1 **A. The Modified Synthesis Model is Insufficiently Documented and Is Based**
2 **Upon Unverifiable Methodologies**

3 **Q. Is the Modified Synthesis Model sufficiently documented?**

4 A. No. The documentation accompanying the Modified Synthesis Model is not sufficient
5 for explaining and understanding the Model's inner workings. The documentation
6 describes the various modules in the Modified Synthesis Model, and the types of inputs
7 (including the numerous non-state specific default assumptions) used in those modules,
8 but its numerous formulas are not explained and are difficult to comprehend and analyze.
9 These formulas are often the only "documentation" of the "engineering logic" used by the
10 Modified Synthesis Model; yet, no supporting material whatsoever is provided.[13/]

11

12 **Q. In what way is the Modified Synthesis Model difficult to analyze?**

13 A. Though voluminous, the documentation filed by Mr. Pitkin with the Modified Synthesis
14 Model is insufficient to adequately evaluate the Model in an efficient and timely manner.
15 The contents of the various worksheets and computer programs in the Modified Synthesis
16 Model are only vaguely explained, if at all. Any effort to "reverse engineer" a number
17 appearing on a worksheet, or calculation in a program module, requires a laborious study
18 of a large number of formulas, many of which are extremely difficult to follow, and/or
19 painfully slow to implement and test.

[13/] For example, as I describe later, the Modified Synthesis Model contains two large worksheets, with numerous unexplained formulas, that purportedly assign network operations costs to individual UNEs. Not only are these calculations difficult to verify, but in this instance, they produce obviously incorrect results.

In addition, the Modified Synthesis Model was written in Turbo Pascal, an outdated programming language that is no longer commercially available.[14/] The manufacturer no longer supports the software, and thus its proper functioning cannot be guaranteed.

The Modified Synthesis Model also draws on an old version of Microsoft ACCESS. Consequently, the files cannot be easily changed. Even if one were to convert the ACCESS files to a newer version of the same software for modification, once converted, the database could not be incorporated back into the Model because the Model would not be compatible with the newer version of ACCESS. The only remedy for this incompatibility between the old and new software is to dedicate a computer, containing mostly obsolete software, for the sole purpose of testing the Modified Synthesis Model with modified ACCESS files. In fact, the only way I was able to obtain the results in Table 1 was by dedicating such a computer with obsolete software.

Although the Model's documentation as well as its sponsors claim that users have a selection of different clustering algorithms, only one algorithm (divisive) seems to be working in the Model. The Model stops execution after the first wire center each time one of the remaining two options (agglomerative and nearest neighbor) is selected.

14/ *See* Borland Software Corporation's web page for Turbo Pascal at http://www.borland.com/pascal.

1 Those portions of the source code that are actually available for inspection are not
2 documented, making a comprehensive review extremely time consuming and almost
3 impossible.
4
5 Finally, Model runs are extremely slow. Even with the most powerful machines,
6 a complete run of the model takes four to eight hours. Consequently, a meaningful
7 analysis (often requiring multiple runs to test alternative scenarios) is extremely difficult
8 and time consuming.
9
10 **Q. Did you encounter any other problems in running and analyzing the Modified**
11 **Synthesis Model?**
12 A. Yes, the NERA staff members working on this project and I encountered significant
13 problems in running and analyzing the Modified Synthesis Model. Once installed, the
14 Model frequently crashed when we tried to perform simple sensitivity tests. For instance,
15 we wanted to measure the effects of one of Mr. Pitkin's modifications, changing the road
16 factor from 1.0 to 0.9. This simple procedure caused the Model to crash. At first, the
17 Model would not start execution after submitting the run. Since it is nearly impossible to
18 pinpoint the cause of this problem, we removed the Model from the computer and
19 reinstalled it. This time, the Model did run, but would "hang" at the clustering of the first
20 wire center. We rebooted the machine and submitted the above-mentioned run again.
21 This time the Model partially ran again but indicated that there was an error with a .dll
22 file. Once again, we removed the Model from the machine and reinstalled it. After

submitting the run one more time, the Model seemed to perform fine. However, after operation of the clustering module, it crashed for unexplained reasons.

