decisions were based on the assumption that the Synthesis Model and its input values will be used solely to produce average state cost estimates to be used when calculating federal USF support.[74] In contrast, state regulatory bodies were charged with analyzing costs in far greater detail and with much greater accuracy when calculating state USF or UNE cost estimates.[75]

Similarly, the Commission determined that the default input values included in the Synthesis Model for determining federal USF support should reflect the "nationwide average,"[76] and made "no finding as to whether nationwide values would be appropriate for purposes other than determining federal universal service support."[77]

Q. Do the Synthesis Model's default input values reflect Verizon VA's or any efficient carrier's forward-looking cost of providing UNEs in Virginia?

A. Absolutely not. The preponderance of the Synthesis Model's inputs represents nationwide values that are derived from investment and expense calculations of different vintages. Additionally, as I will discuss later, some of the Synthesis Model's values are set at embedded levels, and some of the relevant investments are simply ignored. Mr. Pitkin's updates for demand, plant-specific expenses, and

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[74] *Id.*

[75] Tenth Report and Order at ¶ 92.

[76] Tenth Report and Order at ¶ 31.

[77] *Id.* (emphasis added).

overhead do not correct any of these infirmities, and actually compound the Modified Synthesis Model's understated and distorted cost estimates.

Q. Which of the Synthesis Model's default input values are set at nationwide levels?

A. Many significant investment and expense inputs, including those used to determine OSP and switching UNE prices and costs, are based on nationwide inputs. Additionally, nationwide factors are used to calculate General Support facilities expenses. Further, the Synthesis Model's default logic used to determine costs for Common Support Services is based on nationwide data. Although, Mr. Pitkin attempts to replace some nationwide values with Virginia-specific data, in many instances he fails to do so correctly and his modifications often exacerbate the Model's underlying flaws. Other times, after review of the Virginia-specific data, and presumably not satisfied with the values, Mr. Pitkin simply decides to disregard them in favor of inappropriate nationwide values that produce understated costs.

B. The Model Inappropriately Uses Data Of Mixed Vintages

Q. Are the Synthesis Model's default values based on data from the same vintage?

A. No. The Taylor Nelson Sofres ("TNS") (formerly PNR Associates, Inc. ("PNR")) customer location and demand data used by the Synthesis Model and the Modified Synthesis Model are from different time periods. TNS customer location data are based on pre-1998 sources, with some dating back to 1990,

while the road segment data used by TNS are of 1995 vintage. In contrast, the Model's default demand data (lines and usage) associated with the TNS customer base are for 1998. Yet, each of these assorted vintages must interact to determine customer location and line requirements -- a function the Modified Synthesis Model is not designed to or is not sophisticated enough to perform.

The OSP cable and switching prices from the NRRI study also utilize data of mixed vintages. Specifically, the Synthesis Model and the Modified Synthesis Model use 1997 outside plant price levels with Commission-projected 1999 switch price,[78] and digital circuit equipment. However, the expense factors for OSP, switching (including circuit equipment) and General Support facilities are set at 1998 levels. The General Support ratios become distorted when input values with different time vintages are used with erroneous geographic levels of aggregation, including:

1. General support investment based on Verizon VA's 2000 embedded levels;

[78] The Commission states that "In order to estimate the costs associated with the purchase and installation of new switches, and exclude the costs associated with upgrading switches, we removed those switches installed more than three years prior to the reporting of their associated book-value costs." Because the Commission's preclusion of "growth jobs" excluded 70 percent of the original switches, the Commission also expanded the time period for switch costs back to 1983 in order to enlarge the data set. Tenth Report and Order at Appendix C, ¶ 2.

2. General support expense based on 1998 nationwide current levels;

3. OSP investment based on 1997 nationwide current levels;

4. OSP expense based on 1998 nationwide current levels;

5. Central office switching and transmission equipment investment based on 1999 current levels; and

6. Central office switching and transmission equipment expense based on 1998 nationwide current levels.

Effectively, AT&T/WorldCom would have the Commission believe that this "apples-to-oranges" approach produces accurate results -- in fact, nothing could be further from the truth.

