

1 **3. Overview of Model Methodology**

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3 **Q. Are there other models available that can be used to estimate costs and evaluate the**
4 **prices proposed by the Company?**

5 A. Yes. For instance, three computerized cost models have been submitted to the Federal-State
6 Joint Board on Universal Service for possible use by the FCC in implementing a universal
7 service fund. These models are the Benchmark Cost Proxy Model (BCPM), developed and
8 sponsored by US West, Pacific Telesis and Sprint, the Hatfield Model, developed by Hatfield
9 Associates and sponsored by AT&T and MCI, and the Telecom Economic Cost Model,
10 developed by our firm and sponsored by the New Jersey Division of Ratepayer Advocate.

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12 **Q. Are there similarities between the various models you have mentioned?**

13 A. Yes. All the models, to varying degrees, seek to estimate the forward-looking economic cost
14 of a network used to provide local telephone services. Additionally, each model generates or
15 assumes a specified architecture or layout of a cable-based telecommunications network.
16 (None of these models deals with wireless networks). Finally, each of these models includes a
17 large set of inputs or assumptions which the user can modify in order to develop specific cost
18 estimates.

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20 **Q. Do these other models have advantages relative to the ones used by BA-Del?**

21 A. Yes. In a regulatory context, they offer at least two significant advantages. First, they are
22 “open” to inspection, allowing analysts and regulators to thoroughly study the inner workings of
23 the model. Second, the estimating process is accomplished within computer files that are
24 directly linked or integrated. As a result, the parties have a much greater opportunity to fully
25 understand each others’ cost estimates, to critique the model, and to readily determine how the
26 cost estimates vary when key assumptions or inputs are changed. Because other parties are

1 given access to most, if not all, of the underlying logic, they are given a full opportunity to
2 thoroughly study the model, to verify the reasonableness of the results, and to compute
3 alternative results which reflect any differences in philosophy or opinion concerning key issues.
4 These models are not perfect, and they have all been criticized. However, it should be
5 recognized that much of this criticism is a direct result of the fact that it is relatively easy to
6 analyze the logic and test the impact of key inputs and assumptions.

7 In contrast, Bell Atlantic-Delaware is relying on models which incorporate assumptions
8 that are not always fully accessible, which rely upon algorithms which cannot be seen or
9 critiqued, and which are not fully integrated with each other. As a result, the Staff and other
10 parties are limited in the extent to which they can review or scrutinize the cost studies submitted
11 by BA-DE in this proceeding. Although Bell Atlantic-Delaware provided us with copies of its
12 models, it did not do so until two weeks after we had requested them. We did not receive
13 them on diskettes until January 13, 1997, by which time it was impossible for us to fully
14 examine or understand the large number of separate computer files before filing in this
15 proceeding. Furthermore, since the algorithms, or logic, contained within several of the models
16 could not be reviewed or analyzed, we would not be able to fully examine, understand, or
17 critique them, even if more time had been available.

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19 **Q. Two Price Waterhouse analysts, testifying on behalf of BA-DeI, imply that the**
20 **Company's study methods can be adequately audited by an independent reviewer.**
21 **Was that your experience?**

22 **A. No. Mr. William Denebeim of Price Waterhouse has testified as follows:**

23 These seven cost models used by the Company in its TELRIC studies can be
24 reviewed by a third party to determine whether the use of the models is in
25 compliance with the Company's defined cost procedures and methods.

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27 The fact that these models are proprietary and utilize proprietary data does not
28 prevent a third party from obtaining a meaningful understanding of how the
29 models are used.

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2 BA-DelExhibit 8, at 6. Mr. Denebeim further concludes that “someone with knowledge of
3 telecommunications network costing principles and methods could review the models to
4 determine how they calculate their results”. Id., at 15.

5 While this all sounds very encouraging, we encountered multiple difficulties in attempting
6 to review the Company’s studies. To begin with, the time frame for this proceeding is fairly
7 brief. Furthermore, the models and studies are spread across numerous different computer
8 files. We received from the Company 751 different computer files; 76 of these files were
9 executable (*.exe) files or software of some type; 33 were text files (*.doc or *.txt); most of
10 the remaining files appeared to be data files of various types--presumably inputs and outputs
11 related to one or more of the 76 software files. All told, these 751 files contain 121 megabytes
12 of information. For perspective, realize that each megabyte can contain the equivalent of more
13 than 500 pages of double spaced text. While it might not be impossible to review and absorb all
14 this information in the brief period available for this proceeding, it certainly would be
15 challenging.

