years
6 due to adjustments required to meet the Commission's revised reporting
7 requirements."[35] However, even if Mr. Pitkin's special access forecast was
8 correct, which it is not, the Modified Synthesis Model is incapable of accurately
9 modeling special access services. Instead, Mr. Pitkin's extraordinary forecast only
10 exacerbates the Model's flaws. Mr. Pitkin's inappropriate estimate of special
11 access DS-0 equivalents as well as his misguided attempt to modify the Model's
12 treatment of special access services, coupled with the inability of the Modified
13 Synthesis Model to properly build and estimate the costs of special access
14 services, is nothing more than an improper attempt to manipulate the Model's
15 erroneous treatment of special access lines in order to drive down loop costs.
16
17 **Q. How does the Modified Synthesis Model determine the number of special**
18 **access loops?**
19 **A.** The Modified Synthesis Model improperly assumes that all DS-1 and DS-3
20 services reported as special access lines in ARMIS (as equivalent DS-0 line
21 counts) are provisioned on individual physical loops, even though DS-3 services

[34] AT&T/WorldCom Cost Model Documentation at Attachment D.

[35] Verizon FCC ARMIS Report 43-08, COSA: CVVA (for year-end Dec. 31, 2000) at fn. 3.

can only be provisioned over coaxial or fiber optic cable and DS-1 services are either contained within higher speed DS-3 signals or provisioned over just 2 physical loops, not 24 as is assumed by Mr. Pitkin assumes. In an attempt to address criticisms that the Model inappropriately divides loop investment by DS-0 equivalents plus plain old telephone service ("POTS") loops, rather than by the actual physical loops required, Mr. Pitkin altered one of the Model's inputs so that it builds an individual loop for each DS-0 equivalent reported in ARMIS, even though DS-1 and DS-3 services are not provisioned in this manner.

Q. What is the effect on the loop cost of using special access DS-0 equivalents as reported in ARMIS?

A. The use of DS-0 equivalents, while overstating the amount of loop plant in the Modified Synthesis Model, actually works to significantly understate the cost of the 2-wire copper loop typically used to provision basic exchange service. First, the Modified Synthesis Model overbuilds the loop plant by building a separate loop for every access line and every special access DS-0 equivalent. Per-line costs are then determined by dividing the total loop cost by the combined count. By failing to factor into the equation the exact count of DS-1 and DS-3 circuits and their attendant actual loop plant requirements, and dividing by the actual number of in-service physical loops, the Model assumes efficiencies that simply do not exist.

This approach also distorts the amount of outside plant that is built since special access lines are distributed by the Modified Synthesis Model across all business exchange lines. In reality, these special access services (e.g., DS-1, DS-3) are not uniformly distributed, but concentrated in a select few large business locations. Logically, a single service that equates to 672 lines and is carried on coax or fiber cable, should not be distributed uniformly as reflected in the Model. For the most part, special access services should have little impact on 2-wire OSP, especially to residential and small business locations. Thus, the Modified Synthesis Model improperly drives down the loop investment through the inefficiencies associated with the larger but improperly distributed loop plant and non existent economies of scale.

Q. Have you quantified the relative cost impact on two-wire loops resulting from Mr. Pitkin's exaggerated special access line forecast?

A. Yes. Table 3 below shows the loop costs produced by the default version of the Synthesis Model, the loop cost using Mr. Pitkin's misstatement of DS-1 and DS-3 special access lines, and an estimate of the loop cost using more appropriate actual physical loop requirements. The only purpose of the loop costs shown in the table is to quantify the relative change in cost associated with each set of inputs. In no way do the results suggest that any of the loop costs shown are representative of Verizon VA's actual loop costs.

TABLE 3
Comparison of 2- Wire Loop Costs

Method	Cost Per Loop
Synthesis Model Default Methodology	$5.49
Mr. Pitkin's Adjustments-All DS-0s on Physical Loops	$5.92
Predetermined Pair Requirements for Special Access Lines	$8.65

Note: All loop costs are based on Mr. Pitkin's erroneous 2002 demand levels.

Q. Please describe what each loop cost shown above represents.

A. The $5.49 cost per-loop is the product of the Synthesis Model's default methodology, which develops total loop costs based on somewhat more, but not totally, appropriate loop requirements for special access lines and divides inappropriately total loop costs by the total number of DS-0 equivalents, rather than physical loops required.