Q. Is the Modified Synthesis Model's use of the NRRI study data for OSP and switching appropriate for calculating TELRIC-compliant UNEs in Virginia?

A. No. The NRRI study contains serious vintage problems that significantly reduce cost. In its analysis of OSP data, the NRRI study used RUS data from the 1990s and earlier vendor contracts that were then converted to 1997 price levels. When developing switching input values, the Commission adopted a subset of the NRRI data points and employed a time series regression to convert switch prices to 1997 levels.

To develop more current Synthesis Model input values, the Commission determined that switching and digital equipment prices should be projected to 1999 levels in order to capture expected declines in costs. However, the

Commission, in its decision to bring switch prices up to 1999 values, chose not to project the costs of OSP cable and structure or General Support facility investments, despite the fact that the data demonstrated that current investments for these items were increasing relative to book costs (in contrast to the declining switch prices). This disparity serves to inappropriately reduce costs. Not surprisingly, this model deficiency was not corrected by AT&T/WorldCom in the Modified Synthesis Model.

Q. Please explain your statement that some Model default inputs were set at embedded levels and some of the relevant investments were simply ignored.

A. For General Support facility investments, such as garages, motor vehicles, work equipment, furniture/office equipment, and buildings, the Modified Synthesis Model's methodology uses embedded relationships to calculate forward-looking investment levels. As Dr. Tardiff shows, these embedded relationships produce lower costs than the current values. In other instances, relevant investment values are simply omitted. For example, the logic of the Synthesis Model, and by default the Modified Synthesis Model, fails to include any investment for the land required by General Support facilities. The existence of these errors and omissions is no secret. The Commission has acknowledged them,[79] but concluded that both were platform issues that would be addressed in a future model proceeding. AT&T/WorldCom, however, fail to correct, or even acknowledge, either of these errors.

[79] Tenth Report and Order at ¶¶415, 418, fn. 1273.

1

2 **Q. Is it appropriate for a cost model to use mixed vintages of data?**

3 **A.** Cost models and cost studies often rely on mixed vintages of data to develop cost
4 estimates. To ensure reasonable and accurate cost estimates the cost study or
5 model developer must use care and make appropriate adjustments to maintain
6 consistency within the cost development. For example, as explained in Verizon
7 VA's cost panel testimony, Verizon VA made a number of adjustments to data to
8 insure all aspects of the costs being estimated were for a consistent forward-
9 looking time period.

10

11 AT&T/WorldCom made no attempt to insure consistency in data sources,
12 but rather deliberately abused the use of mixed vintages of data to achieve its
13 objective of having a model produce low UNE costs. Blatant examples of this
14 include: 1) projecting residence and business lines four years further in time than
15 the housing units and business location data and making no attempt to adjust the
16 housing units and business location data to include the obvious growth that is
17 occurring; and 2) taking advantage of the downward trend in switching costs by
18 projecting switching investments into the future while inconsistently excluding
19 the upward trend in OSP by using OSP investment costs from a past period.

20

21 **C. The Modified Synthesis Model's Fill Factors Are Inappropriate**

22 **Q. What is a utilization factor and how is it used in the Modified Synthesis**
23 **Model?**

1 **A.** A utilization factor (also called a fill factor) compares the portion of a network
2 facility that is "filled" to the total capacity of the facility.[80] The Modified
3 Synthesis Model uses target fill factors to determine the capacity of various
4 facilities that will be included in the Model's hypothetical network.
5
6 **Q. Is it appropriate to use lower fill factors when calculating UNE costs than**
7 **when determining appropriate levels of universal service funding?**
8 **A.** Yes. The Commission acknowledged the appropriateness of lower UNE fill
9 factors when stating that the federal USF mechanism should reflect current
10 demand and not be burdened by the costs resulting from the industry practice of
11 building to ultimate demand.[81] Mr. Pitkin's UNE fill factors, which are higher
12 than USF fill factors, thus conflict with the Commission's recommendation
13 regarding UNE fill factors. Mr. Pitkin fails to explain why the fill factors for
14 UNEs should be higher than those for USF.
15
16 **Q. Are the Modified Synthesis Model's utilization factors attainable in an**
17 **efficient, forward-looking network?**
18 **A.** No. By using target fill factors to build distribution facilities, the Modified
19 Synthesis Model ignores accepted planning standards and guidelines for building
20 distribution facilities and builds insufficient distribution capacity to serve existing
21 demand efficiently. Likewise, the Model ignores the variety of real-world factors

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[80] Verizon VA's Cost Panel Testimony at Section IV-C-2.