16 Compounding this problem, several of the most important models, including the UAAA
17 model and the SCIS model, were provided in a format that prevented us from studying the
18 inner workings of the software. With these models, unlike some of the other models provided
19 by the Company (e.g., LCAM), one can see only what goes in and what comes out. Thus, it is
20 fair to characterize these models as “black boxes.”

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22 **Q. You mentioned some other models which are being considered for use by the FCC; are**
23 **these also “black boxes” where the user can only see what goes in and what comes**
24 **out?**

25 A. No. The BCPM, Hatfield, and Telecom Economic Cost models are all “open” models
26 developed using the popular Microsoft Excel software. With these “glass box” models, a user

1 can view algorithms and formulas and trace all the way from the input data to the output values,
2 thereby gaining a much more complete and precise understanding of the model. Furthermore,
3 these models are publicly available and can be operated using public data, thereby eliminating
4 confidentiality concerns and the cumbersome restrictions that apply to the use of proprietary
5 data. In contrast, the BA-Del models were all provided under the terms of stringent proprietary
6 agreements, which make it difficult to work with the models. For example, we cannot readily
7 use results of the models which were obtained in one jurisdiction or proceeding for purposes of
8 a critique or comparison in another jurisdiction or proceeding. Thus, one is discouraged or
9 precluded from making comparisons between the results of different studies and different
10 assumptions. Because the models are not integrated, it is time consuming to experiment with the
11 inputs, and an outside analyst cannot be confident that the resulting outputs are directly
12 comparable to those submitted by the Company. Moreover, analysts are discouraged from
13 undertaking such experimentation, since the results obtained in one proceeding cannot be used
14 in other proceedings. Whether intentional or not, the lack of integration and the presence of
15 proprietary restrictions make it more difficult for the parties to gain a solid understanding of the
16 models, and they make it harder for the Commission to gain any perspective on the validity, or
17 lack of validity, of particular cost estimates.

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19 **Q. Why are Bell models such as the UAAA subject to stringent proprietary restrictions if**
20 **one cannot study the underlying algorithms?**

21 A. This is a question best asked of BA-Del. However, it is my understanding that one of the
22 justifications for these restrictions is that developers of this software (Bellcore) fear that a
23 greater level of disclosure would reduce the value of their intellectual property. Given sufficient
24 time, which could involve months of effort, I suppose a persistent analyst might engage in some
25 form of “reverse engineering” in order to guess at what is happening inside these black boxes.
26 However, I am not convinced of the need to protect software that in some ways is less

1 sophisticated, and more simplistic, than the glass box models which are publicly available.
2 Furthermore, I question whether any competing software developers would find the required
3 effort to reverse engineer the Bellcore models to be economically justified, given the limited
4 market for such models and the inherent difficulty in competing with an entrenched firm like
5 Bellcore. If a competing software developer wanted to go after this market, that competitor's
6 time would be better spent on an independent design effort (without extensive resort to reverse
7 engineering and mimicry), since this would provide a higher level of market credibility, and
8 would make it easier to provide new and different features and functions.
9

10 **Q. Would you please describe what you have learned from your review of the UAAA**
11 **model?**

12 A. Yes. While I learned essentially nothing about the inner workings of the model, I was able to
13 confirm my understanding that the model relies upon a large amount of historical engineering
14 data. Data such as feeder length, size, and structure, distribution length and structure, and the
15 number of distribution areas are taken from data bases developed or maintained by the
16 Company--they are not developed by the model on an economic cost minimization basis. These
17 UAA data inputs apparently reflect the actual number of working and available cable pairs, and
18 various other data specific to each UAA within each wire center. While the studies are all
19 claimed to be "forward looking," it is not clear which inputs are purely historic and which are
20 based upon forward looking assumptions or judgments. To the extent the cost studies are
21 forward looking, it does not appear that the UAA model itself does much to translate from a
22 backward to a forward orientation. Rather, it appears that this transformation, to the extent it
23 occurs at all, is part of the judgments used in creating the inputs used to operate the models.
24 While the wealth of data used in running the UAA model is impressive and interesting, there is
25 no indication that this information is adequately converted into an efficient network design which
26 is consistent with the concept of the "long run" as this term is used by economists. There is no

1 indication that the UAA model is designed to optimize the network, or otherwise ensure that the
2 model develops a cost effective network design.