To rule out configuration problems with a specific computer, we installed and ran the Model on three different computers. Although the Model would often work initially after installation, it eventually stopped running on each of the computers, indicating a problem with the software rather than the hardware.

Overall, the Model is extremely unstable and has a very short lifecycle, as it often took only three or four runs of various scenarios before the Model effectively stopped running. In some of these instances, the Model would simply run in place, unable to make calculations and to move from one stage to the next (e.g., from Cluster to ClusIntf to FeedDist) and would not even alert the user to the problem by way of an error message. The only remedy after the Model stopped running would be to (1) uninstall the Model, (2) delete the HCPM folder from the computer, and (3) reinstall the Model again. During the course of our analysis, we uninstalled and reinstalled the Model approximately 15-20 times.

Even apart from the frequent crashes and re-installation, the Model was extremely slow in processing individual runs. For example, on some computers, the Model required individual runs to be submitted overnight. Given that a meaningful analysis involves multiple runs to test alternative scenarios, the Model -- even when it functioned properly -- made any attempt to analyze the Model extremely difficult.

1 **Q. Can the Modified Synthesis Model's "input" assumptions be validated by AT&T's**
2 **own experience?**
3 A. No. AT&T has not used its own cost information or engineering practices to support the
4 assumptions in the Modified Synthesis Model. Instead, AT&T insists that its evaluation
5 of the conditions it faces to operate in Virginia are irrelevant to determining whether the
6 Modified Synthesis Model produces accurate cost estimates.[15] Rather than considering
7 its own cost information, or producing it so that it could be analyzed in relation to the
8 Modified Synthesis Model's assumptions, AT&T claims that the cost assumptions for
9 determining Verizon VA's costs should be based, to a large extent, on the nationwide
10 averages that the Commission chose for universal service support, not for UNEs.
11
12 **B. The Modified Synthesis Model Systematically Understates Costs**
13 **Q. What is your assessment of the cost estimates produced by the Modified Synthesis**
14 **Model?**
15 A. Despite the sponsors' attempt to convince the Commission otherwise,[16] the Modified
16 Synthesis Model's cost estimates differ significantly from the cost estimates produced by

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[15] In a recent response to a data request, AT&T stated: "[B]esides, asking whether AT&T or any of its affiliates have any analyses to determine whether to provide local exchange services in Verizon's Virginia service area, including local exchange service over AT&T's cable television facilities, completely misses the point: Verizon is obligated under the Act to provide nondiscriminatory and commercially reasonable rates, term and conditions for interconnection, including UNEs and resale, so as to allow AT&T to provide competitive local exchange services." Before the Federal Communications Commission, CC Docket Nos. 00-128, -249, -251, *AT&T and WorldCom's Responses to Verizon Virginia Inc.'s Third Set of Discovery to AT&T and Fourth Set of Discovery to WorldCom, Request No. VZ-VA 27* (July 26, 2001).

[16] For example, Ms. Murray discusses how the Commission adopted its Synthesis Model for universal service and then proceeds to characterize Mr. Pitkin's modifications as state-specific input adjustments and calculation changes to assign non-direct costs differently. Murray Direct Testimony at pgs. 9 and 11. In fact, Mr. Pitkin made other changes to the Model's inputs and calculations that have created a huge difference between the original and modified costs.

the Synthesis Model, or for that matter, from the cost estimates AT&T has advocated in past proceedings.

Q. How are the Modified Synthesis Model's cost estimates different from those produced by the Synthesis Model?

A. The cost estimates produced by the Modified Synthesis Model are much lower than the costs produced by the Synthesis Model. For example, the Synthesis Model produces a total loop cost for Virginia of $19.16, which is more than triple the Modified Synthesis Model's estimate of $5.92.[17]

Q. Why are loop cost estimates produced by the Modified Synthesis Model so much lower than those produced by the Synthesis Model?

A. A primary reason for this discrepancy is Mr. Pitkin's proposed treatment of direct loop costs.[18] Specifically, when comparing the direct loop costs produced by the Synthesis Model to Mr. Pitkin's version, the results are as follows: $9.82 for the Synthesis Model versus $4.21 for the Modified Synthesis Model. Mr. Pitkin's modifications cut the costs produced by the Synthesis Model for Verizon VA by over 57 percent!