[81] Tenth Report and Order at ¶ 199.

that prevent an efficiently-designed network from achieving the utilization levels assumed by Mr. Pitkin.

Q. How does the Modified Synthesis Model violate accepted planning standards and guidelines for building distribution facilities?

A. Accepted planning standards and guidelines for building efficient distribution facilities require building two or more pairs per subscriber location to accommodate subscribers' needs for multiple lines.[82] This allows local exchange carriers to activate orders for new service without incurring the added expense and delay associated with rearranging existing distribution pairs or installing additional distribution cables each time a subscriber orders an additional line at a customer location. The Modified Synthesis Model ignores these accepted industry practices and instead attempts to size distribution facilities by building a target level of spare capacity based on actual demand for the number of lines. As a result, the Model does not guarantee that at least one additional distribution pair is allocated to each subscriber location. The Model further fails to account for the resulting additional costs and delays of having to rearrange or install additional distribution pairs more frequently to meet customer demand for additional lines. The Model also fails to account properly for distribution facilities at vacant residential and business units.[83] As a result, the Modified Synthesis Model substantially understates distribution investment.

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[82] *See supra* Section III-B; Verizon VA's Cost Panel Testimony at pgs. 114-116.

[83] *See supra* Section III-B.

1

2 **Q. Does this understated distribution investment have an effect on a carrier's**
3 **ability to conform to the service quality standards imposed by the Virginia**
4 **Commission and expected by Virginia consumers?**

5 A. Yes. As previously noted, the Modified Synthesis Model fails to build
6 sufficient distribution plant to accommodate demand fluctuations and customer
7 churn. If Verizon VA had to operate a network with such undersized distribution
8 facilities, Verizon VA would not be able to fill orders for additional lines on a
9 timely basis, because it often would have to rearrange existing distribution pairs
10 or install an additional copper cable on distribution poles just to complete an order
11 for an additional line. Thus, Verizon VA thus could not meet the service quality
12 standards and order completion time lines imposed by the Virginia Commission
13 and expected by Virginia consumers.

14

15 **Q. Are the other target utilization factors used by the Modified Synthesis Model**
16 **attainable in a forward-looking network?**

17 A. No. For example, the 100 percent utilization factor for fiber strand is unrealistic
18 and fails to reflect the way fiber optic cables are actually installed, and ignores the
19 requirement for a level of administrative spare capacity necessary to perform
20 maintenance, and accommodate moves and relocations. Most sizes of fiber cables
21 are manufactured with individual strands grouped in ribbons of 12 -- it is far more
22 efficient to work with these 12-ribbon strands.[84] Though this may produce very

[84] Verizon VA's Cost Panel Testimony at pgs. 108-111.

low utilization levels (33 percent at the RT level where 4 of the 12 strands from each ribbon are in use), the added cost of the unused strands is far lower than the additional costs necessary to install cable containing loose strands (i.e., strands that are not grouped in ribbons of 12). Thus, the Model decreases costs as a result of the cost savings associated with a loose strand construction, but ignores the significantly higher installation costs associated with installing loose strands.

The Model's utilization factors for copper feeder cable, which range from 70 percent to 82.5 percent depending on the density zone, also are unreasonably high for a forward-looking network. An efficient, forward-looking network should include a sufficient amount of spare copper feeder cable (15 percent of total capacity) to accommodate administrative and maintenance needs.[85] Copper feeder facilities also must be sized to accommodate growth that occurs during the relief planning period to avoid substantial additional costs and delays associated with having to rearrange or install additional feeder facilities more frequently to meet customer demand. The Model's target utilization levels fail to provide sufficient spare capacity to accommodate these needs and the Model further fails to account for the substantial additional costs that would be associated with attempting to operate a network with inefficiently high copper feeder utilization levels.

Q. Is the line fill input in the Synthesis Model a utilization factor?

[85] Verizon VA's Cost Panel Testimony at pgs. 102-105.