The $5.92 cost per-loop assumes that all special access DS-0 equivalents are provisioned inappropriately on individual loops. However, as I explained above, Mr. Pitkin's unrealistic special access line forecast combined with his equating the need for an individual loop based on DS-0 equivalents exaggerates the Model's efficiencies by overbuilding the loop plant.

The $8.65 cost per-loop reflects a more, but not totally, appropriate methodology to treat special access lines in the Modified Synthesis Model despite

the fact that the Model itself cannot produce an accurate loop cost because of its inherent flaws. This estimate mirrors the Synthesis Model's calculation for total loop cost, but predetermines more realistic physical loop requirements for special access lines by dividing the total loop cost by the total number of actual physical loops required. The only purpose of this demonstration is to show the relative effect on costs that each treatment of special access lines produces and should not be construed as an accurate display of loop costs. The Modified Synthesis Model simply cannot handle DS-1 and DS-3 services properly.

Looking at the cost of the 2-wire loop as compared to the cost produced by the Synthesis Model's default values, Mr. Pitkin's erroneous manipulations understates loop costs by almost 50 percent. Mr. Pitkin's artificial reduction in the 2-wire loop cost will also decrease the cost of all other loops that are based on this 2-wire cost.

Q. Have you estimated the extent to which Mr. Pitkin's treatment of special access DS-1 and DS-3 services has caused the Modified Synthesis Model to overbuild Verizon-VA's loop plant?

A. Yes. Verizon-VA had approximately ***Begin Verizon-VA proprietary***XXX ***End Verizon-VA Proprietary** DS-1 special access services and approximately ***Begin Verizon-VA proprietary***XXX ***End Verizon-VA Proprietary** DS-3 special access services at year end 2000. The DS-1s require approximately ***Begin Verizon-VA proprietary***XXX

1 ***End Verizon-VA Proprietary** physical loops (e.g., 2 copper pairs per DS-
2 1)[36] that terminate at no more than (and probably significantly less than)
3 ***Begin Verizon-VA proprietary*** XXX ***End Verizon-VA Proprietary**
4 customer locations and the DS-3s would require ***Begin Verizon-VA
5 proprietary*** XXX***End Verizon-VA Proprietary** physical fiber and/or
6 coaxial loops terminating at no more than (and probably significantly less than)
7 ***Begin Verizon-VA proprietary*** XXX ***End Verizon-VA Proprietary**
8 customer locations. As I have previously explained, the Model does not build any
9 fiber or coaxial loops that terminate at any customer locations.
10
11 In attempting to address previous criticisms, Mr. Pitkin has
12 inappropriately set the Modified Synthesis Model input for "pct_ds1" special
13 access lines at zero instead of the Commission determined default value of 91.75
14 percent. He would thus have caused the Model to build approximately 1.4 million
15 physical loops (e.g., pairs) based on year 2000 data as opposed to the ***Begin
16 Verizon-VA proprietary*** XXX ***End Verizon-VA Proprietary** physical
17 loops actually required for the DS-1s. These exaggerated loops and the attendant
18 and unsubstantiated economies of scale are then spread across all business
19 customer locations rather than the actual termination points of the services. The
20 net result is a significant dilution of OSP costs. Although Mr. Pitkin claims that
21 this "correction" is in response to my criticism (which he obviously agrees is

[36] Even these copper pairs are an absolute upper limit since a significant number of DS-1s are provisioned on multiplexed fiber systems or fiber DLC systems to the premise and use no copper at all. Again, the Model is simply not sufficiently sophisticated to reflect this real-world network architecture.

valid) of the Model's inappropriate division of total loop investment by total derived channels (special access DS-0 equivalents plus POTS loops), in reality it is nothing more than an abuse of the Model's shortcoming and its lack of sufficient sophistication to properly handle special access services. He has even more severely exacerbated this problem by his inappropriate and inflated forecast of year-end 2002 special access line counts. The Commission should not countenance this abuse of the Model's shortcomings.

Q. Does the Modified Synthesis Model account for the loop electronics required to provision special access DS-1 and DS-3 services?