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[17] The investment in cable and wire facilities (ARMIS account 2410) per-line from the Synthesis Model is 2.52 times the corresponding investment per-line produced by the Modified Synthesis Model.

[18] Non-direct costs (e.g., costs other than the capital costs and operating expenses associated with plant accounts) are handled somewhat differently in USF and UNE cost calculations; thus, a comparison of direct costs provides a better "apples-to-apples" comparison.

Q. What causes this large discrepancy?

A. The large discrepancy between the cost estimates produced by the Modified Synthesis Model and those produced by the Synthesis Model is caused by: (1) the huge increase in lines assumed by Mr. Pitkin and used to lower per-line cost results;[19] (2) changes in depreciation and cost-of-capital; (3) other input changes (e.g., feeder placement costs and structure placement (plant mix) and sharing percentages); and (4) Mr. Pitkin's changes to the Synthesis Model's code. Table 1 below shows the impact of each of these factors.

TABLE 1

Cost Model	Direct Loop Cost	Percentage of Difference
Synthesis Model	$ 9.82	
Synthesis Model with Mr. Pitkin's Line Counts	$ 7.01	50%
Synthesis Model with Mr. Pitkin's Line Counts and Financials	$ 6.34	12%
Synthesis Model with all of Mr. Pitkin's input changes	$4.69	29%
The Modified Synthesis Model	$ 4.21	9%

Table 1 shows that the total difference in direct loop costs between the models -- $5.61 ($9.82-$4.21) -- can be explained by the following successive changes to the Synthesis Model: (1) merely changing the line counts accounts for a little over half the

[19] Although Mr. Pitkin has provided Attachment D as the basis of his projections of subscriber lines, the line counts in the Model's output do not match those listed in the Attachment. Evidently, errors have been introduced in transferring the line counts in the supporting attachment to the Model.

1 difference;[20] (2) adding the changes to the cost of capital and depreciation accounts for an
2 additional 12 percent decrease; and (3) making all the other input changes accounts for
3 another 29 percent reduction. The remaining 9 percent is caused by Mr. Pitkin's
4 alteration of the Synthesis Model's code.
5
6 **Q. Is Mr. Pitkin's use of estimated 2002 line counts reasonable?**
7 A. No, for a number of reasons. First, any attempt to estimate line counts for 2002 is
8 speculative at best and highly unreliable. Mr. Pitkin's primary explanation for the steep
9 63 percent increase, from 4.1 to 6.7 million lines, is the recent increase in special access
10 lines, which, according to ARMIS data, have been growing at an average annual rate of
11 over 40 percent. Such high growth rates compound quickly; in fact, extending Mr.
12 Pitkin's speculative projection for two more years (to 2004) would produce a line count
13 of an unbelievable 10.2 million, with 55 percent of those lines being special access.

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[20] The cost per line also includes Mr. Pitkin's input change that treats all business and special access lines as voice-grade lines. In response to Verizon VA data request number 38, AT&T/WorldCom reports that Mr. Pitkin made this change in response to Mr. Murphy's criticism in the recent Maryland USF proceeding. This change, by itself, would increase loop costs. However, Mr. Pitkin has also changed this Commission's structure sharing inputs to unattainable levels and changing these inputs more than offsets the cost increase that would have resulted from Mr. Pitkin's response to Mr. Murphy's criticism. Had Mr. Pitkin used the same inputs that he used in the Maryland USF proceeding for both the special access/business lines inputs and structure sharing, the loop cost would have been $6.28, rather than $5.92. Had Mr. Pitkin responded to Mr. Murphy's criticism without simultaneously changing the structure sharing inputs, the loop cost would have been $6.70. Pitkin Direct Testimony at p. 18. Finally, while Mr. Pitkin's response to Mr. Murphy's criticism better aligns the line counts used to generate costs (numerator) and produce unit costs (denominator), his solution makes the representation of special access channels even more unrealistic. A better way to align numerator and denominator would have been to estimate the latter as the number of physical facilities associated with special access lines (e.g., a DS-1 circuit provides 24 voice channels on two physical loops). When the Commission's default inputs are used to approximate this adjustment, the first two costs in Table 1 would change to $11.58 and $10.51, respectively.