1 **A.** No. The Model does not have an input for line fill.

2

3 **Q. Is Mr. Riolo's recommended change to the Synthesis Model's default input**

4 **value for line fill appropriate?**

5 **A.** No. Mr. Riolo was mistaken in his interpretation that the line fill input value

6 represents utilization of the line cards associated with a DLC system. The Model

7 documentation provided by AT&T/WorldCom specifically states otherwise:

8

9 The line fill percent specifies the percentage of the line limit that will be
10 used as a constraint by the initial divisive clustering algorithm. Since the
11 full line constraint is not met initially, the optimization routines can
12 actually reassign locations from cluster to cluster.[86]

13

14 Later in the same document AT&T/WorldCom state:

15 As explained in section 3.1 this factor seeks to determine a good
16 approximation to the cost minimizing number of clusters in more densely
17 populated regions. The line fill factor has no effect on any of the
18 clustering algorithms in sparsely populated regions. When the divisive
19 algorithm is used, a line fill factor less than (SIC) is recommended. Since
20 both the agglomerative and nearest neighbor algorithms produce a larger
21 number of clusters than the divisive, it is recommended that the line fill
22 factor be set to 100% when these algorithms are used.[87]

23 Thus the very basis for Mr. Riolo's recommendation and Mr. Pitkin's

24 implementation of this input change is unjustified and unsupported.

25 **Q. What Does The Modified FCC Model Use For Utilization Of The Line Cards**

26 **Associated With A DLC System?**

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[86] AT&T/WorldCom Cost Model Documentation at Attachment B, p. 7.

[87] *Id.* at Attachment B, p. 32, fn. 30.

1 **A.** As noted above, the Model does not have an input for line card utilization. The
2 Model documentation is silent on this issue and our latest analysis indicates the
3 Model appears to rely on feeder fill factors to size the DLC.

4 **Q. What utilization rate does the Modified FCC model use for DLC line cards?**
5 **A.** Despite the fact that Mr. Riolo stated that "a 90 percent utilization rate for DLC
6 line cards is very reasonable" and recommended using a 90 percent utilization for
7 line cards,[88] the Modified FCC Model does not use this value but appears to apply
8 an internally calculated fill.

9

10 **Q. Does the Modified Synthesis Model design and estimate DLC costs**
11 **appropriately?**

12 **A.** No. Mr. Riolo[89] recognized, as did the Verizon cost panel,[90] the need to consider
13 growth demands as well as working lines in stating that the DLC design and cost
14 estimates should be based on a utilization factor for line card cost development.
15 Due to a platform flaw, the Model fails to reflect any utilization factor in the line
16 card cost development. This platform flaw results in approximately an 11 percent
17 understatement of the DLC line card investment given Mr. Riolo's
18 inappropriately high utilization recommendation and approximately a ***Begin

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88 *Id.* at p. 36.

89 *Id.* at pgs. 37-38.

90 Verizon Cost Panel Direct Testimony at pgs. 104-106.

AT&T Proprietary* XXX ***End AT&T Proprietary*** understatement of the line card investment given Verizon VA's more appropriate ***Begin Verizon-VA Proprietary*** XXX ***End Verizon-VA Proprietary*** factor.[91]

Q. Does the Modified Synthesis Model estimate DLC costs based on a utilization factor for the common equipment and electronics?

A. No. The Modified Synthesis Model ignores the spare capacity margins needed to accommodate administrative requirements and growth demands on the remote terminals and inappropriately builds strictly to the working lines.[92]

Q. Does the Modified Synthesis Model contain a reasonable number of remote terminals?

A. No. As I have explained, the Model drastically understates the number of distribution areas and therefore also drastically understates the number of remote terminals.

D. The Modified Synthesis Model Understates Switch-Related Costs

Q. Does AT&T/WorldCom fail to account for switch growth in calculating UNE switch costs?

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[91] *Id.* at p. 101.

[92] For further discussion, see Verizon VA's Cost Panel Testimony at pgs. 102-105.