A. No. The Modified Synthesis Model does not include the investment for the electronic multiplexing equipment that enables special access DS-1 services to function over copper cable and DS-3 services to function over coaxial or fiber optic cable. Without provisioning this equipment, the modeled loop lacks the necessary functionality to deliver DS-1 or higher speed services. Not surprisingly, the omission of this necessary equipment serves to further understate the estimated loop cost produced by the Model.

In fact, the Commission can and should summarily reject the Modified Synthesis Model on the basis of this lack of sophistication and inability to properly account for "All Services" that use the network.

Q. Does Mr. Pitkin's manipulation of the Modified Synthesis Model's inability to handle special access services comply with TELRIC principles?

A. Absolutely not. It is a blatant violation of TELRIC principles to model anything more than total demand and the specific forward-looking network components required to provide that demand.[37] As I have demonstrated, Mr. Pitkin has grossly exaggerated loop demand and the Model is not sufficiently sophisticated to model the requisite network components to provision that demand.

6. AT&T/WorldCom's Improper Treatment Of 4-Wire, DS-1 And DS-3 Loops Produces Inaccurate Cost Estimates That Are Not TELRIC-Compliant

Q. Does Mr. Pitkin employ TELRIC-compliant methods in developing the costs for four-wire, DS-1 and DS-3 loops?

A. No. Mr. Pitkin's calculation of the cost for 4-wire, DS-1 and DS-3 loops is flawed conceptually and as implemented. Specifically, the Modified Synthesis Model does not calculate the costs of provisioning 4-wire, DS-1 or DS-3 loops or identify the cost differences between any functionalities.

Mr. Pitkin was forced to rely on a string of assumptions and non-cost based rate relationships to manipulate an already understated and non-TELRIC compliant 2-wire loop cost to produce an out-of-model estimate for the other loops. The starting point for Mr. Pitkin's calculations is the flawed assumption

[37] First Report and Order at ¶ 682.

that the Modified Synthesis Model's loop cost accurately identifies the cost of a 2-wire loop that meets the Commission's definition of a loop element -- in fact, nothing could be further from the truth. Significantly, Mr. Pitkin employs a different method to develop the cost of a 4-wire loop than the method he uses to develop DS-1 and DS-3 loop costs, but offers no explanation as to why the conceptual approach should be different.

Q. What assumptions underlie Mr. Pitkin's development of the 4-wire loop cost?

A. In estimating the cost of a 4-wire loop, Mr. Pitkin inappropriately assumes that each of the components (NID, Concentration, Feeder and Distribution) that make up a 2-wire DLC and Non-DLC loop are accurate. He thus assumes that only minor adjustments are required to develop a 4-wire cost.

Consequently, Mr. Pitkin employs non-cost based assumptions to adjust the 2-wire loop cost to a 4-wire loop cost. For example, he states for the DLC Concentration element, the "DLC channel unit investment will increase (estimated to double) for a 4-wire loop. Thus, overall DLC costs are estimated to be approximately 40 percent higher for a 4-wire loop than for a 2-wire loop."[38] Similarly, he assumes that the Feeder and Distribution elements will double, and the NID value will increase by $0.03 to account for an additional overvoltage

[38] Pitkin Direct Testimony at p. 24.

protector. The total effect of Mr. Pitkin's adjustments results in a 4-wire loop cost that is 1.7 times greater than the cost of the 2-wire loop.

Q. Is Mr. Pitkin's methodology for developing a 4-wire loop cost correct?

A. No. The Synthesis Model, with or without AT&T/WorldCom's modifications, designs a network that can only provision POTS, and assumes that all lines consume the same portion of each element. As a result of this averaging across all lines, Mr. Pitkin's initial cost estimates are understated. For example, 4-wire services would typically be provisioned to businesses that have larger NIDs, or as is often the case, an inside terminal instead of a NID. These inside terminals are connected by cables rather than drops, which are typically used with NIDs. The cost of each element produced by the Synthesis Model does not reflect these differences and as I previously discussed, understates costs because of its inappropriate treatment of special access lines. Even assuming that the cost of an average NID was a reasonable starting point, which it is not, Mr. Pitkin's adjustment for an overvoltage protector does not reflect any of the cost for the NID enclosure.