1 Second, even if the line count projection were valid (which it is not) there is an
2 additional error resulting from Mr. Pitkin's implementation of these line counts. As I
3 described earlier, by using the Synthesis Model's surrogate locations, Mr. Pitkin
4 essentially assumes that this huge increase is for additional lines at existing customer
5 locations (i.e., the same service territory is served by more intense use of existing support
6 structures and larger cables rather than expansion into new areas) -- a completely
7 unrealistic assumption.[21/] Thus, the almost 30 percent "reduction" from the Synthesis
8 Model's direct cost of $9.82 to $7.01 merely reflects the false economies produced by Mr.
9 Pitkin's temporal mismatch between future line growth and existing customer locations.[22/]
10
11 Third, the Modified Synthesis Model assumes that the company-wide relationship
12 between special access and business lines applies to each distribution area, i.e., Mr.
13 Pitkin's projections assume that special access lines are about 1.66 times the number of
14 business lines and this multiple is used in every distribution area. In fact, special access

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21/ Stated another way, cost per line is calculated by first calculating the total cost necessary to serve all customer locations and then dividing that cost by the number of lines at those locations. The mismatch in time between customer locations (none more recent than 1998) and lines (projections for 2002) means that the numerator has been severely understated, and as a result, the cost per line is essentially meaningless. Ironically, AT&T and WorldCom (then MCI Communications, Inc.) argued to this Commission why customer locations and line counts need to match to provide a proper cost per line:

"Because the current number of lines is used in this average cost calculation, we agree with AT&T and MCI that the total cost should be determined by using the current number of customer locations. As AT&T and MCI note, "the key issue is the consistency of the numerator and denominator" in the average cost calculation.

Tenth Report and Order at ¶ 56 (emphasis added).

22/ The absurdity introduced by AT&T/WorldCom's mismatch is further illustrated by the fact that the average incremental direct cost per additional line is a rock bottom $2.53.

lines are more geographically concentrated, implying that the Model builds plant to accommodate these lines in the wrong places.

Finally, Mr. Pitkin does not adjust the fill factor to accommodate his assumed 63 percent increase in line count. If Mr. Pitkin's assumption were implemented in the real-world, a low fill factor would be necessary to ensure that there is sufficient spare capacity during the relief planning period for increases in demand, administrative purposes, and allowances for defective cables. The Modified Synthesis Model, however, makes the assumption that an "efficient firm" accommodates growth by starting over from scratch and replacing existing cables with cables only marginally larger than necessary to serve the increased demand. In reality, networks do not have this "throwaway" characteristic. Real-world firms realize that accounting for a lower fill factor and buying larger cables now to anticipate future increases in demand is more cost effective in the long-run than buying cables that "optimally" serve current demand now, but require frequent replacement with marginally larger cables to accommodate increases in demand. However, by making this erroneous assumption, the Model produces unrealistically low total loop cost estimates. Therefore, like the temporal mismatch between future line growth and existing customer locations, Mr. Pitkin's 63 percent increase in line count, without a corresponding adjustment to the fill factor, results in an artificially low total loop cost estimate.[23/]

[23/] This example ignores the fact that the Modified Synthesis Model might not only contemplate replacing cables with larger cables, but also reconfiguring routes themselves, because as the number of distribution areas