3 Apparently, the UAAA copper cable investments are derived by performing simple
4 regression analyses of the installed cable costs associated with actual historical projects.
5 Statistical factors (slope coefficients and intercepts) derived from this historic data are then
6 applied to cable sizes and lengths and used as inputs into the UAAA model. The UAAA model
7 takes these statistics and combines it with information concerning the historical design of the
8 network. There does not appear to be much (if any) attempt to select or develop the least-cost
9 technology, plant mix, or network design based on today's conditions.

10 Perhaps the best example of this problem is the Company's approach to the tradeoffs
11 between copper and fiber cable. In this proceeding the Company developed cost estimates for
12 a network that relies very heavily upon fiber optic cable, based upon the rationale that this is a
13 more forward-looking design. However, this design was largely imposed on the UAAA model
14 by BA-Del; it is not the result of a sophisticated cost/benefit or cost minimization analysis within
15 the model. In fact, I did not find any evidence to suggest that the quantity of fiber was the result
16 of a detailed cost minimization, revenue maximization, or other optimization analysis.

17 I don't dispute the desirability of the Company's goal of delivering "fiber to the curb."
18 Increased fiber deployment will allow it to provide video dial tone services, broadband data
19 services, and higher quality voice services. Such deployment is consistent with the policies of
20 the Commission and the State of Delaware.

21 However, at least for the immediate future, the great majority of the unbundled loops
22 which will be *provided by BA-Del to its competitors* will probably consist of ordinary copper
23 pairs. In this proceeding the Company is proposing to price these copper pairs on the basis of
24 a "future looking" network in which all loops over 7,000 to 9,000 feet long include a substantial
25 segment of fiber cable. While this hypothetical network design might provide greater reliability
26 or better transmission quality, any such benefits will not necessarily be provided to the carriers.

1 They will be provided with ordinary copper pairs in most cases--and that is probably all they
2 want or need.

3 In a sense, the Company proposes to charge its competitors for digital loops but it will
4 provide them with analog loops. There has been no showing that the Company's cost estimates
5 are appropriate for the unbundled copper loops which will actually be provided in most cases.
6 Nor has there been any showing that the cost of the hypothetical "forward looking" broadband-
7 capable network is comparable to, or less than, the cost of a network which relies entirely upon
8 copper cable. Once fiber is actually deployed to the curb, and broadband services are
9 adequately promoted, the resulting increase in bandwidth and volume of traffic carried on the
10 network may translate into a substantial reduction in the cost of providing "POTS" (since
11 ordinary voice services will use only a minor fraction of the fiber network's bandwidth).
12 However, there is no indication that the Company has adequately taken these traffic increases,
13 or resulting cost savings, into account in this proceeding. To the contrary, it appears that the
14 Company's cost studies are based upon a scenario which is not particularly meaningful or
15 realistic: they rely heavily upon fiber, and include the relatively high cost of electronics used to
16 provide voice grade services over such a network, without considering the economies of scale
17 and declining equipment prices which will be available by the time such a network is actually
18 deployed, and the Company begins to market video dial tone and other broadband services on
19 a widespread basis.

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21 **Q. How does the Company's approach compare to the manner in which the Telecom
22 Economic Cost Model deals with this type of problem?**

23 A. The Telecom Economic Cost Model treats the size and configuration of the network as a
24 variable, which can be optimized in the long run. With regard to installed cable costs, it is more
25 sophisticated than the UAAA model. The UAAA model estimates installed cable investments
26 based on some highly simplified statistical parameters (an intercept and slope variable) in

1 combination with various input assumptions (e.g., feeder cable size is treated as an input
2 assumption) which are applied to a data base of engineering information concerning the existing
3 network.

4 In contrast, the Telecom Economic Cost Model develops detailed estimates of the
5 required amount of cable material and the actual cost of purchasing and installing this amount of
6 material for a stylized network that is designed to optimally serve the wire center area. For
7 instance, cable size is optimized by the model. Similarly, our model calculates the amount of
8 time required for design/engineering, placing and splicing the cable, based upon detailed inputs,
9 using algorithms within the model. The model can develop a network consisting entirely of
10 copper cable, one consisting entirely of fiber cable up to the final segment of distribution cable
11 and loops (which are copper), or using a combination of copper and fiber. In the latter case, the
12 mix can be optimized based upon a variety of different criteria, including cost minimization.

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