Q. What is the concentration function inherent in the assumed GR-303 IDLC?

A. The GR-303 remote terminal is designed to concentrate the traffic generated by switched analog distribution lines over significantly fewer DS-0 paths to the central office switch. This capability is also referred to as dynamic time slot assignment in the GR-303 IDLC architecture. For illustrative purposes, in my

discussion below, the remote terminal will require one DS-0 to the central office for every four POTS lines in the distribution area served by the DLC remote terminal.

Q. Does Mr. Pitkin correctly account for the cost of the concentration function inherent in the assumed GR-303 IDLC in his development of a 4-wire loop cost estimate?

A. No. Mr. Pitkin inappropriately assumes that no adjustment is required for the DLC common equipment, the Feeder/Distribution Interface or the fiber feeder. Mr. Pitkin makes no adjustment for the additional DLC common equipment required by 4-wire circuits and mistakenly assumes they can be concentrated in the same fashion as 2-wire POTS lines are. Switched lines operating over the switched network are the only lines that can take advantage of the GR-303 IDLC dynamic time slot assignment (concentration) capability. Four-wire loops are not susceptible to the concentration and dynamic time slot assignment assumed in the Model's GR-303 architecture. Four-wire loops are generally "full period" loops, meaning they have a full time, 100 percent dedicated transmission path, available exclusively to the subscriber of the 4-wire loop. Whereas a basic POTS line only should be assigned a quarter of the cost of a DS-0 (within the DLC and connecting to the central office) because of the concentration feature, a 4-wire loop needs to be assigned the full cost of a DS-0 because it requires this dedicated path. Therefore, the 2-wire POTS DLC costs associated with the concentration and transport to the central office associated with a 2-wire POTS circuit more

appropriately should be increased by a factor of 4 (the 4:1 line concentration ratio).[39]

Mr. Pitkin also did not capture additional common equipment allocations that should be made. Specifically, a 4-wire private line circuit requires a special services channel unit termination. These special services channel units provide less capacity than a switched POTS line card occupying the same plug-in shelf slot. In general, a given number of 4-wire circuits will require from 2 to 4 times as many channel units (line cards, and thus shelf slots as POTS lines require). That means 4-wire circuits will require from 2 to 4 times as many plug-in slots, shelf space and cabinet space than a 2-wire POTS line. Therefore, the component common equipment cost allocation per circuit for a 4-wire circuit should be 2 to 4 times higher than a POTS line card.

Attachment I to AT&T/WorldCom's cost study also shows that the 4-wire loop cost and the DS-1 loop cost are a statewide average rather than deaveraged by density zone. This statewide average is inconsistent with the Commission's geographic deaveraging requirements and Verizon VA's presentation of its 4-wire and DS-1 loop costs.

Q. Are Mr. Pitkin's out-of-model adjustments to produce the cost of DS-1 and DS-3 loops appropriate?

[39] If the Model uses a higher concentration ratio, the multiplier should be increased proportionally. For example, the multiplier should be 6 for a concentration ratio of 6:1.

1 **A.** No. Mr. Pitkin's estimate of DS-1 and DS-3 loop UNE costs completely
2 abandons the cost relationships used, albeit incorrectly, to adjust the 2-wire cost to
3 produce a 4-wire cost. Unlike his 4-wire cost calculation where he attempted to
4 adjust individual 2-wire loop components to develop a 4-wire cost, Mr. Pitkin
5 does not account for any of the physical equipment components necessary to
6 provision DS-1 and DS-3 services. Instead, Mr. Pitkin inappropriately assumes
7 that DS-1 and DS-3 costs can be estimated using cost/price relationships. Based
8 on this inconsistency alone, the Commission should reject Mr. Pitkin's non-cost
9 based approach.
10
11 However, Mr. Pitkin's cost/price approach to cost development is also
12 flawed. Mr. Pitkin assumes that there are 8 DS-0 equivalents per-pair, which are
13 adjusted down for DS-1s, and up for DS-3s, using an unsupported relationship in
14 demand for DS-1 and DS-3 services and a 1994 nationwide benchmark DS-3 to
15 DS-1 non-cost based price relationship. However, it is clear that Mr. Pitkin's
16 premise of 8 DS-0 circuits, which was developed from intraLATA private line
17 loops and special access DS-0 equivalents, is fundamentally flawed because Mr.
18 Pitkin inappropriately assumes away any difference in the mix among analog, DS-
19 1 and DS-3 services underlying the private line and special access values he uses.
20 Consistent with these flawed assumptions, Mr. Pitkin further assumes,
21 inappropriately, that 90 percent of the network is DS-1s and 10 percent is DS-3s.
22 Applying a 1994 nationwide non-cost based price benchmark to these figures, Mr.