1 **Q. Why does the Modified Synthesis Model produce lower loop costs than the**
2 **Commission's Synthesis Model when the same inputs are used?**
3 A. This cost reduction appears to be explained by a significant reduction in route feet caused
4 by Mr. Pitkin's coding changes: the sum of feeder and distribution route distances is 20
5 percent lower in the Modified Synthesis Model. In addition to the obvious cost-
6 minimizing implications of this reduction, another important consequence is that
7 whatever justification there may have been for reducing route distances by applying a
8 road factor less than one to the Synthesis Model, which presumably is based on a
9 comparison of that Model to some external measure of route distances, is more than
10 eliminated by the reductions in distance that the code changes have caused. Mr. Pitkin's
11 reduction in the road factor is a blatant form of double-counting.
12
13 **Q. Mr. Pitkin attempts to support his coding changes on the basis that he informed the**
14 **Commission's staff of the changes early last year and that the Commission's latest**
15 **version of the Synthesis Model incorporates "many of these changes."[24] Do these**
16 **assurances form a proper basis for accepting Mr. Pitkin's code changes?**
17 A. No. Whether or not the Commission's modifications to the Synthesis Model corroborate
18 what Mr. Pitkin has done depends how close the results are. And on this basis, when Mr.
19 Pitkin's inputs are used, the beta version of the Synthesis Model produces cost estimates

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grows, the Model contemplates a new "optimal" collection of feeder routes to serve them. Again, real-world firms simply do not accommodate growth in this manner.

[24] Pitkin Direct Testimony at pgs. 9-10.

that are closer to its original version than to Mr. Pitkin's cost estimates ($4.55 compared to $4.69 and $4.21 shown in Table 1 for the Synthesis Model and the Modified Synthesis Model, respectively). And while Mr. Pitkin's code changes reduce route distance by 20 percent, the FCC's changes cause only a 2 percent reduction from the route distance produced by the Synthesis Model. Apparently, even though the Commission's staff has had about one and a half years to consider the merits of Mr. Pitkin's changes, the bottom line is that whatever changes the Commission may have incorporated into its beta version have not moved costs a great deal.

Q. How do the Modified Synthesis Model's UNE cost estimates compare to the cost estimates produced by the other models that AT&T/WorldCom have sponsored previously in Virginia?

A. Mr. Pitkin's modifications have reduced each component of the loop cost by almost one-half or more and the switching components by substantial amounts. As Table 2 below demonstrates, the total cost of the loop decreased by a surprising 56 percent over the four years between AT&T/WorldCom's previous filing of the HAI Model, Release 3.1 and their current filing of the Modified Synthesis Model.

1 **TABLE 2**

	HAI Model, Release 3.1[25]	HAI Model, Release 5.0a	Modified Synthesis Model
NID	$0.46	$0.44	$0.25
Distribution	$8.01	$6.86	$2.89
Concentration	$3.04	$2.65	$1.64
Feeder	$1.92	$2.23	$1.14
Total Loop	$13.43	$12.18	$5.92
Port	$0.92	$0.87	$0.50
Usage	$2.15	$2.04	$1.21
End Office	$3.08	$2.91	$1.71
Other	$1.45	$1.49	$1.71
Total Cost	$18.20	$16.81	$9.51

2 This result directly contradicts WorldCom's statement in its Supreme Court brief on July
3 23, 2001 that "Although the computer-based elements of the network (such as the
4 switches) may be characterized by declining costs, other elements (such as the loop plant)
5 are not declining; for many elements costs are rising."[26] Nonetheless, with results like
6 this, it is no wonder AT&T/WorldCom has abandoned the HAI Model in this proceeding,
7 despite the fact that they continue to sponsor the model in other jurisdictions.[27] As
8 discussed below, these cost reductions are absurd, unjustified, and serve to significantly
9 understate Verizon VA's forward-looking UNE costs.

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[25] Before the Virginia State Corporation Commission, Case No. PUC970005, *Affidavit of Robert A. Mercer* (April 7, 1997); Before the Virginia State Corporation Commission, Case No. PUC970005, *Direct Testimony of Robert A. Mercer* (April 23, 1997).

[26] *See* fn.1 and corresponding text *supra.*

[27] AT&T most recently filed the HAI Model in a Massachusetts UNE proceeding. Before the Massachusetts Department of Telecommunications and Energy, D.T.E. 01-20, *HAI Model, Release 5.2-MA* (May 8, 2001).