1 **A.** Yes. By failing to consider switch growth, the Modified Synthesis Model
2 understates Verizon VA's or any efficient carriers forward-looking costs of
3 providing UNEs. It is generally accepted that costs associated with switch growth
4 are higher than initial placement costs. By omitting these costs, significant switch
5 costs are being ignored.[93] Therefore, this Commission should include the costs of
6 switch growth to ensure that UNE costs more accurately reflect those costs
7 actually incurred by Verizon VA. The very fact that the regression analysis
8 utilized to develop switch investment inputs had to eliminate 70 percent of the
9 overall data points, as discussed earlier, proves that ILECs must actually grow
10 switches and incur the associated costs on a forward-looking basis.
11
12 **Q. Does the Synthesis Model understate power and main distribution frame**
13 **investment?**
14 **A.** Yes. The Modified Synthesis Model's proposed methodology produces an
15 unreasonably low figure of $8 per-line for main distribution frame ("MDF") and
16 power investment.[94] This level of power investment was purportedly based on
17 data supplied by Technology Futures, Inc. ("TFI") to the Commission. Use of
18 this data, however, is inappropriate. Upon review of the Tenth Report and Order,
19 TFI stated unequivocally that the Commission had misused its study. According

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[93] Tenth Report and Order at Appendix C, ¶ 2.

[94] In the Matter of the Federal-State Joint Board on Universal Service, In the Matter of Forward-Looking Cost Mechanism for High Cost Support for Non-Rural LECs, CC Docket Nos. 96-45 and 97-160, *Affidavit of Jason Zhang in Support of GTE's Petition for Reconsideration of the Commission's Tenth Report and Order* (Jan. 3, 2000) at ¶ 33. The Synthesis Model's default run produced approximately $112 per-line switching investment for Verizon. The power investment was 8 percent of that value or $8.30.

to TFI, the actual investment for MDF and power is substantially higher than the Modified Synthesis Model's estimate. Properly interpreted, the TFI study should have produced an investment value of at least $45 per-line for MDF and power.[95] A copy of the letter from TFI is attached to this testimony as Attachment 4.

Q. How does the Modified Synthesis Model account for central office construction?

A. Central office buildings provide space for switches, distributing frames, transmission equipment, power equipment, and other supporting hardware. The Modified Synthesis Model uses several input tables to compute building construction costs and land investment. These tables include a range of central office space to support different line size switches, a unit construction cost that varies by line size, and a land cost based on line size. In developing its land and building investment, the Modified Syntheses Model relies on the Model's default table values.

Q. Does the default input value for central office construction differ greatly from AT&T's own experience?

A. Yes. In response to a Verizon VA data request, AT&T stated that its central office construction costs averaged *****Begin AT&T Proprietary*** XXX***End AT&T Proprietary*****[96] The default value in the Synthesis

[95] *Id.* at ¶ 34.

[96] Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, -251, *AT&T's Response to Verizon VA's First Set of Data Requests, Request No. VZ-VA I-6 (h)* (July 9, 2001).

Model, and the Modified Synthesis Model, for central office construction ranges from $75 to $150 per square foot.[97] Even adding in the Model's most expensive land cost ($20 per square foot) results in a construction cost of $190 per square foot.[98] This is yet another instance in which AT&T/WorldCom has acknowledged a difference between its actual costs and the grossly understated costs used in the Modified Synthesis Model.

E. AT&T/WorldCom's Input Modifications Are Inappropriate, Uncorroborated, And Result In Additional Errors

Q. What input modifications has AT&T/WorldCom made to the Synthesis Model?

A. Mr. Pitkin, in collaboration with Mr. Riolo, has introduced numerous and significant changes to the Synthesis Model's inputs. Mr. Pitkin's modifications exacerbate flaws in the Synthesis Model, are unsupported and uncorroborated by any credible evidence, and significantly understate the cost estimates produced by the Model.

1. Structure Sharing

Q. Does the Modified Synthesis Model account for structure sharing?

A. Yes. The Modified Synthesis Model, through its input values, accounts for several types of OSP structure sharing, including: 1) sharing between an ILEC

[97] HAI Model, Release 5.0a, Inputs Portfolio at p. 78.

[98] *Id.* at p 79. The land costs per square foot is adjusted by the default lot size multiplier of 2.