1 Pitkin estimates that the price of a DS-3 was 9.6[40] times the price of a DS-1.
2 Using these relationships, Mr. Pitkin produces a 2-wire cost multiplier to develop
3 DS-1 and DS-3 costs (4.3 times 2-wire cost for DS-1 and 41.3 times 2-wire cost
4 for DS-3). Interestingly, Mr. Pitkin's DS-1 and DS-3 multipliers ignore the DS-0
5 equivalent demand used in the Synthesis Model based on 12 DS-0 equivalents
6 per-line.
7
8 Additionally, as previously explained, DS-3 and higher special access
9 services simply cannot be provisioned over copper facilities. They must use
10 either fiber or coaxial cable (or a combination of both) all the way to the customer
11 location. Neither of these types of cable is modeled to the customer locations.
12
13 The 2-wire loop cost, as I previously discussed, is significantly
14 understated and Mr. Pitkin's out-of-model application of various multipliers to the
15 2-wire cost to develop DS-1 and DS-3 loop costs is inappropriate, inaccurate and
16 fails to reflect the actual costs incurred by Verizon VA.
17
18 **Q. What impact do the platform, engineering and input flaws you discussed**
19 **have on the Modified Synthesis Model cost estimates?**
20 A. Each of the flaws and errors I have identified individually and collectively
21 decrease the Model's cost estimates for the loop and sub-loop elements. For

[40] In the Matter of Transport Rate Structure and Pricing, CC Docket No. 91-213, *Third Memorandum Opinion and Order on Reconsideration and Supplemental Notice of Proposed Rulemaking,* FCC 94-325 (rel. Dec. 22 1994) at ¶ 33.

1 example, since the Modified Synthesis Model only builds approximately 50
2 percent of the serving areas that actually exist in Verizon VA's network and does
3 not maximize the length of the feeder portion of the loop, the loop investments
4 required to serve Verizon VA's customers will be substantially understated. Also,
5 the Modified Synthesis Model underestimates costs by incorrectly modeling
6 access to unbundled, fiber-fed loops using the GR-303 IDLC switch interface and
7 ignoring required equipment elements and certain technical limitations. The
8 Modified Synthesis Model incorrectly assumes the use of exaggerated quantities
9 of individual loops when DS-1 and DS-3 are used in the network, and thus
10 understates the cost of a 2-wire copper loop typically used to provision basic
11 exchange service. Finally, the underlying loop design, platform and associated
12 inputs drastically reduce plant investment and produce an average loop cost for
13 Verizon VA of only $5.92. This sum is a mere fraction of what any efficient
14 carrier would incur to provide the unbundled loop.
15
16 **Q. What would be the result if a network were built to conform to the loop**
17 **design criteria and assumptions in the Modified Synthesis Model?**
18 **A.** The result would be a loop network that is non-functional. The loop design does
19 not adhere to the CSA standard, and thus the network modeled may not even
20 support basic digital services such as ISDN and DDS, and would introduce
21 inefficiencies in the ILEC's operations. The network would not have enough
22 plant to meet current, future or churn demands. In addition, because the Modified
23 Synthesis Model does not build outside plant to vacant residential and business

units or known new construction sites, service delays would result. Because the Model builds an average drop length of only 24 feet, numerous housing units and business locations will not get physically connected to the network. As a result, the network will be unable to meet the service standards mandated by the Virginia Commission for the provision of residential and business services. Moreover, the Model does not account for the fact that local ordinances often prohibit the placement of aerial cable in certain locations.

B. Switch And Inter-Office Facilities Module

Q. For which UNEs does the Modified Synthesis Model's switch and IOF module generate cost estimates?

A. The Modified Synthesis Model's switch and IOF module is instrumental in determining UNE costs for local switching, tandem switching, transport, operator services, and signaling.

Q. Would flaws in the switch and IOF module affect the cost estimates for all these UNEs?

A. Yes. The deficiencies that I have found in the switch and IOF module will affect the cost of each of the aforementioned UNEs -- local switching, tandem switching, transport, operator services and signaling.