1 **C. The Modified Synthesis Model Generates Patently Unreasonable Cost**
2 **Estimates**

3 **Q. Do the theoretical failings and methodological concerns you identified translate into**
4 **inaccurate cost estimates?**

5 A. Yes. Due to the inappropriate underlying assumptions and additional flaws introduced by
6 Mr. Pitkin, the Modified Synthesis Model significantly underestimates the forward-
7 looking investments and expenses for UNEs in Virginia. Table 3 employs a common test
8 of reasonableness (or external validity), comparing the investments and expenses
9 produced by the Modified Synthesis Model with the investments and expenses Verizon
10 VA currently incurs to provide telephone service in Virginia.[28] The "2000 Actual" data
11 in Table 3 is taken from Verizon VA's ARMIS reports. In general, the Modified
12 Synthesis Model produces investment levels that are less than one-half of Verizon VA's
13 total investment, and expenses that are generally less than one-third of Verizon VA's
14 current levels. Though Verizon VA may be able to achieve certain efficiencies in a
15 forward-looking network, and has had every incentive to do so under the price cap
16 regimes it has been subject to at the state and federal level, it would be impossible to
17 achieve anywhere near the level of cost reductions estimated by the Modified Synthesis
18 Model. The suggestion that Verizon VA's forward-looking costs would be less than one-
19 third of its current costs simply defies common sense and sound economic reasoning.
20

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[28] The Modified Synthesis Model Expense Module includes a USOA Detail Worksheet that breaks down the investment and expense in the Part 32 account for comparison with embedded ARMIS data.

1

TABLE 3A: Investment

Comparison of Modified Synthesis Model Cost Estimates to 2000 Current Costs				
USOA	**Investment Description**	**Modified Synthesis Model ($000)**	**2000 Current ($000)**	**% Current Cost Included in Model**
Telecommunications Plant in Service				
2111	Land	$20,591	$21,346	96.5%
2112	Motor Vehicles	$22,000	$70,576	31.2%
2113	Aircraft	$0	$0	
2114	Special Purpose Vehicles	$0	$52,643	0.0%
2115	Garage Work Equipment	$0	$0	
2116	Other Work Equipment	$0	$0	
2121	Buildings	$167,973	$423,616	39.7%
2122	Furniture	$382	$1,225	31.2%
2123.1	Office Support Equipment	$1,932	$6,199	31.2%
2124	General Purpose Computers	$50,879	$163,220	31.2%
2110	Total Land & Support Assets	$263,757	$738,825	35.7%
2212	Digital Electronic Switching	$466,122	$1,368,627	34.1%
2220	Operator Systems	$12,896	$16,359	78.8%
2232	Circuit Equipment	$744,146	$2,033,696	36.6%
2411	Poles	$64,141	$85,048	75.4%
2421.1	Aerial Cable – Metallic	$418,217	$530,973	86.2%
2421.2	Aerial Cable – NonMetallic	$39,690		
2422.1	Underground Cable – Metallic	$98,463	$439,514	38.1%
2422.2	Underground Cable – NonMetallic	$69,073		
2423.1	Buried Cable – Metallic	$763,640	$1,308,448	63.2%
2423.2	Buried Cable – NonMetallic	$63,404		
2441	Conduit Systems	$38,194	$365,941	10.4%
2410	Total Cable & Wire Facilities	$1,554,823	$2,729,924	57.0%
Total TPIS (before amortizable assets)		$3,041,745	$7,037,282	43.2%

TABLE 3B: Expenses

Comparison of Modified Synthesis Model Cost Estimates to 2000 Current Costs				
USOA	**Expense Description**	**Modified Synthesis Model ($000)**	**2000 Current ($000)**	**% Current Cost Included in Model**
Plant Specific Expenses				
6112	Motor Vehicles	$514	$763	67.3%
6113	Aircraft	$0	$209	0.0%
6114	Special Purpose Vehicles	$383	$143	268.0%
6115	Garage Work Equipment	$0	$0	
6116	Other Work Equipment	$0	$0	
6110	Network Support	$897	$1,116	80.4%
6121	Land & Buildings	$9,239	$40,000	23.1%
6122	Furniture	$17	$6,234	0.3%
6123	Office Equipment	$84	$3,196	2.6%
6124	General Purpose Computers	$2,200	$45,369	4.8%
6120	Land & Support Assets	$11,540	$94,800	12.2%
6212	Digital Electronic Switching	$26,010	$47,689	54.5%
6220	Operator Systems	$1,123	$3,139	35.8%
6232	Circuit Equipment	$14,892	$19,723	75.5%
6411	Poles	$1,413	$14,210	9.9%
6421	Aerial Cable	$26,784	$56,603	47.3%
6422	Underground Cable	$2,890	$10,925	26.5%
6423	Buried Cable	$30,877	$109,902	28.1%
6441	Conduit Systems	$225	$1,566	14.4%
6410	Total Cable & Wire Facilities	$62,189	$193,316	32.2%
	Total Plant Specific Expenses	$116,651	$379,057	30.8%
Plant Nonspecific Operations				
6530	Total Network Operations Support	$80,695	$110,392	73.3%
6561	Depreciation TPIS	$179,160	$474,526	37.8%
6623	Customer Services	$11,279	$116,249	9.7%
Total Corporate Operations		$45,044	$148,083	30.4%

Q. Please explain the data provided by these tables.

A. Table 3A compares Verizon VA's actual capital investment to the Modified Synthesis Model's estimated capital investment. For example, the Table shows that the Modified Synthesis Model produces only 57 percent of Verizon VA's current investment in OSP network components, including fiber, copper, poles, and conduit.[29] For support assets (vehicles, office equipment, and the like), digital electronic switching, and electronic circuit equipment, the Model performs even worse, producing approximately one-third of Verizon VA's current investment. Turning to expenses on Table 3B, the Model produces only about 31 percent of Verizon VA's current plant-specific expenses. The comparison is particularly telling with respect to digital switching expenses, where the Modified Synthesis Model estimates that Verizon VA can maintain its switches for only 54 percent of the cost it currently incurs. The Modified Synthesis Model thus assumes that Verizon VA can maintain the same type of digital switching resources serving even more lines with a much smaller workforce than it currently employs. The expenses associated with circuit equipment are also unrealistically low. Despite an approximate tripling of lines that are assumed to be served by fiber feeder, the Modified Synthesis Model produces less than 76 percent of Verizon VA's current expenses.

Although prices based on economic costs do not necessarily ensure that Verizon VA will recover its historical investment, the huge disparity between the Modified

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[29] In addition, the Modified Synthesis Model's estimated capital investment is purportedly sufficient to serve 28 percent more lines than Verizon VA reported for 2000. Thus, on a per-line basis, Mr. Pitkin's model produces only 44 percent (0.57/1.28) of current investment.

Synthesis Model's results and Verizon VA's book costs is startling and indicative of the failure of the Model to produce reasonable estimates of forward-looking costs.

Q. How do the "total investments" assumed in the Modified Synthesis Model compare to Verizon VA's actual recent investments in Virginia?

A. A comparison of Verizon VA's investment from 1996 to 2000 (approximately the time that has elapsed since the last time AT&T presented UNE results in Virginia) illustrates the unrealistic investment and expense levels assumed by the Model. Between 1996 and 2000, Verizon VA invested about $2.3 billion in its total plant in-service. The Modified Synthesis Model calculates that it would require only about $700 million more in investment (representing a total of $3 billion (see Table 3A)) to construct from scratch Verizon VA's entire network on a forward-looking basis.

Q. How does the Modified Synthesis Model's forecasted investment compare to the investment of facilities-based competitive local exchange carriers ("CLECS")?

A. According to the Association for Local Telecommunications Services ("ALTS"), CLECs invested over $55 billion in infrastructure nationwide between 1997 and 2000 and served about 16 million lines at the end of 2000, resulting in investment of about $3,000 per-line.[30] In contrast, the Modified Synthesis Model claims that an investment of $3 billion

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[30] ALTS reports that "between 1997 and 2000, CLECs spent in excess of $55 billion on capital investments -- infrastructure that will serve the booming demand for voice and data telecommunications services." David A. Wolcott, Director, Public Policy Research, ALTS, "An ALTS Analysis: Local Competition Policy & The New Economy" (Feb. 2, 2001) p. 4; available at www.alts.org. A similar figure ($56 billion) was cited in another ALTS report. See The Association for Local Telecommunications Services, "The State of Local Competition 2001" (Feb. 2001).

is sufficient to serve almost 6.7 million lines in Virginia -- an investment of only about $455 per-line.[31] Even under the most conservative assumptions, this six-fold difference in investment per-line indicates that the Modified Synthesis Model produces unreliably low investment estimates and thus should not be used to estimate the forward-looking costs of providing UNEs in Virginia.

Q. Are Verizon VA's current costs a useful benchmark for evaluating the results of a forward-looking cost model?

A. Yes. For many types of costs, Verizon VA's current costs can serve as a meaningful starting point when estimating forward-looking costs. Indeed, the Modified Synthesis Model proponents have consistently argued that its loop costs are based on technology that has been in place for years and that the Model follows current engineering practices. Under these circumstances, current costs (and the loop facilities themselves) can be considerably more reliable than cost estimates based on a hypothetical construct that has never formed the basis for building a functioning network.

Q. Would you expect that forward-looking costs would differ from embedded costs?

A. Yes. Even if forward-looking costs and current costs do not match, the obvious and critical question is whether a model that produces forward-looking costs that are <u>less than one-half</u> of current costs is credible. While technological change and further competition

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[31] In contrast, the Synthesis Model produces an investment per-line of $887 when lines are measured as voice-grade equivalents, and $1,046 when physical channels are used.

may make Verizon VA more efficient, the idea that it can replace its current network with one that serves almost 30 percent more lines, but at less than one-half the cost, as the Modified Synthesis Model predicts, is ludicrous.

To put this comparison in context, when the Commission established price caps for AT&T in 1989, it estimated that AT&T could reduce its costs by 3 percent per-year. At this rate, it would have taken AT&T over 35 years to shed two-thirds of its per-line costs.[32] In contrast, proponents of the Modified Synthesis Model argue, in effect, that incumbent telephone companies can shed this percentage of their costs essentially overnight.

Q. Why does the Modified Synthesis Model produce such understated cost estimates?

A. There are at least two explanations: (1) the Modified Synthesis Model provides insufficient material (e.g., cable, structures) to provide service; and (2) the prices for materials are unrealistically low. For example, 2000 ARMIS data show that Verizon VA owns approximately 284,732 equivalent poles in Virginia and the Commission reports a current-cost-to-book-cost ratio of 2.39 for poles (i.e., if all existing poles were replaced with new ones, pole investment would be 2.39 times higher than book investment). Multiplying this ratio by the investment in Table 3A (which produces an investment of

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[32] Approximately the same duration is implied by the average productivity target of about 2.7 percent adopted in states with price cap plans. Even with the more ambitious productivity target of 6.5 percent that the Commission applied to the interstate services of price-capped local exchange carriers, it would take about 16 years to shed two-thirds of a firm's unit costs.

$203 million -- 217 percent greater than that produced by the Modified Synthesis Model) and dividing by the number of poles, produces a cost per-pole of about $713, which is about 71 percent higher than the Modified Synthesis Model's input price. Thus, the 217 percent greater investment in poles is a function of: (1) the 71 percent price difference, and (2) the fact that, in the real world, there are approximately 85 percent more poles than the Modified Synthesis Model estimates. The large difference in the number of poles is explained to a large extent by the unrealistically high level of structure sharing assumed by the Model.

Q. Have you performed a current-cost-to-book-cost comparison for Verizon VA?

A. Yes. I compared the OSP investment from the Modified Synthesis Model with what it would require Verizon VA to replace its plant at current prices.[33] Table 4 following shows the investment necessary to replace OSP facilities at current prices as a multiple of the Modified Synthesis Model's costs.[34]

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[33] To perform this comparison, I converted the book investments in Table 3A into current dollars by using the current-cost-to-book-cost ratios developed by the Commission and reported in Appendix D of the Tenth Report and Order.

[34] For example, the Commission reports a current cost to book cost ratio of 1.80 for conduit. Multiplying this ratio by the book cost of $366 million for conduit shown in Table 3A produces a current cost of $660 million, which is 17.29 times the $38 million in conduit investment produced by the Modified Synthesis Model.